Package: gp3tools (via r-universe)

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Type Package

Title Import, Inspect, Analyse, and Report Gazepoint GP3 Exports

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Description Tools for importing, inspecting, cleaning, summarising, modelling, and reporting Gazepoint GP3 and Gazepoint Analysis CSV exports. The package supports offline workflows for all-gaze, fixation, pupil, area-of-interest, transition, time-course, quality-audit, and manuscript-reporting analyses.

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Contents

`as_gazepoint_master` *Convert Gazepoint all-gaze data to a master sample table*

Description

Converts a Gazepoint all-gaze export into a standard sample-level table with one row per gaze sample. The returned table keeps Gazepoint identifiers but also adds analysis-friendly columns such as `subject`, `media_id`, `time_ms`, `x`, `y`, `left_pupil`, `right_pupil`, `mean_pupil`, `valid_sample`, `missing_gaze`, `missing_pupil`, `trackloss`, `blink`, `aoi_current`, `message`, and `event_type`.

Usage

```
as_gazepoint_master(
  data,
  screen_width_px = NULL,
  screen_height_px = NULL,
  source_col = "USER_FILE",
  media_col = "MEDIA_ID",
  media_name_col = "MEDIA_NAME",
  time_col = "TIME",
  coordinate_unit = c("auto", "normalised", "pixels"),
  event_latency_offset_ms = 0
)
```

Arguments

`data`	A Gazepoint all-gaze data frame, usually `results$all_gaze`.
`screen_width_px`	Optional screen width in pixels. If supplied and gaze coordinates are detected as normalised 0-1 coordinates, x coordinates are converted to pixels.
`screen_height_px`	Optional screen height in pixels. If supplied and gaze coordinates are detected as normalised 0-1 coordinates, y coordinates are converted to pixels.
`source_col`	Column identifying the source/user file.
`media_col`	Column identifying the Gazepoint media/stimulus.
`media_name_col`	Column identifying the Gazepoint media/stimulus name.
`time_col`	Gazepoint time column, usually `TIME`.
`coordinate_unit`	One of `"auto"`, `"normalised"`, or `"pixels"`. `"auto"` detects normalised coordinates when coordinate values are mostly between 0 and 1.
`event_latency_offset_ms`	Optional timing correction in milliseconds. Positive values shift event/sample time forward.

Details

This function is intended as a bridge between raw Gazepoint exports and more advanced eye-tracking workflows. It does not require an external trial log. Later, experiment-level information such as condition, trial ID, response, accuracy, or reaction time can be joined to the returned table.

Value

A tibble with one row per sample and standardised sample-level eye-tracking columns.

Examples

```
## Not run:
results <- run_gazepoint_workflow(
  export_dir = "C:/Users/YourName/Desktop/gp3_test_exports",
  output_dir = "C:/Users/YourName/Desktop/gp3_outputs"
)

master <- as_gazepoint_master(
  results$all_gaze,
  screen_width_px = 1920,
  screen_height_px = 1080
)

dplyr::glimpse(master)

## End(Not run)
```

---

audit_gazepoint_aoi_coding_matrix

Audit AOI coding against geometry

Description

Validate observed sample-level AOI labels against AOI labels derived from gaze coordinates and AOI geometry.

Usage

```
audit_gazepoint_aoi_coding_matrix(
  gaze_data,
  aoi_geometry,
  observed_aoi_col = NULL,
  gaze_x_col = NULL,
  gaze_y_col = NULL,
  gaze_stimulus_col = NULL,
  sample_id_cols = NULL,
  geometry_aoi_col = NULL,
```

```
  geometry_stimulus_col = NULL,
  x_min_col = NULL,
  y_min_col = NULL,
  x_max_col = NULL,
  y_max_col = NULL,
  x_col = NULL,
  y_col = NULL,
  width_col = NULL,
  height_col = NULL,
  screen_x_range = c(0, 1),
  screen_y_range = c(0, 1),
  tie_method = c("ambiguous", "first"),
  outside_label = "outside",
  ambiguous_label = "ambiguous",
  missing_label = "missing_coordinate",
 observed_outside_values = c("outside", "none", "no_aoi", "non_aoi", "background",
    "off_aoi"),
  max_mismatch_prop = 0.05,
  max_ambiguous_prop = 0.05,
  max_missing_coordinate_prop = 0.2,
  ignore_invalid_geometry = TRUE
)
```

Arguments

gaze_data	A data frame containing gaze samples and observed AOI labels.
aoi_geometry	A data frame containing AOI geometry definitions.
observed_aoi_col	Observed AOI label column in gaze_data.
gaze_x_col	Gaze x-coordinate column. If NULL, common aliases are detected automatically.
gaze_y_col	Gaze y-coordinate column. If NULL, common aliases are detected automatically.
gaze_stimulus_col	Optional gaze stimulus/media column.
sample_id_cols	Optional columns to carry into the sample-level coding audit table.
geometry_aoi_col	AOI label/name column in aoi_geometry.
geometry_stimulus_col	Optional stimulus/media column in aoi_geometry.
x_min_col	Optional AOI left/x-min column.
y_min_col	Optional AOI top/y-min column.
x_max_col	Optional AOI right/x-max column.
y_max_col	Optional AOI bottom/y-max column.
x_col	Optional AOI left/x column used with width_col.
y_col	Optional AOI top/y column used with height_col.
width_col	Optional AOI width column.

`height_col` Optional AOI height column.

`screen_x_range` Numeric length-2 vector defining the screen x range.

`screen_y_range` Numeric length-2 vector defining the screen y range.

`tie_method` How to handle samples falling in multiple AOIs. Use `"ambiguous"` to label them as ambiguous or `"first"` to use the first matching AOI.

`outside_label` Label used for samples outside all AOIs.

`ambiguous_label`
Label used for samples inside multiple AOIs when `tie_method = "ambiguous"`.

`missing_label` Label used for samples with missing/non-finite gaze coordinates.

`observed_outside_values`
Character values in `observed_aoi_col` treated as outside/non-AOI labels.

`max_mismatch_prop`
Maximum acceptable proportion of comparable samples where observed and geometry-derived AOI labels differ.

`max_ambiguous_prop`
Maximum acceptable proportion of samples with ambiguous geometry-derived AOI assignment.

`max_missing_coordinate_prop`
Maximum acceptable proportion of samples with missing/non-finite gaze coordinates.

`ignore_invalid_geometry`
Logical. If `TRUE`, AOIs with invalid coordinates or dimensions are excluded before coding validation.

Value

A list with class `gp3_aoi_coding_matrix_audit` containing overview, geometry_summary, sample_coding, coding_matrix, observed_summary, derived_summary, flagged_samples, and settings tables.

`audit_gazepoint_aoi_geometry`
Audit AOI geometry definitions

Description

Create a publication-level audit of AOI geometry definitions, including AOI size, area, coordinate validity, screen-bound checks, and duplicate geometry.

Usage

```
audit_gazepoint_aoi_geometry(
  data,
  aoi_col = NULL,
  stimulus_col = NULL,
  x_min_col = NULL,
  y_min_col = NULL,
  x_max_col = NULL,
  y_max_col = NULL,
  x_col = NULL,
  y_col = NULL,
  width_col = NULL,
  height_col = NULL,
  screen_x_range = c(0, 1),
  screen_y_range = c(0, 1),
  min_width = 0,
  min_height = 0,
  min_area = 0,
  max_area_prop = 1,
  require_within_screen = TRUE
)
```

Arguments

data	A data frame containing AOI geometry definitions.
aoi_col	AOI label/name column. If NULL, common AOI-name aliases are detected automatically.
stimulus_col	Optional stimulus/media column.
x_min_col	Optional AOI left/x-min column.
y_min_col	Optional AOI top/y-min column.
x_max_col	Optional AOI right/x-max column.
y_max_col	Optional AOI bottom/y-max column.
x_col	Optional AOI left/x column used with width_col.
y_col	Optional AOI top/y column used with height_col.
width_col	Optional AOI width column.
height_col	Optional AOI height column.
screen_x_range	Numeric length-2 vector defining the screen x range.
screen_y_range	Numeric length-2 vector defining the screen y range.
min_width	Minimum acceptable AOI width.
min_height	Minimum acceptable AOI height.
min_area	Minimum acceptable AOI area.
max_area_prop	Maximum acceptable AOI area as a proportion of screen area.
require_within_screen	Logical. If TRUE, AOIs extending outside the screen range are flagged.

Value

A list with class gp3_aoi_geometry_audit containing overview, geometry_summary, size_summary, flagged_aois, duplicate_geometry, and settings tables.

`audit_gazepoint_aoi_margin_sensitivity`
Audit AOI margin sensitivity

Description

Audit whether sample-level AOI assignments are sensitive to small expansions or shrinkages of AOI boundaries.

Usage

```
audit_gazepoint_aoi_margin_sensitivity(
  gaze_data,
  aoi_geometry,
  gaze_x_col = NULL,
  gaze_y_col = NULL,
  gaze_stimulus_col = NULL,
  sample_id_cols = NULL,
  geometry_aoi_col = NULL,
  geometry_stimulus_col = NULL,
  x_min_col = NULL,
  y_min_col = NULL,
  x_max_col = NULL,
  y_max_col = NULL,
  x_col = NULL,
  y_col = NULL,
  width_col = NULL,
  height_col = NULL,
  margins = c(-0.02, 0, 0.02),
  screen_x_range = c(0, 1),
  screen_y_range = c(0, 1),
  tie_method = c("ambiguous", "first"),
  outside_label = "outside",
  ambiguous_label = "ambiguous",
  missing_label = "missing_coordinate",
  max_margin_change_prop = 0.1,
  max_ambiguous_prop = 0.05,
  ignore_invalid_geometry = TRUE
)
```

Arguments

gaze_data	A data frame containing gaze samples.
aoi_geometry	A data frame containing AOI geometry definitions.
gaze_x_col	Gaze x-coordinate column. If NULL, common aliases are detected automatically.
gaze_y_col	Gaze y-coordinate column. If NULL, common aliases are detected automatically.
gaze_stimulus_col	Optional gaze stimulus/media column.
sample_id_cols	Optional columns to carry into the sample-level audit table.
geometry_aoi_col	AOI label/name column in aoi_geometry.
geometry_stimulus_col	Optional stimulus/media column in aoi_geometry.
x_min_col	Optional AOI left/x-min column.
y_min_col	Optional AOI top/y-min column.
x_max_col	Optional AOI right/x-max column.
y_max_col	Optional AOI bottom/y-max column.
x_col	Optional AOI left/x column used with width_col.
y_col	Optional AOI top/y column used with height_col.
width_col	Optional AOI width column.
height_col	Optional AOI height column.
margins	Numeric vector of AOI boundary margins. Positive values expand AOIs; negative values shrink AOIs. A zero-margin baseline is always added.
screen_x_range	Numeric length-2 vector defining the screen x range.
screen_y_range	Numeric length-2 vector defining the screen y range.
tie_method	How to handle samples falling in multiple AOIs. Use "ambiguous" to label them as ambiguous or "first" to use the first matching AOI.
outside_label	Label for samples outside all AOIs.
ambiguous_label	Label for samples inside multiple AOIs when tie_method = "ambiguous".
missing_label	Label for samples with missing/non-finite gaze coordinates.
max_margin_change_prop	Maximum acceptable proportion of samples whose AOI assignment changes from the zero-margin baseline.
max_ambiguous_prop	Maximum acceptable proportion of ambiguous samples.
ignore_invalid_geometry	Logical. If TRUE, AOIs with invalid coordinates or dimensions are excluded before margin coding.

Value

A list with class gp3_aoi_margin_sensitivity_audit containing overview, geometry_summary, sample_sensitivity, margin_summary, aoi_margin_summary, flagged_samples, and settings tables.

`audit_gazepoint_aoi_overlap` *Audit AOI overlap*

Description

Create a publication-level audit of pairwise AOI overlap within each stimulus.

Usage

```
audit_gazepoint_aoi_overlap(
  data,
  aoi_col = NULL,
  stimulus_col = NULL,
  x_min_col = NULL,
  y_min_col = NULL,
  x_max_col = NULL,
  y_max_col = NULL,
  x_col = NULL,
  y_col = NULL,
  width_col = NULL,
  height_col = NULL,
  screen_x_range = c(0, 1),
  screen_y_range = c(0, 1),
  min_overlap_area = 0,
  min_overlap_prop = 0,
  ignore_invalid_geometry = TRUE
)
```

Arguments

`data`	A data frame containing AOI geometry definitions.
`aoi_col`	AOI label/name column. If `NULL`, common AOI-name aliases are detected automatically by `audit_gazepoint_aoi_geometry()`.
`stimulus_col`	Optional stimulus/media column.
`x_min_col`	Optional AOI left/x-min column.
`y_min_col`	Optional AOI top/y-min column.
`x_max_col`	Optional AOI right/x-max column.
`y_max_col`	Optional AOI bottom/y-max column.
`x_col`	Optional AOI left/x column used with `width_col`.
`y_col`	Optional AOI top/y column used with `height_col`.
`width_col`	Optional AOI width column.
`height_col`	Optional AOI height column.
`screen_x_range`	Numeric length-2 vector defining the screen x range.

screen_y_range Numeric length-2 vector defining the screen y range.

min_overlap_area
: Minimum overlap area above which an AOI pair is flagged.

min_overlap_prop
: Minimum overlap proportion above which an AOI pair is flagged. This is computed relative to the smaller AOI in the pair.

ignore_invalid_geometry
: Logical. If TRUE, AOIs with invalid geometry are excluded from pairwise overlap calculations.

Value

A list with class gp3_aoi_overlap_audit containing overview, geometry_summary, pairwise_overlap, overlap_summary, flagged_overlaps, and settings tables.

---

audit_gazepoint_aoi_window_denominators

Audit AOI window denominators before binomial modelling

Description

Audit AOI-window sample denominators before confirmatory binomial or logistic mixed-effects modelling. The function is designed for output from summarise_gazepoint_aoi_windows().

Usage

```
audit_gazepoint_aoi_window_denominators(
  data,
  window_col = "window_label",
  window_start_col = "window_start_ms",
  window_end_col = "window_end_ms",
  denominator_col = "n_valid_denominator_samples",
  total_col = "n_window_samples",
  target_col = "n_target_samples",
  condition_col = "condition",
  group_cols = NULL,
  min_denominator_samples = 5,
  min_valid_denominator_prop = 0.7,
  max_denominator_cv = 0.25,
  max_condition_ratio = 2
)
```

Arguments

data AOI-window summary data.

window_col Name of the AOI-window label column.

`window_start_col`
: Optional window-start column.

`window_end_col`
: Optional window-end column.

`denominator_col`
: Name of the denominator column to audit.

`total_col`
: Name of the total window-sample column.

`target_col`
: Name of the target-success count column.

`condition_col`
: Optional condition column.

`group_cols`
: Optional grouping columns for row-level audit context.

`min_denominator_samples`
: Minimum acceptable denominator count.

`min_valid_denominator_prop`
: Minimum acceptable valid-denominator proportion relative to total window samples.

`max_denominator_cv`
: Maximum acceptable denominator coefficient of variation within each window.

`max_condition_ratio`
: Maximum acceptable ratio between the largest and smallest mean denominator across conditions within a window.

Value

A named list containing overview, row audit, window summary, condition-window summary, denominator-imbalance summary, flagged rows, and settings.

`audit_gazepoint_condition_quality_imbalance` *Audit condition-level quality imbalance*

Description

Create a publication-level audit of whether gaze, pupil, retention, or other quality metrics differ across experimental conditions.

Usage

```
audit_gazepoint_condition_quality_imbalance(
  data,
  condition_col = "condition",
  quality_cols = NULL,
  subject_col = NULL,
  min_units_per_condition = 1L,
  max_mean_difference = 0.1,
  max_condition_ratio = 2,
  lower_is_better = c("missing_gaze_prop", "offscreen_prop", "excluded_prop",
    "failure_prop", "artifact_prop")
)
```

Arguments

data	A data frame containing condition-level, unit-level, or subject-condition-level quality metrics.
condition_col	Condition column.
quality_cols	Numeric quality-metric columns. If NULL, common quality columns are detected automatically.
subject_col	Optional subject column.
min_units_per_condition	Minimum number of rows/units expected per condition.
max_mean_difference	Maximum acceptable absolute difference between condition means for each quality metric.
max_condition_ratio	Maximum acceptable ratio between the largest and smallest non-zero condition mean for each quality metric.
lower_is_better	Optional character vector naming metrics where lower values indicate better quality, such as missing-gaze or exclusion metrics.

Value

A list with class gp3_condition_quality_imbalance_audit containing overview, condition_summary, metric_summary, flagged_metrics, and settings tables.

---

audit_gazepoint_design_balance

Audit Gazepoint experimental design balance

Description

Create a publication-level audit of observed design balance across subjects, conditions, and optional stimulus/trial identifiers.

Usage

```
audit_gazepoint_design_balance(
  data,
  subject_col = "subject",
  condition_col = "condition",
  unit_cols = c("media_id", "trial_global"),
  expected_conditions = NULL,
  min_units_per_condition = 1L,
  max_condition_ratio = 2,
  require_all_conditions_per_subject = TRUE
)
```

Arguments

data	A data frame containing trial-level, window-level, or sample-level Gazepoint-derived data.
subject_col	Subject/participant identifier column.
condition_col	Experimental condition column.
unit_cols	Optional columns defining the repeated unit to count within each subject and condition, such as media, trial, block, or window.
expected_conditions	Optional character vector of expected condition labels.
min_units_per_condition	Minimum number of observed units expected per subject-condition cell.
max_condition_ratio	Maximum allowed ratio between a subject's largest and smallest non-zero condition counts.
require_all_conditions_per_subject	Logical. If TRUE, flag subjects who do not have all expected or observed conditions.

Value

A list with class gp3_design_balance_audit containing overview, subject_summary, condition_summary, cell_summary, imbalance_summary, flagged_cells, and settings tables.

---

audit_gazepoint_event_sync

Audit Gazepoint event and timing synchronisation

Description

Create a publication-level audit of event timing, trial timing, and event availability in a Gazepoint master table or sample-level export.

Usage

```
audit_gazepoint_event_sync(
  data,
  time_col = "time",
  event_col = NULL,
  group_cols = c("subject", "media_id", "trial_global"),
  condition_col = NULL,
  expected_event_labels = NULL,
  onset_event_label = NULL,
  response_event_label = NULL,
  min_samples_per_unit = 1L,
  max_time_gap_ms = NULL
)
```

Arguments

data	A data frame containing sample-level Gazepoint data.
time_col	Name of the time column.
event_col	Optional event-label column. If NULL, the function tries to detect a common event column.
group_cols	Columns defining a trial or recording unit.
condition_col	Optional condition column.
expected_event_labels	Optional character vector of expected event labels.
onset_event_label	Optional event label identifying trial/stimulus onset.
response_event_label	Optional event label identifying response events.
min_samples_per_unit	Minimum number of samples expected per unit.
max_time_gap_ms	Optional maximum allowed within-unit time gap in milliseconds.

Value

A list with class gp3_event_sync_audit containing overview, unit_summary, event_summary, expected_event_summary, flagged_units, and settings tables.

---

audit_gazepoint_exclusion_flow

Audit Gazepoint exclusion and retention flow

Description

Create a publication-level audit of retained and excluded analysis units.

Usage

```
audit_gazepoint_exclusion_flow(
  data,
  subject_col = "subject",
  condition_col = NULL,
  unit_cols = c("media_id", "trial_global"),
  include_col = NULL,
  exclude_col = NULL,
  status_col = NULL,
  reason_col = NULL,
  included_values = c("included", "include", "kept", "keep", "retained", "ok", "ready",
    "complete", "completed"),
```

```
  excluded_values = c("excluded", "exclude", "drop", "dropped", "removed", "fail",
    "failed", "not_ready", "review", "invalid"),
  min_retained_prop = 0.7,
  max_condition_exclusion_ratio = 2
)
```

Arguments

`data`	A data frame containing row-, trial-, window-, or unit-level data.
`subject_col`	Subject/participant identifier column.
`condition_col`	Optional condition column.
`unit_cols`	Optional columns defining the analysis unit, such as media, trial, block, or window.
`include_col`	Optional logical/numeric/character column indicating rows or units retained for analysis.
`exclude_col`	Optional logical/numeric/character column indicating rows or units excluded from analysis.
`status_col`	Optional status column used to infer inclusion or exclusion.
`reason_col`	Optional exclusion-reason column.
`included_values`	Character values in `status_col` treated as retained.
`excluded_values`	Character values in `status_col` treated as excluded.
`min_retained_prop`	Minimum acceptable retained-unit proportion.
`max_condition_exclusion_ratio`	Maximum allowed ratio between condition exclusion proportions.

Value

A list with class `gp3_exclusion_flow_audit` containing overview, unit_flow, reason_summary, condition_summary, subject_summary, flagged_units, and settings tables.

`audit_gazepoint_fixation_reliability` *Audit split-half reliability of fixation or AOI metrics*

Description

Computes odd-even or random split-half reliability for common fixation and AOI-derived metrics. The audit returns the split-half correlation and the Spearman-Brown corrected reliability estimate.

Usage

```
audit_gazepoint_fixation_reliability(
  data,
  subject_col,
  trial_col,
 metric = c("fixation_count", "mean_fixation_duration", "total_fixation_duration",
    "aoi_dwell_prop", "transition_count", "entropy_score"),
  duration_col = NULL,
  aoi_col = NULL,
  target_aoi = NULL,
  time_col = NULL,
  group_cols = NULL,
  min_trials = 4,
  split_method = c("odd_even", "random"),
  seed = NULL,
  correlation_method = c("pearson", "spearman")
)
```

Arguments

data	A fixation-level or AOI-event-level data frame.
subject_col	Character scalar. Subject identifier column.
trial_col	Character scalar. Trial identifier column.
metric	Metric to audit. Supported values are "fixation_count", "mean_fixation_duration", "total_fixation_duration", "aoi_dwell_prop", "transition_count", and "entropy_score".
duration_col	Optional duration column. Required for duration metrics. Optional for "aoi_dwell_prop"; if omitted, row proportions are used.
aoi_col	Optional AOI column. Required for AOI, transition, and entropy metrics.
target_aoi	Optional AOI label required when metric = "aoi_dwell_prop".
time_col	Optional time column used to order AOI sequences.
group_cols	Optional grouping columns. Reliability is computed separately within each group.
min_trials	Minimum number of trials per subject required for inclusion.
split_method	"odd_even" or "random".
seed	Optional random seed used when split_method = "random".
correlation_method	Correlation method passed to stats::cor().

Value

A data frame containing split-half reliability diagnostics.

Examples

```
dat <- expand.grid(
  subject = paste0("S", 1:6),
  trial = paste0("T", 1:4),
  KEEP.OUT.ATTRS = FALSE
)
dat$duration <- rep(seq_len(6), each = 4) + rep(c(0, 0.1, 0, 0.1), 6)

audit_gazepoint_fixation_reliability(
  dat,
  subject_col = "subject",
  trial_col = "trial",
  metric = "total_fixation_duration",
  duration_col = "duration"
)
```

`audit_gazepoint_gaze_signal_quality`
Audit Gazepoint gaze-signal quality

Description

Create a publication-level audit of gaze coordinate availability, validity, off-screen samples, and optional pupil availability.

Usage

```
audit_gazepoint_gaze_signal_quality(
  data,
  subject_col = "subject",
  condition_col = NULL,
  group_cols = c("subject", "media_id", "trial_global"),
  x_col = NULL,
  y_col = NULL,
  validity_cols = NULL,
  pupil_col = NULL,
  screen_x_range = c(0, 1),
  screen_y_range = c(0, 1),
  min_gaze_valid_prop = 0.7,
  max_missing_gaze_prop = 0.3,
  max_offscreen_prop = 0.3,
  min_pupil_valid_prop = 0.7
)
```

Arguments

`data`	A sample-level Gazepoint data frame.

subject_col	Subject/participant identifier column.
condition_col	Optional condition column.
group_cols	Columns defining a recording, stimulus, trial, or analysis unit.
x_col	Optional gaze-x coordinate column. If NULL, common Gazepoint aliases are detected.
y_col	Optional gaze-y coordinate column. If NULL, common Gazepoint aliases are detected.
validity_cols	Optional gaze-validity columns. If NULL, common Gazepoint validity columns are detected.
pupil_col	Optional pupil column. If NULL, common pupil aliases are detected.
screen_x_range	Numeric length-2 vector defining plausible on-screen x range.
screen_y_range	Numeric length-2 vector defining plausible on-screen y range.
min_gaze_valid_prop	Minimum acceptable gaze-validity proportion.
max_missing_gaze_prop	Maximum acceptable missing-gaze proportion.
max_offscreen_prop	Maximum acceptable off-screen proportion.
min_pupil_valid_prop	Minimum acceptable valid-pupil proportion when a pupil column is available.

Value

A list with class gp3_gaze_signal_quality_audit containing overview, unit_summary, subject_summary, condition_summary, signal_issue_summary, flagged_units, and settings tables.

---

audit_gazepoint_master

Audit a Gazepoint master sample table

Description

Creates compact quality-audit tables from a master sample-level table created by as_gazepoint_master() or create_gazepoint_master(). The audit summarises missing gaze, missing pupil, off-screen gaze, AOI states, pupil availability, coordinate ranges, and subject/media-level quality.

Usage

```
audit_gazepoint_master(master)
```

Arguments

master	A master sample-level table created by as_gazepoint_master() or create_gazepoint_master().

Value

A named list of tibbles:

overview One-row overview of the master table.

by_subject Quality summary by participant/source.

by_media Quality summary by media/stimulus.

by_subject_media Quality summary by participant/source and media/stimulus.

aoi_states Counts and percentages of AOI states.

pupil_summary Pupil summary by participant/source and media/stimulus.

coordinate_summary Coordinate range and off-screen summary.

Examples

```
## Not run:
results <- run_gazepoint_workflow(
  export_dir = "C:/Users/YourName/Desktop/gp3_test_exports",
  output_dir = "C:/Users/YourName/Desktop/gp3_outputs"
)

master <- create_gazepoint_master(
  gaze_data = results$all_gaze,
  screen_width_px = 1920,
  screen_height_px = 1080
)

audit <- audit_gazepoint_master(master)

audit$overview
audit$by_subject
audit$aoi_states

## End(Not run)
```

`audit_gazepoint_post_exclusion_balance`
Audit post-exclusion condition balance

Description

Create a publication-level audit of whether the retained analysis sample remains balanced across subjects and experimental conditions after exclusions.

Usage

```
audit_gazepoint_post_exclusion_balance(
  data,
  subject_col = "subject",
  condition_col = "condition",
  unit_cols = c("media_id", "trial_global"),
  retained_col = NULL,
  include_col = NULL,
  exclude_col = NULL,
  status_col = NULL,
  expected_conditions = NULL,
 included_values = c("included", "include", "kept", "keep", "retained", "ok", "ready",
    "complete", "completed"),
 excluded_values = c("excluded", "exclude", "drop", "dropped", "removed", "fail",
    "failed", "not_ready", "review", "invalid"),
  min_retained_units_per_condition = 1L,
  min_retained_units_per_subject_condition = 1L,
  max_condition_count_ratio = 2,
  max_subject_condition_ratio = 2,
  require_all_conditions_per_subject = TRUE
)
```

Arguments

`data`	A data frame containing row-, sample-, trial-, or unit-level data.
`subject_col`	Subject/participant identifier column.
`condition_col`	Experimental condition column.
`unit_cols`	Optional columns defining the analysis unit, such as media, trial, block, or window.
`retained_col`	Optional logical/numeric/character column indicating retained units.
`include_col`	Optional logical/numeric/character inclusion column.
`exclude_col`	Optional logical/numeric/character exclusion column.
`status_col`	Optional status column used to infer retained/excluded units.
`expected_conditions`	Optional character vector of expected conditions.
`included_values`	Character values in `status_col` treated as retained.
`excluded_values`	Character values in `status_col` treated as excluded.
`min_retained_units_per_condition`	Minimum retained units required per condition.
`min_retained_units_per_subject_condition`	Minimum retained units required per subject-condition cell.
`max_condition_count_ratio`	Maximum allowed ratio between condition-level retained counts.

max_subject_condition_ratio
: Maximum allowed within-subject retained condition-count ratio.

require_all_conditions_per_subject
: Logical. If TRUE, flag subjects missing retained units in one or more expected conditions.

Value

A list with class gp3_post_exclusion_balance_audit containing overview, unit_flow, cell_summary, condition_summary, subject_summary, flagged_cells, flagged_subjects, and settings tables.

---

audit_gazepoint_pupil_baseline

Audit Gazepoint pupil baseline quality

Description

Summarise baseline quality after baseline_correct_gazepoint_pupil().

Usage

```
audit_gazepoint_pupil_baseline(
  data,
  group_cols = c("subject", "media_id"),
  time_col = "time",
  pupil_col = "pupil_interpolated",
  baseline_n_col = "pupil_baseline_n",
  baseline_status_col = "pupil_baseline_status",
  baseline_available_col = "pupil_baseline_available",
  baseline_used_col = "pupil_baseline_used",
  baseline_window_start_col = "pupil_baseline_window_start",
  baseline_window_end_col = "pupil_baseline_window_end",
  baseline_flag_col = NULL,
  interpolated_col = "pupil_was_interpolated",
  artifact_col = NULL,
  artifact_reason_col = NULL,
  min_baseline_samples = 1,
  max_missing_pct = 50,
  max_interpolated_pct = 50,
  max_artifact_pct = 50
)
```

Arguments

data
: A data frame returned by baseline_correct_gazepoint_pupil() or a later pupil-preprocessing step.

group_cols
: Character vector of grouping columns. Use character(0) for an overall audit.

`time_col` Name of the time column.

`pupil_col` Name of the pupil column used to evaluate missingness.

`baseline_n_col` Name of the baseline valid-sample count column.

`baseline_status_col`
Name of the baseline-status column.

`baseline_available_col`
Name of the baseline-availability column.

`baseline_used_col`
Name of the logical column indicating whether a row used a baseline value.

`baseline_window_start_col`
Name of the baseline-window start column.

`baseline_window_end_col`
Name of the baseline-window end column.

`baseline_flag_col`
Optional logical column identifying baseline rows. If `NULL`, baseline rows are detected from the time column and baseline window start/end columns.

`interpolated_col`
Name of the logical interpolation flag column.

`artifact_col` Optional artifact flag column. If `NULL`, the function tries to detect `pupil_artifact_flag`, `pupil_flag_invalid`, or `artifact_flag`.

`artifact_reason_col`
Optional artifact-reason column. If `NULL`, the function tries to detect `pupil_artifact_reason`, `pupil_flag_reason`, or `artifact_reason`.

`min_baseline_samples`
Minimum acceptable number of valid baseline samples before a group is flagged as low quality.

`max_missing_pct`
Maximum acceptable percentage of missing baseline samples.

`max_interpolated_pct`
Maximum acceptable percentage of interpolated baseline samples.

`max_artifact_pct`
Maximum acceptable percentage of artifact-flagged baseline samples.

Details

The function reports baseline-row counts, valid/missing baseline samples, interpolated baseline samples, artifact-flagged baseline samples, no-baseline cases, and low-quality baseline flags by subject, media, trial, condition, or any selected grouping variables.

Value

A tibble with one row per group.

audit_gazepoint_pupil_drift *Audit Gazepoint pupil drift*

Description

Summarise tonic pupil/time-on-task drift in processed Gazepoint pupil data.

Usage

```
audit_gazepoint_pupil_drift(
  data,
  group_cols = "subject",
  pupil_col = NULL,
  time_col = "time",
  order_col = "trial",
  condition_col = "condition",
  exclude_col = "excluded_trial",
  include_excluded = FALSE,
  min_valid_samples = 3,
  max_abs_slope_per_min = 1,
  max_condition_time_mean_diff_ms = 1000,
  max_condition_order_mean_diff = 1
)
```

Arguments

data	A data frame from a Gazepoint pupil preprocessing pipeline.
group_cols	Character vector of grouping columns for the main drift audit. The default is "subject".
pupil_col	Name of the pupil column to analyse. If NULL, the function automatically tries pupil_smoothed, pupil_baseline_corrected, pupil_interpolated, pupil_clean, and pupil.
time_col	Name of the within-trial or sample-time column.
order_col	Optional trial/order column used to assess time-on-task imbalance. If NULL, order-based summaries are skipped.
condition_col	Optional condition column used to summarise condition drift and time-on-task imbalance. If NULL, condition summaries are skipped.
exclude_col	Optional logical exclusion column. If present and include_excluded = FALSE, excluded rows are removed before analysis.
include_excluded	Logical. If FALSE, rows marked by exclude_col are excluded when that column exists.
min_valid_samples	Minimum valid pupil samples required to estimate a drift slope.

`max_abs_slope_per_min`
: Maximum acceptable absolute pupil slope per minute before a drift warning is raised.

`max_condition_time_mean_diff_ms`
: Maximum acceptable difference in mean sample time across conditions.

`max_condition_order_mean_diff`
: Maximum acceptable difference in mean trial/order value across conditions.

Details

The function estimates simple linear pupil trends over time within selected grouping variables, usually subjects. It also reports subject-level drift, condition-level drift, and possible condition imbalance in time-on-task.

Value

A named list containing `by_group`, `by_subject`, `by_condition`, `condition_balance`, and `summary` tibbles.

---

audit_gazepoint_pupil_gaps

Audit Gazepoint pupil interpolation gaps

Description

Summarise observed, interpolated, and remaining missing pupil samples, together with gap-level counts and gap duration/sample-size summaries.

Usage

```
audit_gazepoint_pupil_gaps(
  data,
  group_cols = c("subject", "media_id"),
  status_col = "pupil_interpolation_status",
  gap_id_col = "pupil_gap_id",
  gap_n_samples_col = "pupil_gap_n_samples",
  gap_duration_col = "pupil_gap_duration_ms",
  interpolated_col = "pupil_was_interpolated",
  pupil_col = "pupil_interpolated"
)
```

Arguments

`data`	A data frame containing pupil interpolation status columns.
`group_cols`	Character vector of grouping columns. Use `character(0)` for an overall audit.
`status_col`	Name of the interpolation status column.

`gap_id_col` Name of the gap identifier column.

`gap_n_samples_col`
Name of the column containing gap size in samples.

`gap_duration_col`
Name of the column containing gap duration in ms.

`interpolated_col`
Name of the logical column indicating whether a sample was interpolated.

`pupil_col` Name of the pupil column after interpolation.

Details

This function is intended for data returned by `interpolate_gazepoint_pupil()`, but it can also be used with any table that contains compatible interpolation-status and gap columns.

Value

A tibble with one row per group, or one row overall when `group_cols = character(0)`.

`audit_gazepoint_pupil_imbalance`
Audit Gazepoint pupil preprocessing imbalance

Description

Check whether pupil preprocessing loss differs across experimental conditions or other grouping variables.

Usage

```
audit_gazepoint_pupil_imbalance(
  data,
  group_cols = "condition",
  pupil_col = "pupil_interpolated",
  interpolated_col = "pupil_was_interpolated",
  interpolation_status_col = "pupil_interpolation_status",
  artifact_col = NULL,
  artifact_reason_col = NULL,
  min_group_n = 1,
  max_valid_pct_diff = 10,
  max_artifact_pct_diff = 10,
  max_missing_pct_diff = 10,
  max_interpolated_pct_diff = 10
)
```

Arguments

`data`	A data frame from a pupil preprocessing pipeline.
`group_cols`	Character vector of grouping columns. By default, summaries are produced by `condition`.
`pupil_col`	Name of the post-preprocessing pupil column used to define remaining valid and missing samples.
`interpolated_col`	Name of the logical interpolation flag column.
`interpolation_status_col`	Name of the interpolation-status column.
`artifact_col`	Optional artifact flag column. If `NULL`, the function tries to detect `pupil_artifact_flag`, `pupil_flag_invalid`, or `artifact_flag`.
`artifact_reason_col`	Optional artifact-reason column. If `NULL`, the function tries to detect `pupil_artifact_reason`, `pupil_flag_reason`, or `artifact_reason`.
`min_group_n`	Minimum group size below which a group is flagged.
`max_valid_pct_diff`	Maximum acceptable range in valid-sample percentage across groups.
`max_artifact_pct_diff`	Maximum acceptable range in artifact percentage across groups.
`max_missing_pct_diff`	Maximum acceptable range in remaining-missing percentage across groups.
`max_interpolated_pct_diff`	Maximum acceptable range in interpolated percentage across groups.

Details

The function summarises valid pupil samples, interpolated samples, artifact-flagged samples, and remaining missing samples. It also adds simple imbalance flags based on differences between groups.

Value

A tibble with one row per group and imbalance-warning columns.

`audit_gazepoint_pupil_overlap_risk`
Audit Gazepoint pupil-response overlap risk

Description

Check whether event-related pupil-response windows may overlap.

Usage

```
audit_gazepoint_pupil_overlap_risk(
  data,
  group_cols = "subject",
  trial_col = "trial_global",
  time_col = "time",
 event_time_cols = c("stimulus_onset_time", "target_onset_time", "response_time"),
  window_start_ms = 0,
  window_end_ms = 2000,
  min_event_gap_ms = 1000,
  exclude_col = "excluded_trial",
  include_excluded = FALSE
)
```

Arguments

`data`	A Gazepoint sample-level data frame.
`group_cols`	Character vector of grouping columns, usually `"subject"`.
`trial_col`	Name of the trial identifier column.
`time_col`	Name of the within-trial time column.
`event_time_cols`	Character vector of event-time columns, in ms.
`window_start_ms`	Response-window start relative to each event, in ms.
`window_end_ms`	Response-window end relative to each event, in ms.
`min_event_gap_ms`	Minimum acceptable event-to-event gap in ms.
`exclude_col`	Optional logical exclusion column.
`include_excluded`	Logical. If `FALSE`, rows marked by `exclude_col` are removed before the audit when that column exists.

Details

This function is designed as a deconvolution/readiness gate. It checks whether events within the same trial are too close together and whether their response windows overlap. If no usable event-time values are found, the function returns a clean audit with `overlap_assessment_status = "no_usable_event_times"`.

Value

A named list containing `events`, `event_gaps`, `by_trial`, and `summary` tibbles.

audit_gazepoint_pupil_reliability
Audit split-half reliability for Gazepoint pupil outcomes

Description

Create a split-half reliability audit for trial-level or window-level pupil outcomes. The helper is intended for publication-readiness checks when pupil features are interpreted as stable participant-level outcomes or individual difference measures.

Usage

```
audit_gazepoint_pupil_reliability(
  data,
  outcome_cols = NULL,
  participant_col = NULL,
  trial_col = NULL,
  split_col = NULL,
  by_cols = NULL,
  split_method = c("odd_even", "first_second"),
  aggregate_function = c("mean", "median"),
  correlation_method = c("pearson", "spearman"),
  min_trials_per_split = 2,
  name = "gazepoint_pupil_reliability"
)
```

Arguments

data	A data frame containing trial-level or window-level pupil outcomes.
outcome_cols	Character vector of pupil outcome columns. If NULL, common pupil outcome columns are detected automatically.
participant_col	Participant/subject column. If NULL, common participant columns are detected automatically.
trial_col	Trial/order column. If NULL, common trial columns are detected automatically when available. If no trial column is available, row order within participant is used.
split_col	Optional pre-existing split column. If supplied, it must have exactly two non-missing levels.
by_cols	Optional grouping columns for separate reliability audits, such as "condition" or "window".
split_method	Split method used when split_col = NULL. Options are "odd_even" and "first_second".
aggregate_function	Function used to aggregate trial-level values within participant and split. Options are "mean" and "median".

`correlation_method`
: Correlation method for split-half association. Options are `"pearson"` and `"spearman"`.

`min_trials_per_split`
: Minimum number of non-missing outcome values required in each split for a participant to contribute to the reliability estimate.

`name`
: Character label stored in the audit object.

Value

A list with class `gp3_pupil_reliability_audit`.

---

audit_gazepoint_screen_bounds

Audit Gazepoint gaze coordinates against screen bounds

Description

Checks whether gaze coordinates are missing, equal to `(0, 0)`, or outside the expected screen/stimulus bounds. The helper is intended for transparent quality-control reporting, not for automatic exclusion decisions.

Usage

```
audit_gazepoint_screen_bounds(
  data,
  x_col,
  y_col,
  screen_width,
  screen_height,
  group_cols = NULL,
  margin = 0,
  treat_zero_zero_as_out_of_bounds = TRUE
)
```

Arguments

`data`
: A data frame.

`x_col`, `y_col`
: Character names of gaze-coordinate columns.

`screen_width`, `screen_height`
: Numeric screen or stimulus dimensions.

`group_cols`
: Optional grouping columns for group-level summaries.

`margin`
: Numeric tolerance around the screen bounds. A positive value allows coordinates slightly outside the nominal screen area.

`treat_zero_zero_as_out_of_bounds`
: If `TRUE`, `(0, 0)` coordinates are flagged separately and counted as invalid.

Value

A list with row-level flags, group-level summary, overall summary, and settings.

Examples

```
x <- simulate_gazepoint_pupil_data(n_subjects = 2, n_trials = 2, n_time_bins = 5, seed = 1)
audit_gazepoint_screen_bounds(x, "gaze_x", "gaze_y", 1920, 1080)
```

---

audit_gazepoint_stimulus_luminance

Audit stimulus luminance and brightness for Gazepoint studies

---

Description

Compute stimulus-level luminance, brightness, and contrast summaries for image stimuli used in Gazepoint eye-tracking and pupillometry studies. This helper is intended as a publication-readiness audit because pupil size is strongly affected by stimulus brightness.

Usage

```
audit_gazepoint_stimulus_luminance(
  data,
  stimulus_file_col = NULL,
  stimulus_id_col = NULL,
  condition_col = NULL,
  image_dir = NULL,
  recursive = TRUE,
  name = "gazepoint_stimulus_luminance"
)
```

Arguments

`data`	A data frame containing at least a stimulus image/file column.
`stimulus_file_col`	Name of the stimulus image/file column. If `NULL`, common file-column names are detected automatically.
`stimulus_id_col`	Optional stimulus identifier column. If `NULL`, common stimulus/media/item identifier columns are detected automatically.
`condition_col`	Optional experimental condition column. If `NULL`, common condition columns are detected automatically. If no condition column exists, all rows are assigned to `"all_data"`.
`image_dir`	Optional directory prepended to relative stimulus paths.
`recursive`	If `TRUE`, unresolved relative file names are searched for recursively under `image_dir`.
`name`	Character label stored in the audit object.

Value

A list with class `gp3_stimulus_luminance_audit`.

`audit_gazepoint_timecourse_grid` *Audit a Gazepoint time-course grid for cluster-permutation readiness*

Description

Check whether a prepared or raw long-format time-course data set has the subject-by-condition-by-time structure expected by the conservative two-condition cluster-permutation workflow.

Usage

```
audit_gazepoint_timecourse_grid(
  data,
  subject_col = ".gp3_cluster_subject",
  condition_col = ".gp3_cluster_condition",
  time_col = ".gp3_cluster_time_bin",
  outcome_col = ".gp3_cluster_outcome"
)
```

Arguments

`data`	A data frame.
`subject_col`	Subject column. Defaults to the internal prepared column.
`condition_col`	Condition column. Defaults to the internal prepared column.
`time_col`	Time-bin column. Defaults to the internal prepared column.
`outcome_col`	Outcome column. Defaults to the internal prepared column.

Value

A list containing grid counts, missing cells, duplicate cells, and readiness flags.

`baseline_correct_gazepoint_pupil` *Baseline-correct Gazepoint pupil data*

Description

Computes baseline-corrected pupil columns from a Gazepoint pupil time series, typically after `flag_gazepoint_pupil()` and `interpolate_gazepoint_pupil()`. Baselines can be defined either by a time window, such as `c(-200, 0)`, or by a user-supplied logical baseline/pre-stimulus flag column.

Usage

```
baseline_correct_gazepoint_pupil(
  data,
  pupil_col = NULL,
  time_col = NULL,
  baseline_time_col = NULL,
  baseline_window = c(-200, 0),
  baseline_flag_col = NULL,
  group_cols = c("subject", "media_id"),
  baseline_method = c("mean", "median"),
  min_baseline_samples = 1
)
```

Arguments

`data`	A Gazepoint master table, preferably after `interpolate_gazepoint_pupil()`.
`pupil_col`	Optional name of the pupil column to baseline-correct. If `NULL`, the function detects one of `pupil_interpolated`, `pupil_for_preprocessing`, `mean_pupil`, `pupil`, `pupil_raw`, `left_pupil`, or `right_pupil`.
`time_col`	Optional name of the main time column. If `NULL`, the function detects one of `time_ms`, `time`, `time_orig`, or `time_orig_ms`.
`baseline_time_col`	Optional name of the time column used for selecting baseline samples. If `NULL`, the function detects relative-time columns first, then falls back to `time_col`.
`baseline_window`	Numeric vector of length two giving the baseline window in milliseconds. Defaults to `c(-200, 0)`. This can also be set to post-onset or early-window values such as `c(0, 200)` when no pre-stimulus period is available.
`baseline_flag_col`	Optional logical column identifying baseline samples. If supplied, this takes priority over `baseline_window`.
`group_cols`	Character vector of grouping columns used to compute one baseline per independent time series. Defaults to `c("subject", "media_id")`. Columns such as

"trial" or "trial_global" can be added when available. Use character(0) for one global baseline.

baseline_method
: Baseline statistic. One of "mean" or "median". Defaults to "mean".

min_baseline_samples
: Minimum number of valid baseline samples required to compute a baseline. Defaults to 1.

Value

A tibble containing the original data plus baseline-correction columns.

Examples

```
## Not run:
flagged <- flag_gazepoint_pupil(master)
interpolated <- interpolate_gazepoint_pupil(flagged)

corrected <- baseline_correct_gazepoint_pupil(
  interpolated,
  baseline_window = c(-200, 0)
)

corrected <- baseline_correct_gazepoint_pupil(
  interpolated,
  baseline_window = c(0, 200)
)

## End(Not run)
```

---

bootstrap_gazepoint_timecourse

Bootstrap time-course summaries

Description

Compute simple nonparametric bootstrap confidence intervals for a time-varying gaze or pupil measure. The function is intentionally lightweight and returns a tidy data frame that can be plotted or used as a descriptive robustness check alongside model-based analyses.

Usage

```
bootstrap_gazepoint_timecourse(
  data,
  time_col,
  value_col,
  group_col = NULL,
```

```
  subject_col = NULL,
  n_boot = 1000,
  ci = 0.95,
  statistic = c("mean", "median"),
  difference_groups = NULL,
  seed = NULL
)
```

Arguments

data	A data frame.
time_col	Name of the time column.
value_col	Name of the numeric outcome column.
group_col	Optional grouping column, for example condition.
subject_col	Optional subject/participant column. If supplied, bootstrap resampling is performed over subjects within each time and group cell; otherwise rows are resampled.
n_boot	Number of bootstrap draws.
ci	Confidence level for the interval.
statistic	Summary statistic, either mean or median.
difference_groups	Optional character vector of length two. If supplied with group_col, the function also returns a bootstrap difference curve for group 1 minus group 2.
seed	Optional random seed.

Value

A data frame with time, group/contrast, estimate, lower and upper bootstrap interval limits, sample size, and status columns.

---

check_gazepoint_file_pairs

Check Gazepoint all-gaze and fixation file pairs

Description

Checks whether each Gazepoint participant/source has both an all-gaze CSV file and a fixation CSV file before running the full workflow.

Usage

```
check_gazepoint_file_pairs(
  folder,
  all_gaze_pattern = "_all_gaze\\.csv$",
  fixation_pattern = "_fixations\\.csv$",
  recursive = FALSE
)
```

Arguments

folder	Folder containing Gazepoint CSV export files.
all_gaze_pattern	Regular expression for selecting all-gaze files.
fixation_pattern	Regular expression for selecting fixation files.
recursive	Logical. If TRUE, search subfolders recursively.

Value

A tibble with one row per detected participant/source and file-pair status.

---

check_gazepoint_model_convergence
Check model convergence

Description

Check convergence status for fitted models used in gp3tools workflows.

Usage

```
check_gazepoint_model_convergence(model, model_name = NULL)
```

Arguments

model	A fitted model object, or a gp3tools fit object containing a $model element.
model_name	Optional model label used in the returned table.

Details

This helper supports lme4 mixed models, mgcv GAM/GAMM objects, glm objects, and lm objects where convergence is meaningful. It returns a compact diagnostic table instead of printing model-specific messages.

Value

A tibble with model class, convergence status, diagnostic status, and message.

check_gazepoint_model_overdispersion

Check model overdispersion

Description

Compute a Pearson-residual overdispersion diagnostic for models where this is meaningful, especially binomial and count models.

Usage

```
check_gazepoint_model_overdispersion(
  model,
  ratio_threshold = 1.2,
  model_name = NULL
)
```

Arguments

model	A fitted model object, or a gp3tools fit object containing a $model element.
ratio_threshold	Numeric threshold above which the model is flagged as overdispersed.
model_name	Optional model label used in the returned table.

Details

This helper supports glm, lme4 GLMMs, and mgcv GAM/GAMM objects when their family is binomial, quasibinomial, Poisson, quasipoisson, or negative-binomial-like. Gaussian lm, lmer, and Gaussian GAM models return a structured not_applicable diagnostic row.

Value

A tibble with Pearson chi-square, residual degrees of freedom, dispersion ratio, overdispersion flag, diagnostic status, and message.

check_gazepoint_model_singularity

Check model singularity

Description

Check whether a fitted mixed model has a singular random-effects structure.

Usage

```
check_gazepoint_model_singularity(model, tolerance = 1e-04, model_name = NULL)
```

Arguments

model	A fitted model object, or a gp3tools fit object containing a $model element.
tolerance	Numeric tolerance passed to lme4::isSingular().
model_name	Optional model label used in the returned table.

Details

This helper is primarily intended for lme4 mixed models. For model classes where singularity is not meaningful, such as lm, glm, and mgcv GAM objects, it returns a structured not_applicable diagnostic row.

Value

A tibble with model class, singular-fit status, diagnostic status, and message.

---

check_gazepoint_real_data_readiness

Check real-data readiness before Gazepoint analysis

Description

Create an explicit final readiness gate for real Gazepoint or gp3tools master data before confirmatory analysis. The gate checks required identifiers, trial/time structure, analysis-specific columns, missingness, basic design balance, and optional upstream audit objects.

Usage

```
check_gazepoint_real_data_readiness(
  data,
  analysis_type = c("general", "pupil", "aoi", "combined"),
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  condition_col = NULL,
  stimulus_col = NULL,
  aoi_col = NULL,
  pupil_col = NULL,
  gaze_x_col = NULL,
  gaze_y_col = NULL,
  tracking_valid_col = NULL,
  required_cols = NULL,
  audit_objects = NULL,
  min_rows = 1L,
  min_participants = 1L,
  min_trials = 1L,
  max_missing_pupil_prop = 0.4,
```

```
  max_missing_gaze_prop = 0.4,
  max_condition_imbalance_ratio = 3,
  name = "gazepoint_real_data_readiness_gate"
)
```

Arguments

data	A Gazepoint or gp3tools data frame.
analysis_type	Analysis target. Options are "general", "pupil", "aoi", and "combined".
participant_col	Optional participant column. If NULL, common names are detected.
trial_col	Optional trial column. If NULL, common names are detected.
time_col	Optional time column. If NULL, common names are detected.
condition_col	Optional condition/group column. If NULL, common names are detected when present.
stimulus_col	Optional stimulus/media column. If NULL, common names are detected when present.
aoi_col	Optional AOI/state column. If NULL, common names are detected when present.
pupil_col	Optional pupil column. If NULL, common names are detected when present.
gaze_x_col	Optional horizontal gaze coordinate column.
gaze_y_col	Optional vertical gaze coordinate column.
tracking_valid_col	Optional tracking-validity column.
required_cols	Additional required columns.
audit_objects	Optional list of upstream audit/validation objects.
min_rows	Minimum acceptable number of rows.
min_participants	Minimum acceptable number of participants.
min_trials	Minimum acceptable number of participant-trial units.
max_missing_pupil_prop	Maximum acceptable pupil missingness proportion when pupil data are required.
max_missing_gaze_prop	Maximum acceptable gaze-coordinate missingness proportion when gaze coordinate columns are present.
max_condition_imbalance_ratio	Warning threshold for condition imbalance.
name	Character label stored in the returned object.

Details

This helper is a final decision wrapper. It complements, but does not replace, `validate_gazepoint_master()` or `create_gazepoint_analysis_decision_audit()`.

Value

A list with class `gp3_real_data_readiness_gate`.

check_sampling_rate *Check sampling rate by group*

Description

Check sampling rate by group

Usage

```
check_sampling_rate(data, group_cols = "MEDIA_ID", time_col = "TIME")
```

Arguments

data	A Gazepoint all-gaze data frame.
group_cols	Character vector of grouping columns, usually MEDIA_ID or c("participant_id", "MEDIA_ID").
time_col	Name of elapsed-time column.

Value

A tibble with sample interval and estimated Hz.

classify_gazepoint_export *Classify a Gazepoint export*

Description

Uses the filename and header structure to classify a file as all_gaze, fixations, summary, or unknown.

Usage

```
classify_gazepoint_export(path)
```

Arguments

path	File path.

Value

A single character string.

clean_gazepoint_by_trackloss
Flag or filter Gazepoint data by trackloss

Description

Computes trackloss rates globally or within user-specified grouping columns, then flags or removes groups exceeding a transparent threshold. Trackloss can be supplied directly through a validity/tracking column or inferred from missing/out-of-range gaze coordinates.

Usage

```
clean_gazepoint_by_trackloss(
  data,
  group_cols = NULL,
  tracking_col = NULL,
  x_col = NULL,
  y_col = NULL,
  max_trackloss = 0.25,
  action = c("flag", "filter"),
  treat_zero_zero_as_loss = TRUE,
  rate_col = ".gp3_trackloss_rate",
  exclude_col = ".gp3_trackloss_exclude"
)
```

Arguments

`data`	A data frame.
`group_cols`	Optional character vector of grouping columns, for example participant and trial identifiers.
`tracking_col`	Optional tracking/validity column. Logical, numeric, and character encodings are supported.
`x_col`, `y_col`	Optional gaze coordinate columns used when `tracking_col` is not supplied.
`max_trackloss`	Maximum allowed trackloss proportion per group.
`action`	Either `"flag"` to retain all rows and add diagnostic columns, or `"filter"` to remove groups above the threshold.
`treat_zero_zero_as_loss`	If `TRUE`, `(0, 0)` gaze coordinates are treated as trackloss when using `x_col` and `y_col`.
`rate_col`, `exclude_col`	Names of the added diagnostic columns.

Value

A data frame with diagnostic columns. If `action = "filter"`, rows from excluded groups are removed. A compact summary is stored in the `"gp3_trackloss_summary"` attribute.

Examples

```
x <- data.frame(
  participant = c("P1", "P1", "P2", "P2"),
  trial = c(1, 1, 1, 1),
  valid = c(1, 0, 1, 1)
)
clean_gazepoint_by_trackloss(
  x,
  group_cols = c("participant", "trial"),
  tracking_col = "valid",
  max_trackloss = 0.25
)
```

`combine_gazepoint_eyes` *Combine left and right Gazepoint eye channels*

Description

Combines two numeric eye-specific columns into a single analysis column. The helper is intentionally simple and transparent: it can average available left/right values, prefer one eye with fallback to the other, or select the globally less-missing eye as a pragmatic "best eye" rule.

Usage

```
combine_gazepoint_eyes(
  data,
  left_col,
  right_col,
  output_col = "combined_eye",
  method = c("mean", "left", "right", "prefer_left", "prefer_right", "best"),
  valid_min = NULL,
  valid_max = NULL
)
```

Arguments

`data`	A data frame.
`left_col`, `right_col`	Character names of the left- and right-eye columns.
`output_col`	Character name of the combined output column.
`method`	Combination rule. One of `"mean"`, `"left"`, `"right"`, `"prefer_left"`, `"prefer_right"`, or `"best"`.
`valid_min`, `valid_max`	Optional numeric bounds. Values outside these bounds are treated as missing before combination.

Value

A copy of `data` with `output_col` added.

Examples

```
x <- data.frame(left_pupil = c(3.1, NA, 3.4), right_pupil = c(3.3, 3.2, NA))
combine_gazepoint_eyes(x, "left_pupil", "right_pupil", "pupil")
```

`compare_gazepoint_nested_models`

Compare nested Gazepoint models

Description

Compare a sequence of nested models, such as null, main-effect, time, condition, and interaction models. The helper returns model-level fit indices, likelihood-ratio comparisons, ranking information, and extraction statuses.

Usage

```
compare_gazepoint_nested_models(
  models,
  model_names = NULL,
  comparison = c("sequential", "against_first"),
  name = "gazepoint_nested_model_comparison"
)
```

Arguments

`models`	A list of fitted model objects.
`model_names`	Optional character vector of model names. If `NULL`, names are taken from `models` or generated as `model_1`, `model_2`, etc.
`comparison`	Comparison strategy. `"sequential"` compares each model with the previous model. `"against_first"` compares each model with the first model.
`name`	Character label stored in the returned object.

Details

This helper is useful for GCA, confirmatory LMM/GLMM workflows, AOI GLMMs, pupil LMMs, and other fitted model workflows where reviewers expect explicit model-comparison evidence.

Value

A list with class `gp3_nested_model_comparison`.

`compute_gazepoint_aoi_entropy` *Compute AOI entropy metrics*

Description

Computes spatial AOI entropy, directed transition entropy, and conditional transition entropy for Gazepoint-style AOI sequences. The function is useful for quantifying how concentrated, dispersed, or predictable gaze allocation is across Areas of Interest.

Usage

```
compute_gazepoint_aoi_entropy(
  data,
  aoi_col,
  group_cols = NULL,
  time_col = NULL,
  include_missing = FALSE,
  missing_label = "missing",
  collapse_repeats = FALSE,
  log_base = 2
)
```

Arguments

`data`	A data frame containing AOI observations.
`aoi_col`	Character scalar. Column containing AOI labels.
`group_cols`	Optional character vector of grouping columns, such as participant, trial, stimulus, or condition columns.
`time_col`	Optional character scalar. If supplied, observations are ordered by this column within each group before transitions are computed.
`include_missing`	Logical. If `TRUE`, missing or empty AOI labels are retained as `missing_label`; otherwise they are removed.
`missing_label`	Character scalar used when `include_missing = TRUE`.
`collapse_repeats`	Logical. If `TRUE`, consecutive identical AOI labels are collapsed before transition entropy is computed.
`log_base`	Numeric scalar. Base of the logarithm used for entropy.

Value

A data frame with one row per group and entropy/count columns.

Examples

```
dat <- data.frame(
  subject = "S01",
  trial = "T01",
  time = 1:6,
  AOI = c("A", "A", "B", "C", "B", "A")
)

compute_gazepoint_aoi_entropy(
  dat,
  aoi_col = "AOI",
  group_cols = c("subject", "trial"),
  time_col = "time"
)
```

---

compute_gazepoint_aoi_sequence_metrics

Compute AOI sequence metrics

Description

Computes compact scanpath-style descriptors from Gazepoint AOI sequences, including sequence length, AOI visits, transitions, revisits, first and last AOI, dominant AOI, and run-length summaries.

Usage

```
compute_gazepoint_aoi_sequence_metrics(
  data,
  aoi_col,
  group_cols = NULL,
  time_col = NULL,
  include_missing = FALSE,
  missing_label = "missing",
  collapse_repeats = TRUE
)
```

Arguments

`data`	A data frame containing AOI observations.
`aoi_col`	Character scalar. Column containing AOI labels.
`group_cols`	Optional character vector of grouping columns.
`time_col`	Optional character scalar. If supplied, observations are ordered by this column within each group.
`include_missing`	Logical. If `TRUE`, missing or empty AOI labels are retained as `missing_label`; otherwise they are removed.

`missing_label` Character scalar used when `include_missing = TRUE`.

`collapse_repeats`
Logical. If `TRUE`, consecutive identical AOI labels are collapsed before visit, transition, and revisit metrics are computed.

Value

A data frame with one row per group and sequence-metric columns.

Examples

```
dat <- data.frame(
  subject = "S01",
  trial = "T01",
  time = 1:6,
  AOI = c("A", "A", "B", "A", "C", "C")
)

compute_gazepoint_aoi_sequence_metrics(
  dat,
  aoi_col = "AOI",
  group_cols = c("subject", "trial"),
  time_col = "time"
)
```

---

compute_gazepoint_aoi_transition_matrix

Compute Gazepoint AOI transition matrices

Description

Compute AOI transition count and probability matrices from sample-level Gazepoint AOI data, AOI-entry tables, or AOI-sequence tables. The function returns both matrix and long-table forms.

Usage

```
compute_gazepoint_aoi_transition_matrix(
  data,
  aoi_col = NULL,
  time_col = "time",
  group_cols = c("subject", "MEDIA_ID", "trial_global"),
  by_cols = NULL,
  include_non_aoi = TRUE,
  include_self_transitions = TRUE,
  states = NULL,
  time_window = NULL,
  non_aoi_values = c("non_aoi", "none", "background", "outside", "outside_aoi",
    "missing", "missing_aoi"),
  missing_aoi_label = "missing_aoi"
)
```

Arguments

data	A Gazepoint sample-level data frame, AOI-entry table, or AOI-sequence table.
aoi_col	Name of the AOI-state column. Used only when data is sample-level data. If NULL, the function tries aoi_current, AOI, and aoi_state.
time_col	Name of the time column, in milliseconds. Used only when data is sample-level data.
group_cols	Character vector of columns defining independent AOI sequences, usually subject/media/trial.
by_cols	Optional character vector of columns used to compute separate matrices, for example condition or MEDIA_ID.
include_non_aoi	Logical. If TRUE, non-AOI/background states are included in the transition matrix.
include_self_transitions	Logical. If TRUE, same-state transitions are retained. These can occur after non-AOI states are removed.
states	Optional character vector giving the desired row/column order for the transition matrices.
time_window	Optional numeric vector of length 2 giving an entry-start time window in milliseconds.
non_aoi_values	Character vector of AOI labels treated as background or non-AOI states.
missing_aoi_label	Label used when the AOI value is missing.

Value

A list containing count matrices, probability matrices, and long-form transition counts/probabilities.

---

compute_gazepoint_saccade_metrics

Compute basic saccade metrics from fixation coordinates

Description

Compute between-fixation displacement metrics from ordered fixation coordinates. The function does not perform raw event detection; it assumes that fixation-level coordinates are already available, for example from Gazepoint fixation exports.

Usage

```
compute_gazepoint_saccade_metrics(
  data,
  x_col,
  y_col,
  group_cols = NULL,
  time_col = NULL,
  start_time_col = NULL,
  end_time_col = NULL,
  distance_scale = 1,
  drop_missing = TRUE
)
```

Arguments

data	A fixation-level data frame.
x_col	Name of the horizontal fixation-coordinate column.
y_col	Name of the vertical fixation-coordinate column.
group_cols	Optional columns defining independent scanpaths, such as participant and trial.
time_col	Optional column used to order fixations and compute inter-fixation time differences.
start_time_col	Optional fixation-start column.
end_time_col	Optional fixation-end column. If both start and end columns are supplied, saccade duration is computed as the next fixation start minus the current fixation end.
distance_scale	Multiplicative scale applied to coordinate distances.
drop_missing	Should rows with missing coordinates be dropped?

Value

A data frame with one row per between-fixation movement.

---

compute_gazepoint_scanpath_similarity

Compute AOI scanpath similarity

Description

Compute pairwise AOI-sequence similarity between grouped scanpaths using a lightweight Levenshtein edit-distance implementation. Similarity is reported as `1 - normalized_distance`, where normalized distance is divided by the longer sequence length.

Usage

```
compute_gazepoint_scanpath_similarity(
  data,
  aoi_col,
  group_cols,
  time_col = NULL,
  include_missing = FALSE,
  missing_label = "missing",
  collapse_repeats = FALSE,
  max_sequences = 200
)
```

Arguments

data	A data frame containing AOI observations.
aoi_col	Name of the AOI column.
group_cols	Columns defining each scanpath, for example subject and trial.
time_col	Optional time/order column.
include_missing	Should missing AOI labels be retained as a state?
missing_label	Label used when retaining missing AOIs.
collapse_repeats	Should consecutive repeated AOI labels be collapsed?
max_sequences	Maximum number of grouped sequences to compare.

Value

A long-format data frame containing pairwise edit distances, normalized distances, and similarities.

---

compute_gazepoint_sequence_complexity

Compute AOI sequence complexity metrics

Description

Compute compact sequence-complexity summaries from AOI labels. This helper complements transition and entropy summaries by returning simple, interpretable indices such as type-token ratio, transition density, normalized entropy, and a combined complexity index.

Usage

```
compute_gazepoint_sequence_complexity(
  data = NULL,
  sequence = NULL,
  aoi_col = NULL,
  group_cols = NULL,
  time_col = NULL,
  include_missing = FALSE,
  missing_label = "missing",
  collapse_repeats = FALSE
)
```

Arguments

data	Optional data frame containing AOI observations.
sequence	Optional AOI sequence vector. Used when data is not supplied.
aoi_col	Name of the AOI column when data is supplied.
group_cols	Optional grouping columns.
time_col	Optional time/order column.
include_missing	Should missing AOI labels be retained as a state?
missing_label	Label used when retaining missing AOIs.
collapse_repeats	Should consecutive repeated AOI labels be collapsed?

Value

A data frame with sequence length, unique-state count, entropy, transition density, type-token ratio, and complexity index.

---

compute_gazepoint_sequence_distance

Compute AOI sequence distance

Description

Computes a lightweight edit distance between two AOI sequences using a vector-based Levenshtein distance. This provides a simple scanpath dissimilarity measure without requiring heavy sequence-analysis dependencies.

Usage

```
compute_gazepoint_sequence_distance(
  sequence_a,
  sequence_b,
  ignore_missing = TRUE,
  missing_label = "missing",
  collapse_repeats = FALSE,
  substitution_cost = 1,
  insertion_cost = 1,
  deletion_cost = 1
)
```

Arguments

sequence_a	Character, factor, or atomic vector representing the first AOI sequence.
sequence_b	Character, factor, or atomic vector representing the second AOI sequence.
ignore_missing	Logical. If TRUE, missing and empty labels are removed.
missing_label	Character scalar used when ignore_missing = FALSE.
collapse_repeats	Logical. If TRUE, consecutive identical labels are collapsed before distance is computed.
substitution_cost	Numeric scalar substitution cost.
insertion_cost	Numeric scalar insertion cost.
deletion_cost	Numeric scalar deletion cost.

Value

A one-row data frame with edit distance, normalized distance, and sequence lengths.

Examples

```
compute_gazepoint_sequence_distance(
  sequence_a = c("Claim", "Evidence", "CTA"),
  sequence_b = c("Claim", "CTA", "Evidence")
)
```

---

compute_gazepoint_sequence_recurrence

Compute simple categorical sequence recurrence metrics

Description

Compute lightweight recurrence metrics from AOI/state sequences. This is a compact categorical recurrence helper, not a full replacement for dedicated CRQA/RQA packages.

Usage

```
compute_gazepoint_sequence_recurrence(
  data = NULL,
  sequence = NULL,
  aoi_col = NULL,
  group_cols = NULL,
  time_col = NULL,
  min_line = 2,
  include_missing = FALSE,
  missing_label = "missing"
)
```

Arguments

data	Optional long-format data frame.
sequence	Optional AOI/state vector used when data is absent.
aoi_col	AOI/state column when data is supplied.
group_cols	Optional grouping columns.
time_col	Optional ordering column.
min_line	Minimum diagonal-line length for determinism.
include_missing	Should missing states be retained?
missing_label	Label used for retained missing states.

Value

A data frame of recurrence metrics.

---

compute_gazepoint_time_varying_transition_matrix

Compute time-varying Gazepoint transition matrices

Description

Compute transition-count and transition-probability matrices across time windows. This helper is a convenience wrapper for studies where AOI/state transitions are expected to vary over the course of a stimulus, trial, or analysis window.

Usage

```
compute_gazepoint_time_varying_transition_matrix(
  data,
  from_col = NULL,
  to_col = NULL,
  time_col = NULL,
```

```
  window_col = NULL,
  window_size_ms = NULL,
  by_cols = NULL,
  count_col = NULL,
  states = NULL,
  complete_states = TRUE,
  drop_self_transitions = FALSE,
  normalise = c("row", "global", "none"),
  name = "gazepoint_time_varying_transition_matrix"
)
```

Arguments

data	A data frame containing transition-level rows.
from_col	Transition origin column. If NULL, common origin columns are detected automatically.
to_col	Transition destination column. If NULL, common destination columns are detected automatically.
time_col	Optional numeric time column used to construct windows when window_col = NULL.
window_col	Optional existing time-window column.
window_size_ms	Numeric window size used when window_col = NULL.
by_cols	Optional grouping columns, such as subject, condition, trial, or stimulus.
count_col	Optional count/weight column. If NULL, each row contributes one transition.
states	Optional character vector of allowed states/AOIs. If NULL, states are detected from from_col and to_col.
complete_states	If TRUE, complete all state-pair combinations within each time window and group.
drop_self_transitions	If TRUE, remove transitions where origin and destination are the same.
normalise	Probability normalisation. Options are "row", "global", and "none".
name	Character label stored in the returned object.

Value

A list with class gp3_time_varying_transition_matrix.

compute_gazepoint_transition_network_metrics
Compute lightweight AOI transition-network metrics

Description

Compute graph-style summaries from AOI transitions without requiring network packages. Metrics include state count, edge count, density, self-loops, and in/out-degree summaries.

Usage

```
compute_gazepoint_transition_network_metrics(
  data,
  aoi_col = NULL,
  from_col = NULL,
  to_col = NULL,
  group_cols = NULL,
  time_col = NULL,
  include_self_loops = TRUE
)
```

Arguments

data	Optional data frame of AOI observations or transition rows.
aoi_col	AOI column for raw sequence data.
from_col	Source-state column for transition data.
to_col	Destination-state column for transition data.
group_cols	Optional grouping columns for raw sequence data.
time_col	Optional ordering column.
include_self_loops	Should self-transitions be included?

Value

A list with graph-level and state-level summaries.

compute_transition_matrix

Compute an AOI transition matrix

Description

Compute an AOI transition matrix

Usage

```
compute_transition_matrix(
  data,
  group_cols = "MEDIA_ID",
  aoi_col = "AOI",
  time_col = "TIME",
  collapse_repeats = TRUE
)
```

Arguments

`data`	A Gazepoint data frame with AOI labels.
`group_cols`	Columns defining independent sequences.
`aoi_col`	AOI column name.
`time_col`	Time column name.
`collapse_repeats`	If `TRUE`, consecutive identical AOI labels are reduced to one visit before transitions are counted.

Value

A tibble with `from`, `to`, `n`, and `prob`.

create_gazepoint_analysis_decision_audit

Create a final Gazepoint analysis-decision audit

Description

Create a final audit table for a Gazepoint analysis workflow. The function records which analysis branches were run, classifies them as confirmatory, sensitivity, exploratory, diagnostic, preprocessing, or reporting branches, summarises available diagnostics, flags interpretation cautions, and creates a final analysis-readiness table.

Usage

```
create_gazepoint_analysis_decision_audit(
  ...,
  results = NULL,
  branch_roles = NULL,
  required_confirmatory = character(),
  diagnostics_required = TRUE,
  require_clean_diagnostics = FALSE
)
```

Arguments

`...`	Named analysis result objects. Each named object is treated as one analysis branch.
`results`	Optional named list of analysis result objects. This can be used instead of, or together with, `....`
`branch_roles`	Optional data frame describing branch roles. It must contain `branch_name` and `decision_type`. Optional columns include `analysis_family`, `interpretation_scope`, and `notes`.
`required_confirmatory`	Character vector of confirmatory branches that must be present for the analysis to be considered complete.
`diagnostics_required`	Logical. If `TRUE`, confirmatory model branches without extractable diagnostics are flagged with a caution.
`require_clean_diagnostics`	Logical. If `TRUE`, diagnostic warnings in required confirmatory branches make the final readiness status `not_ready`.

Value

A list with class `gp3_analysis_decision_audit` containing overview, branch audit, diagnostics summary, interpretation cautions, readiness, and settings tables.

`create_gazepoint_markovchain_object` *Create a Gazepoint AOI Markov-chain object*

Description

Create a dependency-free Markov-chain-style object from AOI/state sequences. The function computes transition counts, transition probabilities, and matrix representations from ordered gaze/AOI states. It does not require the external `markovchain` package; instead, it returns a lightweight `gp3tools` object that can be inspected, exported, or converted later.

Usage

```
create_gazepoint_markovchain_object(
  data,
  state_col = NULL,
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  sequence_id_cols = NULL,
  state_order = NULL,
 exclude_states = c("missing", "missing_aoi", "missing_coordinate", "trackloss",
    "track_loss"),
  missing_state_label = NULL,
  include_self_transitions = TRUE,
  laplace = 0,
  empty_state_handling = c("self", "zero", "NA"),
  name = "gazepoint_markovchain"
)
```

Arguments

data	A data frame containing ordered AOI/state observations.
state_col	AOI/state column. If NULL, common AOI/state column names are detected automatically.
participant_col	Optional participant/subject column.
trial_col	Optional trial/sequence column.
time_col	Optional time/order column.
sequence_id_cols	Optional character vector of columns defining separate sequences. If NULL, participant and trial columns are used when available.
state_order	Optional character vector giving the preferred state order in the output matrices.
exclude_states	Character vector of states to exclude before transition calculation.
missing_state_label	Optional label used to retain missing states. If NULL, missing/blank states are removed.
include_self_transitions	Logical. If FALSE, transitions from a state to the same state are removed.
laplace	Numeric smoothing value added to all transition cells when computing probabilities.
empty_state_handling	How to handle states with no outgoing transitions: "self" creates an absorbing self-transition, "zero" leaves a zero row, and "NA" returns NA probabilities for that row.
name	Character label stored in the returned object.

Value

A list with class gp3_markovchain_object.

`create_gazepoint_master` *Create a master long-format dataset from Gazepoint all-gaze data*

Description

Converts Gazepoint all-gaze exports imported with `read_gazepoint()` or `read_gazepoint_folder()` into a master sample-level structure suitable for quality checks, AOI summaries, pupil preprocessing, time-course analyses, and publication reporting.

Usage

```
create_gazepoint_master(
  gaze_data,
  screen_width_px = NULL,
  screen_height_px = NULL,
  screen_width_cm = NULL,
  screen_height_cm = NULL,
  viewing_distance_cm = NULL,
  time_unit = c("seconds", "milliseconds"),
  user_col = "USER_FILE",
  media_col = "MEDIA_ID",
  media_name_col = "MEDIA_NAME",
  tracker_model = "Gazepoint",
  tracker_sampling_rate = 60,
  event_latency_offset_ms = 0,
  baseline_window = NULL,
  analysis_window = NULL
)
```

Arguments

gaze_data	Gazepoint all-gaze data frame.
screen_width_px	Optional screen width in pixels. If provided and gaze coordinates are normalised, x-coordinates are converted to pixels.
screen_height_px	Optional screen height in pixels. If provided and gaze coordinates are normalised, y-coordinates are converted to pixels.
screen_width_cm	Optional physical screen width in centimetres.
screen_height_cm	Optional physical screen height in centimetres.

`viewing_distance_cm`
: Optional viewing distance in centimetres.

`time_unit`
: Unit of the Gazepoint `TIME` column. Usually `"seconds"`.

`user_col`
: Column identifying the source/user file.

`media_col`
: Column identifying the stimulus/media.

`media_name_col`
: Column identifying the media/stimulus name.

`tracker_model`
: Tracker label stored in the master data.

`tracker_sampling_rate`
: Expected tracker sampling rate.

`event_latency_offset_ms`
: Optional event-latency correction in milliseconds.

`baseline_window`
: Optional numeric vector of length 2 giving baseline start and end in milliseconds.

`analysis_window`
: Optional numeric vector of length 2 giving analysis start and end in milliseconds.

Value

A tibble with one row per Gazepoint sample and publication-oriented master columns.

`create_gazepoint_preprocessing_multiverse`
Create a Gazepoint preprocessing multiverse

Description

Create a preprocessing multiverse specification for Gazepoint pupil and AOI workflows. The returned object defines alternative preprocessing decisions that can later be passed to pupil or AOI multiverse runners.

Usage

```
create_gazepoint_preprocessing_multiverse(
  pupil_max_gap_ms = c(75, 150, 250),
  pupil_smoothing_window_samples = c(3L, 5L, 7L),
  pupil_baseline_windows = list(c(0, 200), c(-200, 0)),
  pupil_artifact_padding_ms = c(0, 50),
  aoi_denominators = c("valid", "all", "aoi_only"),
  aoi_min_denominator_samples = c(1L, 5L, 10L),
  include_pupil = TRUE,
  include_aoi = TRUE,
  label_prefix = "mv"
)
```

Arguments

`pupil_max_gap_ms`
: Numeric vector of maximum pupil-interpolation gap durations in milliseconds.

`pupil_smoothing_window_samples`
: Integer vector of pupil smoothing window sizes in samples.

`pupil_baseline_windows`
: List of numeric vectors of length 2 defining pupil baseline windows in milliseconds.

`pupil_artifact_padding_ms`
: Numeric vector of artifact-padding values in milliseconds.

`aoi_denominators`
: Character vector of AOI denominator definitions. Typical values are `"valid"`, `"all"`, and `"aoi_only"`.

`aoi_min_denominator_samples`
: Integer vector of minimum denominator sample thresholds for AOI-window modelling.

`include_pupil`
: Logical. If `TRUE`, create pupil preprocessing branches.

`include_aoi`
: Logical. If `TRUE`, create AOI preprocessing branches.

`label_prefix`
: Character prefix used for branch identifiers.

Value

A list with class `gp3_preprocessing_multiverse` containing overview, pupil grid, AOI grid, combined grid, and settings tables.

`create_gazepoint_preprocessing_registry` *Create a Gazepoint pupil-preprocessing registry*

Description

Creates a compact registry of commonly used preprocessing parameters for Gazepoint pupil and gaze analyses. The registry is designed to make preprocessing choices explicit, auditable, and easy to report.

Usage

```
create_gazepoint_preprocessing_registry(
  blink_padding_pre_ms = 100,
  blink_padding_post_ms = 100,
  max_interpolation_gap_ms = 150,
  smoothing_window_ms = 50,
  baseline_start_ms = -200,
  baseline_end_ms = 0,
  pupil_physiological_min = 1,
```

```
  pupil_physiological_max = 9,
  pupil_speed_mad_k = 6,
  binocular_mad_k = 6,
  baseline_missing_prop_threshold = 0.3,
  baseline_interpolated_prop_threshold = 0.3,
  baseline_artifact_prop_threshold = 0.3,
  overlap_trial_duration_ms = 3000,
  overlap_event_gap_ms = 1000
)
```

Arguments

`blink_padding_pre_ms`
: Padding before bad pupil samples, blinks, or tracking artifacts, in milliseconds. Defaults to `100`.

`blink_padding_post_ms`
: Padding after bad pupil samples, blinks, or tracking artifacts, in milliseconds. Defaults to `100`.

`max_interpolation_gap_ms`
: Maximum missing-pupil gap duration to interpolate, in milliseconds. Defaults to `150`.

`smoothing_window_ms`
: Rolling smoothing window, in milliseconds. Defaults to `50`.

`baseline_start_ms`
: Baseline-window start, in milliseconds. Defaults to `-200`.

`baseline_end_ms`
: Baseline-window end, in milliseconds. Defaults to `0`.

`pupil_physiological_min`
: Minimum plausible pupil value when the pupil unit is known to be millimetres. Defaults to `1`.

`pupil_physiological_max`
: Maximum plausible pupil value when the pupil unit is known to be millimetres. Defaults to `9`.

`pupil_speed_mad_k`
: MAD multiplier for pupil-speed outlier detection. Defaults to `6`.

`binocular_mad_k`
: MAD multiplier for left-right pupil disagreement. Defaults to `6`.

`baseline_missing_prop_threshold`
: Baseline missingness threshold used for baseline-quality audits. Defaults to `0.30`.

`baseline_interpolated_prop_threshold`
: Baseline interpolation threshold used for baseline-quality audits. Defaults to `0.30`.

`baseline_artifact_prop_threshold`
: Baseline artifact threshold used for baseline-quality audits. Defaults to `0.30`.

`overlap_trial_duration_ms`
: Trial-duration threshold below which pupil overlap/deconvolution risk should be considered. Defaults to `3000`.

overlap_event_gap_ms
: Event-gap threshold below which pupil-response overlap should be considered. Defaults to 1000.

Value

A tibble with one row per preprocessing parameter.

Examples

```
registry <- create_gazepoint_preprocessing_registry()
registry
```

---

create_gazepoint_report

Create a Gazepoint HTML diagnostic report

Description

Creates a lightweight HTML report from a gp3tools workflow result object. The report includes dataset dimensions, sampling-rate checks, flagged recordings, AOI summaries, and standard diagnostic plots.

Usage

```
create_gazepoint_report(
  results,
  output_file,
  title = "Gazepoint diagnostic report",
  overwrite = TRUE,
  max_rows = 30,
  save_plots = TRUE,
  plot_dir = NULL
)
```

Arguments

results	A named list returned by run_gazepoint_workflow().
output_file	Path to the HTML report file to create.
title	Report title.
overwrite	Logical. If FALSE, stop when the report file already exists.
max_rows	Maximum number of rows to show in preview tables.
save_plots	Logical. If TRUE, save and include diagnostic plots.
plot_dir	Optional folder where report plot files should be saved. If NULL, a folder next to the report is created.

Value

A tibble with the written report path and plot folder.

`create_gazepoint_reporting_checklist` *Create a Gazepoint reporting checklist*

Description

Create an auto-generated reporting checklist for Gazepoint/gp3tools analyses. The checklist summarises whether key dataset, preprocessing, quality-control, AOI, pupil, modelling, sensitivity, and reproducibility elements are present or still need reporting.

Usage

```
create_gazepoint_reporting_checklist(
  data = NULL,
  objects = NULL,
  analysis_type = c("general", "pupil", "aoi", "combined"),
  study_title = NULL,
  required_sections = NULL,
  include_optional = TRUE,
  name = "gazepoint_reporting_checklist"
)
```

Arguments

`data`	Optional Gazepoint or gp3tools data frame.
`objects`	Optional list of gp3tools audit, model, workflow, readiness, or external-check objects.
`analysis_type`	Analysis target. Options are `"general"`, `"pupil"`, `"aoi"`, and `"combined"`.
`study_title`	Optional study title or short label.
`required_sections`	Optional character vector of checklist item IDs that should be treated as required. If `NULL`, a default set is used.
`include_optional`	Logical. If `TRUE`, include optional advanced-methods reporting items.
`name`	Character label stored in the returned object.

Details

This helper is intended as a reporting aid. It does not replace the underlying audit, preprocessing, modelling, or readiness-gate functions.

Value

A list with class `gp3_reporting_checklist`.

`detect_gazepoint_fixations_ivt` *Detect simple I-VT fixations from gaze samples*

Description

Apply a lightweight velocity-threshold fixation detector to ordered gaze samples. This helper is intended for exploratory checks and teaching; it does not replace dedicated event-detection packages or Gazepoint's native fixation export.

Usage

```
detect_gazepoint_fixations_ivt(
  data,
  x_col,
  y_col,
  time_col,
  group_cols = NULL,
  velocity_threshold = 0.01,
  min_duration_ms = 60,
  distance_scale = 1,
  time_scale = 1
)
```

Arguments

`data`	A sample-level gaze data frame.
`x_col`	Horizontal gaze coordinate column.
`y_col`	Vertical gaze coordinate column.
`time_col`	Time column, in milliseconds by default.
`group_cols`	Optional columns defining independent recordings/trials.
`velocity_threshold`	Maximum velocity for a sample-to-sample interval to be treated as fixation-like.
`min_duration_ms`	Minimum fixation duration.
`distance_scale`	Multiplicative scale applied to coordinate distances.
`time_scale`	Multiplicative scale applied to time differences.

Value

A fixation-level data frame.

diagnose_gazepoint_cluster_design

Diagnose the design assumptions of a Gazepoint cluster-permutation workflow

Description

Provide a compact diagnostic summary for the conservative two-condition, within-subject, one-dimensional cluster-permutation workflow.

Usage

```
diagnose_gazepoint_cluster_design(
  data,
  subject_col = ".gp3_cluster_subject",
  condition_col = ".gp3_cluster_condition",
  time_col = ".gp3_cluster_time_bin",
  outcome_col = ".gp3_cluster_outcome"
)
```

Arguments

`data`	A prepared or raw long-format time-course data frame.
`subject_col`	Subject column.
`condition_col`	Condition column.
`time_col`	Time-bin column.
`outcome_col`	Outcome column.

Value

A data frame of design checks and cautious interpretations.

diagnose_gazepoint_gamm

Diagnose GAM and BAM models

Description

Run a compact diagnostics bundle for `mgcv` GAM/BAM models used in `gp3tools` workflows. The function combines convergence, basis-dimension checks, overdispersion checks, and optional DHARMa simulation-based residual diagnostics.

Usage

```
diagnose_gazepoint_gamm(
  model,
  model_name = NULL,
  check_convergence = TRUE,
  check_basis = TRUE,
  check_overdispersion = TRUE,
  use_dharma = FALSE,
  dharma_simulations = 250,
  seed = 123
)
```

Arguments

model	A fitted GAM/BAM object, a gp3tools fit object containing $model, or a named list of fitted model objects.
model_name	Optional model label used in returned tables.
check_convergence	Logical. If TRUE, run convergence diagnostics.
check_basis	Logical. If TRUE, run mgcv::k.check() basis-dimension diagnostics when available.
check_overdispersion	Logical. If TRUE, run overdispersion diagnostics when meaningful for the model family.
use_dharma	Logical. If TRUE, try to run optional DHARMa diagnostics.
dharma_simulations	Number of DHARMa simulations.
seed	Random seed used before DHARMa simulation.

Details

The function accepts raw mgcv::gam() / mgcv::bam() model objects, gp3tools fit objects containing a $model element, or a named list of fitted model objects.

Value

A list with overview, convergence, basis, overdispersion, DHARMa diagnostics, and settings.

---

diagnose_gazepoint_glmm

Diagnose GLMM, LMM, and GLM models

Description

Run a compact diagnostics bundle for model objects used in gp3tools workflows. The function combines convergence, singularity, overdispersion, and optional DHARMa simulation-based residual diagnostics.

Usage

```
diagnose_gazepoint_glmm(
  model,
  model_name = NULL,
  check_convergence = TRUE,
  check_singularity = TRUE,
  check_overdispersion = TRUE,
  use_dharma = TRUE,
  dharma_simulations = 250,
  seed = 123
)
```

Arguments

`model`	A fitted model object, a `gp3tools` fit object containing `$model`, or a named list of fitted model objects.
`model_name`	Optional model label used in returned tables.
`check_convergence`	Logical. If `TRUE`, run convergence diagnostics.
`check_singularity`	Logical. If `TRUE`, run singularity diagnostics.
`check_overdispersion`	Logical. If `TRUE`, run overdispersion diagnostics.
`use_dharma`	Logical. If `TRUE`, try to run optional DHARMa diagnostics.
`dharma_simulations`	Number of DHARMa simulations.
`seed`	Random seed used before DHARMa simulation.

Details

The function accepts raw fitted models, `gp3tools` fit objects containing a `$model` element, or a named list of fitted models. DHARMa diagnostics are optional and are skipped cleanly when DHARMa is not installed.

Value

A list with overview, convergence, singularity, overdispersion, DHARMa diagnostics, and settings.

`estimate_gazepoint_cluster_offset`

Guardrail for exact cluster-offset estimation

Description

This function intentionally fails safely. Cluster-permutation results should not be used as exact effect-offset estimates.

Usage

```
estimate_gazepoint_cluster_offset(...)
```

Arguments

...	Arguments reserved for a future implementation.

Value

This function always stops with an explanatory error.

---

estimate_gazepoint_cluster_onset

Guardrail for exact cluster-onset estimation

Description

This function intentionally fails safely. Cluster-permutation results should not be used as exact effect-onset estimates.

Usage

```
estimate_gazepoint_cluster_onset(...)
```

Arguments

...	Arguments reserved for a future implementation.

Value

This function always stops with an explanatory error.

---

estimate_gazepoint_divergence_point

Estimate a bootstrapped divergence point between two Gazepoint time courses

---

Description

Estimate the earliest time point at which two condition-level time courses reliably diverge. The helper computes observed condition curves, bootstraps the condition difference, identifies the first time point where the bootstrap confidence interval excludes the null value for a requested number of consecutive time points, and returns a bootstrap uncertainty interval for the divergence onset.

Usage

```
estimate_gazepoint_divergence_point(
  data,
  outcome_col,
  time_col,
  condition_col,
  participant_col = NULL,
  trial_col = NULL,
  comparison = NULL,
  bootstrap_unit = c("participant", "trial", "row"),
  summary_function = c("mean", "median"),
  n_boot = 1000L,
  ci = 0.95,
  consecutive_points = 1L,
  null_value = 0,
  min_abs_difference = 0,
  direction = c("two_sided", "positive", "negative"),
  seed = NULL,
  keep_bootstrap = TRUE,
  name = "gazepoint_divergence_point"
)
```

Arguments

`data`	A data frame containing time-course observations.
`outcome_col`	Outcome column, for example pupil size, fixation probability, gaze proportion, or AOI time-course value.
`time_col`	Time column.
`condition_col`	Condition column. Exactly two conditions are compared unless `comparison` is supplied.
`participant_col`	Optional participant column used for participant-level bootstrap resampling.
`trial_col`	Optional trial column used for trial-level bootstrap resampling.
`comparison`	Optional character vector of two condition values. The estimated difference is `comparison[2] - comparison[1]`.
`bootstrap_unit`	Resampling unit. Options are `"participant"`, `"trial"`, and `"row"`.
`summary_function`	Function used to summarise observations within condition-by-time cells. Options are `"mean"` and `"median"`.
`n_boot`	Number of bootstrap resamples.
`ci`	Confidence level for bootstrap intervals.
`consecutive_points`	Number of consecutive time points required before declaring divergence.
`null_value`	Null difference value. Default is `0`.

`min_abs_difference`
: Optional minimum absolute observed difference required at a time point.

`direction`
: Direction of divergence. `"two_sided"` checks whether the bootstrap interval excludes `null_value` in either direction. `"positive"` checks whether `comparison[2] > comparison[1]`. `"negative"` checks whether `comparison[2] < comparison[1]`.

`seed`
: Optional random seed for reproducible bootstrap resampling.

`keep_bootstrap`
: Logical. If `TRUE`, return bootstrap differences for each time point.

`name`
: Character label stored in the returned object.

Details

This helper complements cluster-permutation analysis. Cluster permutation asks where a reliable time window exists; divergence-point analysis asks when the condition difference first emerges.

Value

A list with class `gp3_divergence_point_analysis`.

---

export_gazepoint_cluster_results

Export Gazepoint cluster-permutation results

Description

Export cluster tables, optional null distributions, settings, and cautious report text to a folder of CSV/TXT files.

Usage

```
export_gazepoint_cluster_results(result, outdir, overwrite = FALSE)
```

Arguments

`result`
: A result object returned by `run_gazepoint_cluster_permutation()`.

`outdir`
: Output directory.

`overwrite`
: Should an existing directory be reused?

Value

A data frame listing written files.

`export_gazepoint_heatmap_png` *Export a Gazepoint heatmap plot to PNG*

Description

`export_gazepoint_heatmap_png()` saves a ggplot heatmap to a PNG file.

Usage

```
export_gazepoint_heatmap_png(
  plot,
  filename,
  width = 8,
  height = 5,
  units = "in",
  dpi = 300,
  create_dir = TRUE,
  ...
)
```

Arguments

`plot`	A ggplot object, usually returned by `plot_gazepoint_heatmap()` or `plot_gazepoint_heatmap_overla`
`filename`	Output file path.
`width, height`	Plot size passed to `ggplot2::ggsave()`.
`units`	Units passed to `ggplot2::ggsave()`.
`dpi`	Resolution passed to `ggplot2::ggsave()`.
`create_dir`	Logical. If `TRUE`, the output directory is created when needed.
`...`	Additional arguments passed to `ggplot2::ggsave()`.

Value

Invisibly returns the output path.

Examples

```
gaze <- data.frame(
  x = c(0.20, 0.25, 0.70),
  y = c(0.30, 0.35, 0.60)
)

p <- plot_gazepoint_heatmap(
  gaze,
  x_col = "x",
  y_col = "y",
```

```
  bins = 10
)

out <- tempfile(fileext = ".png")
export_gazepoint_heatmap_png(p, out, width = 4, height = 3)
```

`export_gazepoint_master_audit` *Export a Gazepoint master table, audit tables, and validation tables*

Description

Exports a Gazepoint master sample-level table together with the output of `audit_gazepoint_master()` and, optionally, `validate_gazepoint_master()`. This function is useful after creating a master table with `as_gazepoint_master()` or `create_gazepoint_master()`.

Usage

```
export_gazepoint_master_audit(
  master,
  audit = NULL,
  validation = NULL,
  output_dir = ".",
  prefix = "gazepoint",
  export_master = TRUE,
  export_audit = TRUE,
  export_validation = TRUE,
  overwrite = TRUE,
  na = ""
)
```

Arguments

`master`	A Gazepoint master sample-level table.
`audit`	Optional audit list returned by `audit_gazepoint_master()`. If `NULL`, the audit is created automatically.
`validation`	Optional validation list returned by `validate_gazepoint_master()`. If `NULL` and `export_validation = TRUE`, validation is created automatically.
`output_dir`	Directory where CSV files should be written.
`prefix`	File prefix used for all exported CSV files.
`export_master`	Logical. If `TRUE`, exports the full master table.
`export_audit`	Logical. If `TRUE`, exports audit tables.
`export_validation`	Logical. If `TRUE`, exports validation tables.
`overwrite`	Logical. If `FALSE`, the function aborts when any target file already exists.
`na`	String used for missing values in CSV output.

Value

A tibble listing the exported files, table names, and dimensions.

Examples

```
## Not run:
master <- create_gazepoint_master(
  gaze_data = results$all_gaze,
  screen_width_px = 1920,
  screen_height_px = 1080
)

audit <- audit_gazepoint_master(master)
validation <- validate_gazepoint_master(master)

exported <- export_gazepoint_master_audit(
  master = master,
  audit = audit,
  validation = validation,
  output_dir = "gazepoint_outputs",
  prefix = "study1"
)

exported

## End(Not run)
```

---

export_gazepoint_mne_cluster_input

Export Gazepoint time-course data for MNE-style cluster workflows

---

Description

Write a conservative long-format CSV file and README for continuation in an external Python/MNE workflow. This helper prepares data only; it does not run MNE, construct adjacency matrices, validate exchangeability, or validate the external analysis.

Usage

```
export_gazepoint_mne_cluster_input(
  data,
  outdir,
  subject_col = ".gp3_cluster_subject",
  condition_col = ".gp3_cluster_condition",
  time_col = ".gp3_cluster_time_bin",
  outcome_col = ".gp3_cluster_outcome",
  overwrite = FALSE
)
```

Arguments

data	A prepared or raw long-format time-course data frame.
outdir	Output directory.
subject_col	Subject column.
condition_col	Condition column.
time_col	Time-bin column.
outcome_col	Outcome column.
overwrite	Should an existing directory be reused?

Value

A data frame listing written files.

---

export_gazepoint_model_tables *Export manuscript-ready model tables*

Description

Export model-summary tables and optional estimated marginal means tables to CSV files. The function is designed for objects returned by `tidy_gazepoint_model_summary()` and `summarise_gazepoint_emmeans()`.

Usage

```
export_gazepoint_model_tables(
  model_summary = NULL,
  emmeans_summary = NULL,
  output_dir,
  prefix = "gazepoint_model",
  overwrite = TRUE,
  include_diagnostics = TRUE
)
```

Arguments

model_summary	Optional object returned by `tidy_gazepoint_model_summary()`.
emmeans_summary	Optional object returned by `summarise_gazepoint_emmeans()`.
output_dir	Output directory.
prefix	File-name prefix.
overwrite	Logical. If `FALSE`, existing output files cause an error.
include_diagnostics	Logical. If `TRUE`, export available diagnostic component tables from `model_summary`.

Value

A tibble indexing the written files.

`export_gazepoint_permuco_cluster_input` *Export Gazepoint time-course data for permuco-style cluster workflows*

Description

Write a conservative long-format CSV file and README for continuation in an external R/permuco workflow. This helper prepares data only; it does not run permuco or validate the external model specification.

Usage

```
export_gazepoint_permuco_cluster_input(
  data,
  outdir,
  subject_col = ".gp3_cluster_subject",
  condition_col = ".gp3_cluster_condition",
  time_col = ".gp3_cluster_time_bin",
  outcome_col = ".gp3_cluster_outcome",
  overwrite = FALSE
)
```

Arguments

`data`	A prepared or raw long-format time-course data frame.
`outdir`	Output directory.
`subject_col`	Subject column.
`condition_col`	Condition column.
`time_col`	Time-bin column.
`outcome_col`	Outcome column.
`overwrite`	Should an existing directory be reused?

Value

A data frame listing written files.

`export_gazepoint_permutes_cluster_input` *Export Gazepoint time-course data for permutes-style cluster workflows*

Description

Write a conservative long-format CSV file and README for continuation in an external R/permutes workflow. This helper prepares data only; it does not run permutes or validate the external model specification.

Usage

```
export_gazepoint_permutes_cluster_input(
  data,
  outdir,
  subject_col = ".gp3_cluster_subject",
  condition_col = ".gp3_cluster_condition",
  time_col = ".gp3_cluster_time_bin",
  outcome_col = ".gp3_cluster_outcome",
  overwrite = FALSE
)
```

Arguments

`data`	A prepared or raw long-format time-course data frame.
`outdir`	Output directory.
`subject_col`	Subject column.
`condition_col`	Condition column.
`time_col`	Time-bin column.
`outcome_col`	Outcome column.
`overwrite`	Should an existing directory be reused?

Value

A data frame listing written files.

export_gazepoint_tables

Export Gazepoint analysis tables to CSV files

Description

Writes a named list of analysis tables to CSV files in an output folder.

Usage

```
export_gazepoint_tables(
  tables,
  output_dir,
  prefix = NULL,
  overwrite = TRUE,
  na = ""
)
```

Arguments

tables	A named list of data frames or tibbles.
output_dir	Folder where CSV files should be written.
prefix	Optional filename prefix.
overwrite	Logical. If FALSE, the function stops when a target file already exists.
na	Value used for missing values in the exported CSV files.

Value

A tibble with table names and written file paths.

export_gazepoint_to_bids

Export Gazepoint data to a lightweight BIDS-style folder

Description

Write a conservative BIDS-style eye-tracking folder from a Gazepoint-style data frame. This helper creates standard-looking TSV and JSON sidecar files for sharing and inspection, but it does not claim full validation against a specific evolving BIDS eye-tracking validator.

Usage

```
export_gazepoint_to_bids(
  data,
  outdir,
  subject_col,
  task = "gazepoint",
  session = NULL,
  time_col,
  x_col,
  y_col,
  pupil_col = NULL,
  trial_col = NULL,
  aoi_col = NULL,
  overwrite = FALSE
)
```

Arguments

data	A gaze-sample data frame.
outdir	Output directory.
subject_col	Subject column.
task	Task label used in file names.
session	Optional session label.
time_col	Time column.
x_col	Horizontal gaze coordinate column.
y_col	Vertical gaze coordinate column.
pupil_col	Optional pupil column.
trial_col	Optional trial column.
aoi_col	Optional AOI column.
overwrite	Should an existing output directory be reused?

Value

A data frame listing written files.

---

fit_gazepoint_aoi_brms

Fit an optional Bayesian AOI model with brms

Description

Prepare and optionally fit a Bayesian AOI model using **brms**. The dependency is optional: the function checks for **brms** only when dry_run = FALSE. Tests and lightweight workflows can use dry_run = TRUE to inspect the formula and data without running Stan.

Usage

```
fit_gazepoint_aoi_brms(
  data,
  response,
  predictors,
  subject_col = NULL,
  family = "bernoulli",
  prior = NULL,
  dry_run = TRUE,
  ...
)
```

Arguments

data	A data frame.
response	Response column.
predictors	Character vector of fixed-effect predictors.
subject_col	Optional grouping column for a random intercept.
family	brms family specification as a character string.
prior	Optional brms prior object.
dry_run	If TRUE, return the prepared call components without fitting.
...	Additional arguments passed to `brms::brm()` when fitting.

Value

A dry-run specification list or a `brmsfit` object.

`fit_gazepoint_aoi_gamm`

Fit AOI time-course GAMMs

Description

Fit binomial GAMMs for AOI target-looking time courses prepared by `prepare_gazepoint_aoi_gamm_data()`. The model uses target-looking successes and failures over time and can include condition effects, condition-specific smooths, and subject random-effect smooths.

Usage

```
fit_gazepoint_aoi_gamm(
  data,
  include_condition = TRUE,
  condition_smooths = TRUE,
  random_subject = TRUE,
  random_subject_time = FALSE,
```

```
  time_k = 10,
  subject_time_k = 5,
  family = stats::binomial(),
  method = "fREML",
  discrete = FALSE,
  select = FALSE,
  drop_non_ok = TRUE,
  min_rows = 10,
  min_subjects = 2,
  min_time_bins = 4,
  ...
)
```

Arguments

data	A data frame returned by prepare_gazepoint_aoi_gamm_data().
include_condition	Logical. If TRUE, include condition as a parametric fixed effect when two or more conditions are available.
condition_smooths	Logical. If TRUE, fit condition-specific time smooths when two or more conditions are available.
random_subject	Logical. If TRUE, include a subject random-effect smooth.
random_subject_time	Logical. If TRUE, include subject-specific factor-smooth time deviations. This can be useful for repeated-measures time-course data but may be too heavy for very small datasets.
time_k	Basis dimension for the main time smooth.
subject_time_k	Basis dimension for subject-specific factor-smooth time deviations.
family	Model family. Defaults to stats::binomial().
method	Smoothing-parameter estimation method passed to mgcv::bam().
discrete	Logical passed to mgcv::bam().
select	Logical passed to mgcv::bam().
drop_non_ok	Logical. If TRUE, keep only rows with .gp3_aoi_gamm_status == "ok" before fitting.
min_rows	Minimum number of rows required for model fitting.
min_subjects	Minimum number of subjects required for model fitting.
min_time_bins	Minimum number of time bins required for model fitting.
...	Additional arguments passed to mgcv::bam().

Details

This function is intended for AOI time-course modelling. It is separate from confirmatory AOI-window GLMMs and from cluster-based permutation tests.

Value

A list containing the fitted model, formula, model status, diagnostics, parametric table, smooth table, and settings.

`fit_gazepoint_aoi_model_sensitivity`
Fit AOI-window model-family sensitivity checks

Description

Fit a compact set of sensitivity models for AOI-window outcomes. The main model is a binomial GLMM. Additional checks can include an empirical-logit LMM, a weighted proportion LMM, and a fixed-effects quasibinomial GLM.

Usage

```
fit_gazepoint_aoi_model_sensitivity(
  data,
  success_col = "aoi_glmm_success",
  failure_col = "aoi_glmm_failure",
  denominator_col = "aoi_glmm_denominator",
  proportion_col = "aoi_glmm_prop",
  subject_col = "aoi_glmm_subject",
  condition_col = "aoi_glmm_condition",
  window_col = "aoi_glmm_window",
  model_types = c("binomial_glmm", "empirical_logit_lmm", "proportion_lmm",
    "quasibinomial_glm"),
  include_condition = TRUE,
  include_window = TRUE,
  include_interaction = TRUE,
  random_intercept = TRUE,
  optimizer = "bobyqa",
  maxfun = 2e+05,
  nAGQ = 0,
  empirical_logit_correction = 0.5,
  drop_missing = TRUE
)
```

Arguments

`data`	AOI GLMM data returned by `prepare_gazepoint_aoi_glmm_data()`.
`success_col`	Success-count column.
`failure_col`	Failure-count column.
`denominator_col`	Denominator column.
`proportion_col`	Proportion column.

subject_col	Subject column.
condition_col	Condition column.
window_col	Window column.
model_types	Character vector of model types. Supported values are "binomial_glmm", "empirical_logit_lmm", "proportion_lmm", and "quasibinomial_glm".
include_condition	Logical. Include condition fixed effect when possible.
include_window	Logical. Include window fixed effect when possible.
include_interaction	Logical. Include condition-by-window interaction when both condition and window are included.
random_intercept	Logical. Include subject random intercept in mixed sensitivity models.
optimizer	Optimizer for lme4 mixed models.
maxfun	Maximum optimizer evaluations.
nAGQ	Number of adaptive Gauss-Hermite quadrature points for the binomial GLMM.
empirical_logit_correction	Small correction added to success and failure counts for empirical-logit models.
drop_missing	Logical. Drop rows with missing model variables.

Value

A list containing fitted models, formulas, comparison table, fixed effects table, settings, and status information.

---

fit_gazepoint_aoi_window_glmm

Fit an AOI-window binomial GLMM

Description

Fit a confirmatory AOI-window mixed-effects logistic regression from data prepared by prepare_gazepoint_aoi_glmm_dat

Usage

```
fit_gazepoint_aoi_window_glmm(
  data,
  success_col = "aoi_glmm_success",
  failure_col = "aoi_glmm_failure",
  subject_col = "aoi_glmm_subject",
  condition_col = "aoi_glmm_condition",
  window_col = "aoi_glmm_window",
  include_condition = TRUE,
  include_window = TRUE,
```

```
  include_interaction = TRUE,
  random_intercept = TRUE,
  random_window_slopes = FALSE,
  fallback_on_singular = TRUE,
  optimizer = "bobyqa",
  maxfun = 2e+05,
  nAGQ = 0,
  drop_missing = TRUE
)
```

Arguments

`data`	AOI GLMM data returned by `prepare_gazepoint_aoi_glmm_data()`.
`success_col`	Success-count column.
`failure_col`	Failure-count column.
`subject_col`	Subject factor/column.
`condition_col`	Condition factor/column.
`window_col`	AOI-window factor/column.
`include_condition`	Logical. Include condition fixed effects when at least two conditions are available.
`include_window`	Logical. Include window fixed effects when at least two windows are available.
`include_interaction`	Logical. Include condition-by-window interaction when both condition and window fixed effects are included.
`random_intercept`	Logical. Include subject random intercept.
`random_window_slopes`	Logical. Attempt subject-level random slopes for AOI window.
`fallback_on_singular`	Logical. If `TRUE`, fall back to a simpler random intercept model when a random-slope model is singular or fails.
`optimizer`	Optimizer passed to `lme4::glmerControl()`.
`maxfun`	Maximum optimizer evaluations.
`nAGQ`	Number of adaptive Gauss-Hermite quadrature points.
`drop_missing`	Logical. Drop rows with missing model variables before fitting.

Value

A list with fitted model, attempted model, formulas, comparison table, settings, status fields, and model data.

fit_gazepoint_gca *Fit a Gazepoint Growth Curve Analysis mixed model*

Description

Fit a Growth Curve Analysis (GCA) mixed model to prepared pupil time-course data. The function first attempts a random-intercept plus random-time-slopes model and, if the model fails or is singular, falls back to a random-intercept model.

Usage

```
fit_gazepoint_gca(
  data,
  outcome_col = "gca_pupil",
  subject_col = "subject",
  condition_col = "condition",
  time_terms = NULL,
  degree = NULL,
  weights_col = "gca_weight",
  use_weights = TRUE,
  random_slopes = TRUE,
  fallback_on_singular = TRUE,
  REML = FALSE,
  optimizer = "bobyqa",
  maxfun = 2e+05,
  drop_missing = TRUE
)
```

Arguments

data	A data frame created by prepare_gazepoint_gca_data().
outcome_col	Name of the GCA outcome column.
subject_col	Name of the subject column.
condition_col	Name of the condition column.
time_terms	Optional character vector of polynomial time-term columns. If NULL, terms named time_poly_1, time_poly_2, ... are detected.
degree	Optional number of polynomial terms to use. If supplied and time_terms = NULL, the function uses time_poly_1 through time_poly_degree.
weights_col	Optional weights column. Use NULL for unweighted models.
use_weights	Logical. If TRUE, uses weights_col when available.
random_slopes	Logical. If TRUE, first attempts random slopes for all polynomial time terms.
fallback_on_singular	Logical. If TRUE, falls back to a random-intercept model when the random-slope model is singular.

REML	Logical passed to lme4::lmer().
optimizer	Optimizer passed to lme4::lmerControl().
maxfun	Maximum optimizer function evaluations.
drop_missing	Logical. If TRUE, rows with missing model variables are removed before fitting.

Value

A list of class gp3_gca_model containing the fitted model, attempted and final formulas, model comparison information, settings, and status.

---

fit_gazepoint_pupil_gamm

Fit a Gazepoint pupil GAMM

Description

Fit a generalized additive mixed model for binned pupil time-course data using mgcv::bam(). The function is designed to work with data prepared by prepare_gazepoint_pupil_gamm_data().

Usage

```
fit_gazepoint_pupil_gamm(
  data,
  pupil_col = "mean_pupil",
  time_col = "time_bin_center_ms",
  subject_col = "subject",
  condition_col = "condition",
  n_time_basis = 10,
  use_condition_smooths = TRUE,
  include_subject_random_effect = TRUE,
  family = c("gaussian", "scat"),
  method = "fREML",
  discrete = TRUE,
  rho = NULL,
  ar_start_col = "AR.start",
  weights_col = NULL,
  drop_missing = TRUE
)
```

Arguments

data	A binned pupil time-course data frame.
pupil_col	Name of the dependent pupil column.
time_col	Name of the time-bin centre column.
subject_col	Name of the subject column.

condition_col	Name of the condition column.
n_time_basis	Basis dimension for smooth time terms.
use_condition_smooths	Logical. If TRUE, condition-specific smooths are added when the condition column has more than one level.
include_subject_random_effect	Logical. If TRUE, adds a subject random-effect smooth.
family	Model family. Use "gaussian" for the default Gaussian model or "scat" for mgcv's scaled-t family.
method	Smoothing-parameter estimation method passed to mgcv::bam().
discrete	Logical passed to mgcv::bam().
rho	Optional AR(1) correlation parameter passed to mgcv::bam().
ar_start_col	Optional AR-start column. If present and rho is not NULL, it is passed to mgcv::bam() as AR.start.
weights_col	Optional weights column.
drop_missing	Logical. If TRUE, rows with missing model variables are removed before fitting.

Value

A list of class gp3_pupil_gamm containing the fitted model, formula, data, settings, and status information.

---

fit_gazepoint_pupil_pfe_gamm

Fit a gaze-position-adjusted pupil GAMM sensitivity model

Description

Fit and compare a main pupil GAMM with a gaze-position-adjusted sensitivity model. The adjusted model adds a two-dimensional tensor-product smooth over mean gaze x/y position using te(mean_x, mean_y).

Usage

```
fit_gazepoint_pupil_pfe_gamm(
  data,
  pupil_col = "mean_pupil",
  time_col = "time_bin_center_ms",
  subject_col = "subject",
  condition_col = "condition",
  x_col = "mean_x",
  y_col = "mean_y",
  n_time_basis = 10,
  n_position_basis = 8,
```

```
  use_condition_smooths = TRUE,
  include_subject_random_effect = TRUE,
  family = c("gaussian", "scat"),
  method = "fREML",
  discrete = TRUE,
  rho = NULL,
  ar_start_col = "AR.start",
  weights_col = NULL,
  drop_missing = TRUE
)
```

Arguments

data	A binned pupil time-course data frame, usually created by prepare_gazepoint_pupil_gamm_data().
pupil_col	Name of the dependent pupil column.
time_col	Name of the time-bin centre column.
subject_col	Name of the subject column.
condition_col	Name of the condition column.
x_col	Name of the mean gaze x-position column.
y_col	Name of the mean gaze y-position column.
n_time_basis	Basis dimension for time smooths.
n_position_basis	Basis dimension for gaze-position smooths.
use_condition_smooths	Logical. If TRUE, condition-specific time smooths are used when multiple conditions are present.
include_subject_random_effect	Logical. If TRUE, adds a subject random-effect smooth.
family	Model family. Use "gaussian" or "scat".
method	Smoothing-parameter estimation method passed to mgcv::bam().
discrete	Logical passed to mgcv::bam().
rho	Optional AR(1) correlation parameter passed to mgcv::bam().
ar_start_col	Optional AR-start column.
weights_col	Optional weights column.
drop_missing	Logical. If TRUE, rows with missing model variables are removed before fitting.

Value

A list of class gp3_pupil_pfe_gamm containing the main model, the gaze-position-adjusted model, formulas, comparison table, settings, and status information.

`fit_gazepoint_pupil_window_lmm` *Fit confirmatory pupil-window linear mixed models*

Description

Fit the main confirmatory trial/window-level pupil model from data prepared with `prepare_gazepoint_pupil_window_mode`
The default model is a linear mixed model with pupil outcome as the continuous dependent variable, condition and/or window fixed effects when available, and a subject random intercept when feasible.

Usage

```
fit_gazepoint_pupil_window_lmm(
  data,
  formula = NULL,
  outcome_col = "pupil_model_outcome",
  subject_col = "pupil_model_subject",
  condition_col = "pupil_model_condition",
  window_col = "pupil_model_window",
  weights_col = "pupil_model_weight",
  use_weights = FALSE,
  include_condition = TRUE,
  include_window = TRUE,
  include_interaction = TRUE,
  random_intercept = TRUE,
  random_window_slopes = FALSE,
  fallback_on_singular = TRUE,
  REML = FALSE,
  optimizer = "bobyqa",
  maxfun = 2e+05,
  drop_missing = TRUE,
  ...
)
```

Arguments

`data`	Pupil-window model data, usually produced by `prepare_gazepoint_pupil_window_model_data()`.
`formula`	Optional model formula. If `NULL`, a formula is constructed automatically.
`outcome_col`	Outcome column.
`subject_col`	Subject column.
`condition_col`	Condition column.
`window_col`	Window column.
`weights_col`	Optional weights column.
`use_weights`	Logical. If `TRUE`, use `weights_col` as model weights.

include_condition
: Logical. Include condition fixed effects when more than one condition level is available.

include_window
: Logical. Include window fixed effects when more than one window level is available.

include_interaction
: Logical. Include the condition-by-window interaction when both condition and window are used.

random_intercept
: Logical. Include a subject random intercept when feasible.

random_window_slopes
: Logical. Attempt subject-level random window slopes when feasible.

fallback_on_singular
: Logical. If TRUE, fall back from a random-slope model to a random-intercept model when the attempted model is singular or fails.

REML
: Logical. Passed to `lme4::lmer()`.

optimizer
: Optimizer passed to `lme4::lmerControl()`.

maxfun
: Maximum optimizer iterations passed to `lme4::lmerControl()`.

drop_missing
: Logical. If TRUE, rows with missing or non-finite model inputs are removed before fitting.

...
: Additional arguments passed to `lme4::lmer()` or `stats::lm()`.

Value

A list containing the fitted model, formula, attempted model, fallback information, fixed effects, comparison table, settings, and model diagnostics.

---

fit_gazepoint_pupil_window_sensitivity

Run sensitivity models for confirmatory pupil-window analyses

---

Description

Run a compact set of sensitivity models for confirmatory pupil-window analyses. Supported model families are the main linear mixed model, a weighted linear mixed model, a fixed-effects linear model, and a weighted fixed-effects linear model. Weighted models use the prepared valid-sample count column as weights by default.

Usage

```
fit_gazepoint_pupil_window_sensitivity(
  data,
  outcome_col = "pupil_model_outcome",
  subject_col = "pupil_model_subject",
  condition_col = "pupil_model_condition",
```

```
  window_col = "pupil_model_window",
  weights_col = "pupil_model_weight",
  model_types = c("lmm", "weighted_lmm", "lm", "weighted_lm"),
  include_condition = TRUE,
  include_window = TRUE,
  include_interaction = TRUE,
  random_intercept = TRUE,
  random_window_slopes = FALSE,
  fallback_on_singular = TRUE,
  REML = FALSE,
  optimizer = "bobyqa",
  maxfun = 2e+05,
  drop_missing = TRUE,
  ...
)
```

Arguments

data	Pupil-window model data, usually produced by prepare_gazepoint_pupil_window_model_data().
outcome_col	Outcome column.
subject_col	Subject column.
condition_col	Condition column.
window_col	Window column.
weights_col	Optional weights column.
model_types	Character vector of model types to fit. Supported values are "lmm", "weighted_lmm", "lm", and "weighted_lm".
include_condition	Logical. Include condition fixed effects when more than one condition level is available.
include_window	Logical. Include window fixed effects when more than one window level is available.
include_interaction	Logical. Include the condition-by-window interaction when both condition and window are used.
random_intercept	Logical. Include a subject random intercept for LMM model types when feasible.
random_window_slopes	Logical. Attempt subject-level random window slopes for LMM model types when feasible.
fallback_on_singular	Logical. If TRUE, LMM model types may fall back from random-window-slope models to random-intercept models when needed.
REML	Logical. Passed to lme4::lmer().
optimizer	Optimizer passed to lme4::lmerControl().

maxfun	Maximum optimizer iterations passed to lme4::lmerControl().
drop_missing	Logical. If TRUE, rows with missing or non-finite model inputs are removed before fitting.
...	Additional arguments passed to fit_gazepoint_pupil_window_lmm().

Value

A list containing fitted models, formulas, fixed effects, a comparison table, settings, and model-status information.

---

fit_gazepoint_transition_count_nb_sensitivity

Fit optional negative-binomial transition-count sensitivity models

---

Description

Fit an optional negative-binomial sensitivity model for AOI/state transition counts using glmmTMB when it is installed. This helper is intended as a publication sensitivity branch for overdispersed transition-count outcomes.

Usage

```
fit_gazepoint_transition_count_nb_sensitivity(
  data,
  count_col = NULL,
  from_col = NULL,
  to_col = NULL,
  condition_cols = NULL,
  random_effect_cols = NULL,
  exposure_col = NULL,
  offset_col = NULL,
  formula = NULL,
  family = c("nbinom2", "nbinom1"),
  zero_inflation = FALSE,
  ziformula = NULL,
  dispformula = NULL,
  control = NULL,
  name = "gazepoint_transition_count_nb_sensitivity"
)
```

Arguments

data	A data frame containing transition-count rows.
count_col	Transition-count outcome column. If NULL, common count columns are detected automatically.

from_col	Transition origin column. If NULL, common origin columns are detected automatically.
to_col	Transition destination column. If NULL, common destination columns are detected automatically.
condition_cols	Optional fixed-effect condition columns.
random_effect_cols	Optional random-intercept grouping columns.
exposure_col	Optional positive exposure column. If supplied, the model includes offset(log(exposure_col)).
offset_col	Optional numeric offset column. Use either exposure_col or offset_col, not both.
formula	Optional model formula. If NULL, a formula is constructed from transition origin, destination, condition columns, optional offset, and random intercepts.
family	Negative-binomial family. Options are "nbinom2" and "nbinom1".
zero_inflation	Logical. If TRUE, use ziformula = ~1 unless ziformula is supplied.
ziformula	Optional zero-inflation formula passed to glmmTMB.
dispformula	Optional dispersion formula passed to glmmTMB.
control	Optional control object passed to glmmTMB.
name	Character label stored in the returned object.

Details

The helper keeps glmmTMB optional. If glmmTMB is not installed, it returns a structured skipped object rather than failing.

Value

A list with class gp3_transition_count_nb_sensitivity.

---

flag_gazepoint_pupil *Flag invalid, missing, implausible, and outlying Gazepoint pupil samples*

Description

Adds pupil-quality flags to a Gazepoint master sample-level table created by as_gazepoint_master() or create_gazepoint_master(). This function is intended as a preprocessing step before interpolation, filtering, baseline correction, or pupil-based modelling.

Usage

```
flag_gazepoint_pupil(
  master,
  pupil_col = NULL,
  time_col = NULL,
  missing_pupil_col = NULL,
  group_cols = c("subject", "media_id"),
  min_pupil = 0,
  max_pupil = Inf,
  outlier_k = 1.5,
  flag_iqr_outliers = TRUE
)
```

Arguments

master	A Gazepoint master sample-level table.
pupil_col	Optional name of the pupil column to flag. If NULL, the function detects one of mean_pupil, pupil, pupil_raw, left_pupil, or right_pupil.
time_col	Optional name of the time column. If NULL, the function detects one of time_ms, time, time_orig, or time_orig_ms.
missing_pupil_col	Optional name of the missing-pupil flag column. If NULL, the function uses missing_pupil when available.
group_cols	Character vector of grouping columns used for IQR-based outlier detection. Defaults to c("subject", "media_id") using internally standardised names. Use character(0) for global outlier detection.
min_pupil	Minimum plausible pupil value. Defaults to 0.
max_pupil	Maximum plausible pupil value. Defaults to Inf. Use narrower values, such as 1 and 9, only when the pupil column is known to be measured in millimetres.
outlier_k	Multiplier for IQR-based outlier detection. Defaults to 1.5.
flag_iqr_outliers	Logical. If TRUE, IQR-based outliers are flagged. Defaults to TRUE.

Value

A tibble containing the original master table plus pupil-flagging columns.

Examples

```
## Not run:
flagged <- flag_gazepoint_pupil(master)

dplyr::count(flagged, pupil_flag_reason)

## End(Not run)
```

`flag_gazepoint_pupil_artifacts` *Flag Gazepoint pupil artifacts before interpolation*

Description

Adds pupil-specific artifact flags for blink/trackloss contamination, physiological implausibility when pupil units are millimetres, pupil-speed outliers, left-right binocular pupil disagreement, and temporal padding around bad samples. The function preserves raw pupil columns and creates `pupil_clean`, which can be used as input for interpolation.

Usage

```
flag_gazepoint_pupil_artifacts(
  data,
  pupil_col = NULL,
  left_pupil_col = NULL,
  right_pupil_col = NULL,
  time_col = NULL,
  blink_col = NULL,
  trackloss_col = NULL,
  missing_pupil_col = NULL,
  pupil_unit_col = NULL,
  group_cols = c("subject", "media_id"),
  registry = NULL,
  blink_padding_pre_ms = NULL,
  blink_padding_post_ms = NULL,
  pupil_min_mm = NULL,
  pupil_max_mm = NULL,
  pupil_speed_mad_k = NULL,
  binocular_mad_k = NULL,
  max_physio_outlier_prop = 0.8,
  flag_speed_outliers = TRUE,
  flag_binocular_disagreement = TRUE,
  flag_physiological_outliers = TRUE
)
```

Arguments

`data`	A Gazepoint master table or pupil-processing table.
`pupil_col`	Optional name of the pupil column to clean. If `NULL`, the function detects one of `mean_pupil`, `pupil_raw`, `pupil`, `left_pupil`, or `right_pupil`.
`left_pupil_col`	Optional left-pupil column. If `NULL`, `left_pupil` is used when available.
`right_pupil_col`	Optional right-pupil column. If `NULL`, `right_pupil` is used when available.

`time_col` Optional time column. If `NULL`, the function detects one of `time_ms`, `time`, `time_orig`, or `time_orig_ms`.

`blink_col` Optional blink column. If `NULL`, `blink` is used when available.

`trackloss_col` Optional trackloss column. If `NULL`, one of `trackloss` or `Trackloss` is used when available.

`missing_pupil_col`
Optional missing-pupil column. If `NULL`, `missing_pupil` is used when available.

`pupil_unit_col` Optional pupil-unit column. If `NULL`, `pupil_unit` is used when available.

`group_cols` Character vector of grouping columns used for speed outlier detection and artifact-padding windows. Defaults to `c("subject", "media_id")`. Use `character(0)` for global processing.

`registry` Optional preprocessing registry created by `create_gazepoint_preprocessing_registry()`.

`blink_padding_pre_ms`
Padding before bad samples, in milliseconds. If `NULL`, taken from `registry` or defaults to `100`.

`blink_padding_post_ms`
Padding after bad samples, in milliseconds. If `NULL`, taken from `registry` or defaults to `100`.

`pupil_min_mm` Minimum plausible pupil value when units are millimetres. If `NULL`, taken from `registry` or defaults to `1`.

`pupil_max_mm` Maximum plausible pupil value when units are millimetres. If `NULL`, taken from `registry` or defaults to `9`.

`pupil_speed_mad_k`
MAD multiplier for pupil-speed outlier detection. If `NULL`, taken from `registry` or defaults to `6`.

`binocular_mad_k`
MAD multiplier for binocular-disagreement detection. If `NULL`, taken from `registry` or defaults to `6`.

`max_physio_outlier_prop`
Maximum allowed proportion of non-missing millimetre-labelled pupil samples that may be rejected by the physiological rule before the rule is automatically suppressed. Defaults to `0.80`. This prevents raw-unit Gazepoint exports from being silently erased when the unit label suggests millimetres but the numeric scale is not compatible with ordinary 1–9 mm thresholds.

`flag_speed_outliers`
Logical. If `TRUE`, pupil-speed outliers are flagged. Defaults to `TRUE`.

`flag_binocular_disagreement`
Logical. If `TRUE`, left-right pupil disagreement is flagged when both eyes are available. Defaults to `TRUE`.

`flag_physiological_outliers`
Logical. If `TRUE`, millimetre-based physiological thresholds are applied only when the pupil unit is identified as millimetres. Defaults to `TRUE`.

Value

A tibble containing the original data plus pupil-artifact columns.

Examples

```
## Not run:
registry <- create_gazepoint_preprocessing_registry()

artifact_pupil <- flag_gazepoint_pupil_artifacts(
  master,
  registry = registry
)

dplyr::count(artifact_pupil, pupil_artifact_reason)

## End(Not run)
```

---

flag_gazepoint_pupil_hampel

Flag pupil artifacts with a Hampel filter

Description

Apply a rolling Hampel filter to a Gazepoint pupil column. The helper computes a rolling median and median absolute deviation (MAD) within a centred sample window, then flags pupil samples whose absolute deviation from the local median exceeds `k * MAD`.

Usage

```
flag_gazepoint_pupil_hampel(
  data,
  pupil_col,
  time_col = NULL,
  grouping_cols = NULL,
  window_size_samples = 7L,
  k = 3,
  min_valid_samples = 3L,
  scale_mad = 1.4826,
  flag_col = "pupil_hampel_outlier",
  median_col = "pupil_hampel_median",
  mad_col = "pupil_hampel_mad",
  threshold_col = "pupil_hampel_threshold",
  corrected_col = NULL,
  status_col = "pupil_hampel_status",
  overwrite = FALSE,
  name = "gazepoint_pupil_hampel"
)
```

Arguments

data	A data frame containing pupil observations.
pupil_col	Pupil column to screen.
time_col	Optional time column used to order samples within groups.
grouping_cols	Optional grouping columns, for example participant and trial.
window_size_samples	Odd integer rolling-window size in samples.
k	Hampel threshold multiplier.
min_valid_samples	Minimum finite pupil samples required inside a rolling window.
scale_mad	Scaling factor applied to MAD. The default 1.4826 makes MAD comparable to the standard deviation under normality.
flag_col	Name of the logical Hampel-flag output column.
median_col	Name of the rolling median output column.
mad_col	Name of the rolling MAD output column.
threshold_col	Name of the rolling threshold output column.
corrected_col	Optional name of a corrected pupil column. If supplied, flagged samples are replaced with the local rolling median.
status_col	Name of the row-level Hampel status column.
overwrite	Logical. If FALSE, the function errors when output columns already exist.
name	Character label stored in object attributes.

Details

This helper is intended as an optional sensitivity/artifact-flagging branch. It complements existing pupil artifact checks and should not automatically replace confirmatory preprocessing decisions.

Value

A tibble with Hampel-filter columns added. The object has class gp3_pupil_hampel_flags.

---

flag_gazepoint_sequence_anomalies

Flag unusual AOI sequences

Description

Identify grouped AOI sequences that are unusually short, unusually long, have high missingness, or contain very few unique AOI states. The function is intended as a lightweight quality-control helper rather than a definitive exclusion rule.

Usage

```
flag_gazepoint_sequence_anomalies(
  data,
  aoi_col,
  group_cols,
  time_col = NULL,
  min_length = 2,
  max_length = NULL,
  max_missing_prop = 0.5,
  z_threshold = 3,
  min_unique_aoi = 1
)
```

Arguments

data	A data frame containing AOI observations.
aoi_col	Name of the AOI column.
group_cols	Columns defining each sequence.
time_col	Optional time/order column.
min_length	Minimum acceptable non-missing sequence length.
max_length	Optional maximum acceptable non-missing sequence length.
max_missing_prop	Maximum acceptable missing AOI proportion.
z_threshold	Absolute z-score threshold for unusual sequence length.
min_unique_aoi	Minimum number of unique AOI labels expected.

Value

A data frame with sequence diagnostics and anomaly flags.

---

flag_tracking_quality *Flag low-quality Gazepoint recordings*

Description

Combines tracking-quality and sampling-rate summaries and flags rows with low gaze validity, low pupil validity, abnormal sampling rate, or short duration.

Usage

```
flag_tracking_quality(
  quality,
  sampling,
  by = c("USER_FILE", "MEDIA_ID"),
  min_gaze_valid_pct = 70,
  min_pupil_valid_pct = 70,
  expected_hz = 60,
  hz_tolerance = 5,
  min_duration_sec = NULL
)
```

Arguments

quality	Tracking-quality table from summarise_tracking_quality().
sampling	Sampling-rate table from check_sampling_rate().
by	Columns used to join quality and sampling.
min_gaze_valid_pct	Minimum acceptable FPOGV validity percentage.
min_pupil_valid_pct	Minimum acceptable pupil validity percentage.
expected_hz	Expected sampling rate.
hz_tolerance	Allowed deviation from the expected sampling rate.
min_duration_sec	Minimum acceptable recording duration in seconds.

Value

A tibble with quality, sampling, flag columns, and an overall review flag.

---

gazepoint_example_aoi_geometry

Example AOI geometry table

Description

A lightweight synthetic AOI geometry table for AOI-verification examples. Coordinates are normalised to a 0–1 screen coordinate system.

Usage

```
gazepoint_example_aoi_geometry
```

Format

A tibble with one row per stimulus and AOI, including:

media_id Synthetic stimulus identifier.

aoi Synthetic AOI label.

x_min, y_min, x_max, y_max Normalised rectangular AOI boundaries.

Examples

```
data(gazepoint_example_aoi_geometry)
gazepoint_example_aoi_geometry
```

---

gazepoint_example_aoi_windows

Example AOI-window summary table

Description

A lightweight synthetic AOI-window summary table created from `gazepoint_example_master`. It can be used in examples for AOI-window denominator checks, GLMM preparation, and AOI-window modelling.

Usage

```
gazepoint_example_aoi_windows
```

Format

A tibble with one row per participant, stimulus/trial, and AOI time window.

Examples

```
data(gazepoint_example_aoi_windows)
head(gazepoint_example_aoi_windows)
```

gazepoint_example_fixations *Example Gazepoint fixation table*

Description

A lightweight synthetic Gazepoint-style fixation table for examples, tests, README workflows, and vignettes. The data are artificial and are not from a real participant study.

Usage

```
gazepoint_example_fixations
```

Format

A tibble with fixation-level rows and columns including:

USER_FILE Synthetic participant/file identifier.

subject Synthetic participant identifier.

MEDIA_ID Synthetic stimulus identifier.

trial_global Synthetic trial identifier.

condition Synthetic experimental condition.

FPOGID Synthetic fixation identifier.

FPOGS Synthetic fixation start time.

FPOGD Synthetic fixation duration.

FPOGX, FPOGY Synthetic fixation coordinates.

FPOGV Synthetic fixation validity flag.

AOI Synthetic AOI label.

Examples

```
data(gazepoint_example_fixations)
head(gazepoint_example_fixations)
```

gazepoint_example_master *Example Gazepoint master table*

Description

A lightweight synthetic Gazepoint-style sample-level master table for examples, tests, README workflows, and vignettes. The data are artificial and are not from a real participant study.

Usage

```
gazepoint_example_master
```

Format

A tibble with sample-level rows and columns including:

subject Synthetic participant identifier.

USER_FILE Gazepoint-style participant/file identifier.

MEDIA_ID Synthetic stimulus identifier.

trial_global Synthetic trial identifier.

condition Synthetic experimental condition.

time Sample time in milliseconds.

x, y Normalised gaze coordinates.

pupil Synthetic pupil value.

valid Logical gaze/pupil validity flag.

artifact Logical synthetic pupil-artifact flag.

aoi_current Synthetic AOI state.

is_fixation, is_saccade Synthetic fixation and saccade indicators.

event_label Synthetic event marker.

Examples

```
data(gazepoint_example_master)
head(gazepoint_example_master)
```

gazepoint_example_pupil_windows

Example pupil-window summary table

Description

A lightweight synthetic pupil-window summary table created from `gazepoint_example_master`. It can be used in examples for pupil-window model-data preparation and confirmatory pupil-window modelling.

Usage

```
gazepoint_example_pupil_windows
```

Format

A tibble with one row per participant, stimulus/trial, condition, and pupil time window.

Examples

```
data(gazepoint_example_pupil_windows)
head(gazepoint_example_pupil_windows)
```

harmonize_gazepoint_screen_coordinates

Harmonize Gazepoint screen coordinates across resolutions

Description

Rescales gaze coordinates from one screen or stimulus resolution to another. This is a deterministic coordinate transformation for harmonizing exports before plotting, AOI checks, or descriptive summaries. It does not recalibrate gaze data or correct measurement error.

Usage

```
harmonize_gazepoint_screen_coordinates(
  data,
  x_col,
  y_col,
  from_width,
  from_height,
  to_width,
  to_height,
  output_x_col = "gaze_x_harmonized",
  output_y_col = "gaze_y_harmonized",
  keep_original = TRUE
)
```

Arguments

data	A data frame.
x_col, y_col	Character names of source coordinate columns.
from_width, from_height	Original screen or stimulus dimensions.
to_width, to_height	Target screen or stimulus dimensions.
output_x_col, output_y_col	Names of the rescaled output columns.
keep_original	If TRUE, original coordinate columns are retained. If FALSE, the original columns are removed when output column names differ.

Value

A copy of data with harmonized coordinate columns.

Examples

```
x <- data.frame(gaze_x = c(0, 960, 1920), gaze_y = c(0, 540, 1080))
harmonize_gazepoint_screen_coordinates(
  x,
  x_col = "gaze_x",
  y_col = "gaze_y",
  from_width = 1920,
  from_height = 1080,
  to_width = 1280,
  to_height = 720
)
```

---

inspect_gazepoint_columns

Inspect Gazepoint columns

Description

Inspect Gazepoint columns

Usage

```
inspect_gazepoint_columns(x)
```

Arguments

x	A data frame or path to a Gazepoint CSV export.

Value

A tibble describing column names, semantic groups, and missingness.

`interpolate_gazepoint_pupil` *Interpolate short missing gaps in Gazepoint pupil data*

Description

Performs linear interpolation over short internal gaps in Gazepoint pupil data. This function is intended to be used after `flag_gazepoint_pupil()` or `flag_gazepoint_pupil_artifacts()`. When available, `pupil_clean` is used as the preferred default input column, followed by `pupil_for_preprocessing`. Leading gaps, trailing gaps, long gaps, non-finite time values, and groups with too few valid pupil samples are not interpolated.

Usage

```
interpolate_gazepoint_pupil(
  data,
  pupil_col = NULL,
  time_col = NULL,
  group_cols = c("subject", "media_id"),
  max_gap_ms = 150,
  max_gap_samples = Inf,
  min_valid_points = 2
)
```

Arguments

`data`	A Gazepoint master table, preferably after `flag_gazepoint_pupil()` or `flag_gazepoint_pupil_artif`
`pupil_col`	Optional name of the pupil column to interpolate. If `NULL`, the function detects one of `pupil_clean`, `pupil_for_preprocessing`, `mean_pupil`, `pupil`, `pupil_raw`, `left_pupil`, or `right_pupil`.
`time_col`	Optional name of the time column. If `NULL`, the function detects one of `time_ms`, `time`, `time_orig`, or `time_orig_ms`.
`group_cols`	Character vector of grouping columns used to keep interpolation within independent time series. Defaults to `c("subject", "media_id")` using internally standardised names. Use `character(0)` for global interpolation.
`max_gap_ms`	Maximum duration, in milliseconds, of a gap that may be interpolated. The duration is measured between the valid samples immediately before and after the gap. Defaults to `150`.
`max_gap_samples`	Maximum number of consecutive missing samples that may be interpolated. Defaults to `Inf`.
`min_valid_points`	Minimum number of valid samples required within a group before interpolation is attempted. Defaults to `2`.

Value

A tibble containing the original data plus interpolation columns.

Examples

```
## Not run:
flagged <- flag_gazepoint_pupil(master)

interpolated <- interpolate_gazepoint_pupil(flagged)

dplyr::count(interpolated, pupil_interpolation_status)

artifact_flagged <- flag_gazepoint_pupil_artifacts(master)

artifact_interpolated <- interpolate_gazepoint_pupil(artifact_flagged)

dplyr::count(artifact_interpolated, pupil_interpolation_status)

## End(Not run)
```

---

interpolate_gazepoint_pupil_pchip

Interpolate Gazepoint pupil data using PCHIP

Description

Apply shape-preserving piecewise cubic Hermite interpolation to short internal gaps in Gazepoint pupil time series. This helper is intended as a sensitivity branch alongside the default linear interpolation workflow. It does not overwrite the original pupil column.

Usage

```
interpolate_gazepoint_pupil_pchip(
  data,
  pupil_col = NULL,
  time_col = NULL,
  grouping_cols = NULL,
  max_gap_ms = 500,
  max_gap_samples = NULL,
  min_valid_points = 3,
  output_col = "pupil_interpolated_pchip",
  flag_col = "interpolated_pupil_pchip",
  status_col = "pchip_interpolation_status"
)
```

Arguments

data	A data frame containing pupil time-series data.
pupil_col	Name of the pupil column to interpolate. If NULL, common processed pupil columns are detected automatically.
time_col	Name of the time column. If NULL, common time columns are detected automatically.
grouping_cols	Optional character vector of grouping columns. If NULL, common participant/trial/media grouping columns are detected automatically. Use character(0) to interpolate the full data as one sequence.
max_gap_ms	Maximum internal gap duration, in milliseconds, eligible for interpolation. If both max_gap_ms and max_gap_samples are supplied, both criteria must be satisfied.
max_gap_samples	Maximum number of consecutive missing samples eligible for interpolation.
min_valid_points	Minimum number of valid non-missing points required within a group before PCHIP interpolation is attempted.
output_col	Name of the interpolated pupil output column.
flag_col	Name of the logical flag column indicating samples filled by PCHIP interpolation.
status_col	Name of the interpolation-status column.

Value

A tibble with PCHIP interpolation columns added.

---

launch_gazepoint_qc_dashboard

Launch or describe a lightweight QC dashboard

Description

Provide a minimal optional Shiny dashboard launcher for inspecting a data frame. With launch = FALSE, the function returns a dashboard specification without requiring Shiny.

Usage

```
launch_gazepoint_qc_dashboard(
  data = NULL,
  title = "gp3tools QC dashboard",
  launch = FALSE
)
```

Arguments

data	Optional data frame to inspect.
title	Dashboard title.
launch	Should a Shiny app be launched?

Value

A dashboard specification, or a Shiny app object when launched.

---

plot_gazepoint_aoi_gamm

Plot AOI time-course GAMM results

Description

Plot observed AOI target-looking proportions and fitted GAMM trajectories from a model returned by `fit_gazepoint_aoi_gamm()`.

Usage

```
plot_gazepoint_aoi_gamm(
  fit,
  n_time_points = 100,
  include_observed = TRUE,
  include_fitted = TRUE,
  show_ci = TRUE,
  ci_level = 0.95,
  exclude_random_effects = TRUE,
  observed_summary = c("pooled"),
  point_size = 1.8,
  point_alpha = 0.65,
  line_width = 0.8,
  ribbon_alpha = 0.15,
  title = NULL,
  subtitle = NULL,
  x_label = "Time (ms)",
  y_label = "Target AOI looking probability",
  y_limits = c(0, 1)
)
```

Arguments

fit	A result object returned by `fit_gazepoint_aoi_gamm()`.
n_time_points	Number of time points used for the fitted prediction grid. If `NULL`, the observed time bins are used.

include_observed
: Logical. If TRUE, plot observed binned proportions.

include_fitted
: Logical. If TRUE, plot fitted GAMM trajectories.

show_ci
: Logical. If TRUE, plot fitted confidence intervals.

ci_level
: Confidence level for fitted intervals.

exclude_random_effects
: Logical. If TRUE, exclude subject random-effect smooths from fitted predictions.

observed_summary
: Character. Currently "pooled" pools successes and denominators by condition and time.

point_size
: Size of observed points.

point_alpha
: Transparency for observed points.

line_width
: Width of fitted trajectory lines.

ribbon_alpha
: Transparency for fitted confidence ribbons.

title
: Optional plot title.

subtitle
: Optional plot subtitle.

x_label
: X-axis label.

y_label
: Y-axis label.

y_limits
: Optional numeric vector of length 2 for y-axis limits.

Details

The plot supports single-condition fallback models and multi-condition AOI time-course GAMMs. By default, fitted trajectories are population-level predictions with subject random-effect smooths excluded.

Value

A ggplot object with prediction and observed data stored as attributes.

---

plot_gazepoint_aoi_timeline

Plot an AOI timeline

Description

Creates a scarf-style timeline plot showing the current AOI over time for each subject, trial, or user-defined row grouping.

Usage

```
plot_gazepoint_aoi_timeline(
  data,
  aoi_col,
  time_col,
  y_col = NULL,
  subject_col = NULL,
  trial_col = NULL,
  group_cols = NULL,
  include_missing = FALSE,
  missing_label = "missing",
  sample_width = NULL,
  title = NULL,
  x_label = "Time",
  y_label = NULL,
  aoi_label = "AOI"
)
```

Arguments

data	A data frame containing AOI observations.
aoi_col	Character scalar. Column containing AOI labels.
time_col	Character scalar. Column containing time values.
y_col	Optional character scalar used directly as the y-axis row.
subject_col	Optional subject column used to construct the y-axis row.
trial_col	Optional trial column used to construct the y-axis row.
group_cols	Optional character vector used to construct the y-axis row when y_col is not supplied.
include_missing	Logical. If TRUE, missing or empty AOI labels are retained as missing_label; otherwise they are removed.
missing_label	Character scalar used when include_missing = TRUE.
sample_width	Optional numeric tile width. If omitted, a median time difference is estimated.
title	Optional plot title.
x_label	X-axis label.
y_label	Optional y-axis label.
aoi_label	Fill legend label.

Value

A ggplot object.

Examples

```
dat <- data.frame(
  subject = rep(c("S01", "S02"), each = 4),
  trial = "T01",
  time = rep(1:4, 2),
  AOI = c("A", "A", "B", "C", "A", "B", "B", "C")
)

plot_gazepoint_aoi_timeline(
  dat,
  aoi_col = "AOI",
  time_col = "time",
  subject_col = "subject",
  trial_col = "trial"
)
```

---

plot_gazepoint_aoi_transition_matrix

Plot Gazepoint AOI transition matrix

Description

Plot a heatmap of AOI transition counts or probabilities from the output of `compute_gazepoint_aoi_transition_matrix()` or from a compatible long-form transition table.

Usage

```
plot_gazepoint_aoi_transition_matrix(
  transitions,
  value = c("prob", "n"),
  state_order = NULL,
  by_cols = NULL,
  include_zero = TRUE,
  show_labels = TRUE,
  label_digits = 2,
  label_size = 3,
  facet = TRUE,
  title = NULL
)
```

Arguments

`transitions`	A `gp3_aoi_transition_matrix` object, a long-form transition table with `from`, `to`, `n`, and/or `prob` columns, or a numeric matrix with AOI states as row and column names.
`value`	Which value to plot: `"prob"` for transition probabilities or `"n"` for transition counts.

state_order	Optional character vector defining the AOI order on the heatmap axes.
by_cols	Optional character vector of grouping columns to facet by. If NULL, the function uses grouping columns stored in a gp3_aoi_transition_matrix object, when available.
include_zero	Logical. If TRUE, all possible state-to-state cells are shown, with missing transitions displayed as zero.
show_labels	Logical. If TRUE, cell values are printed inside tiles.
label_digits	Number of digits used when labelling probabilities.
label_size	Text size for cell labels.
facet	Logical. If TRUE, grouped transition tables are faceted.
title	Optional plot title.

Value

A ggplot2 plot object.

---

plot_gazepoint_aoi_verification

Plot AOI geometry for visual verification

Description

Create a visual verification plot of AOI rectangles, with optional gaze samples overlaid.

Usage

```
plot_gazepoint_aoi_verification(
  aoi_geometry,
  gaze_data = NULL,
  geometry_aoi_col = NULL,
  geometry_stimulus_col = NULL,
  x_min_col = NULL,
  y_min_col = NULL,
  x_max_col = NULL,
  y_max_col = NULL,
  x_col = NULL,
  y_col = NULL,
  width_col = NULL,
  height_col = NULL,
  gaze_x_col = NULL,
  gaze_y_col = NULL,
  gaze_stimulus_col = NULL,
  screen_x_range = c(0, 1),
  screen_y_range = c(0, 1),
  facet_by_stimulus = TRUE,
```

```
  show_labels = TRUE,
  show_gaze = TRUE,
  invert_y = TRUE,
  point_alpha = 0.35,
  point_size = 1.2,
  line_width = 0.8,
  label_size = 3
)
```

Arguments

aoi_geometry	A data frame containing AOI geometry definitions.
gaze_data	Optional data frame containing gaze samples to overlay.
geometry_aoi_col	AOI label/name column in aoi_geometry.
geometry_stimulus_col	Optional stimulus/media column in aoi_geometry.
x_min_col	Optional AOI left/x-min column.
y_min_col	Optional AOI top/y-min column.
x_max_col	Optional AOI right/x-max column.
y_max_col	Optional AOI bottom/y-max column.
x_col	Optional AOI left/x column used with width_col.
y_col	Optional AOI top/y column used with height_col.
width_col	Optional AOI width column.
height_col	Optional AOI height column.
gaze_x_col	Optional gaze x-coordinate column.
gaze_y_col	Optional gaze y-coordinate column.
gaze_stimulus_col	Optional gaze stimulus/media column.
screen_x_range	Numeric length-2 vector defining the screen x range.
screen_y_range	Numeric length-2 vector defining the screen y range.
facet_by_stimulus	Logical. If TRUE, facet by stimulus/media when a stimulus column is available.
show_labels	Logical. If TRUE, draw AOI labels at AOI centres.
show_gaze	Logical. If TRUE, overlay gaze samples when gaze_data is supplied.
invert_y	Logical. If TRUE, reverse the y-axis so screen origin is at the top-left.
point_alpha	Alpha transparency for gaze points.
point_size	Size of gaze points.
line_width	Width of AOI rectangle borders.
label_size	Size of AOI labels.

Value

A ggplot object.

plot_gazepoint_cluster_null_distribution

Plot the cluster-permutation null distribution

Description

Plot the null distribution of maximum cluster statistics from a cluster-permutation result when available.

Usage

```
plot_gazepoint_cluster_null_distribution(
  result,
  observed_line = TRUE,
  title = NULL
)
```

Arguments

result	A result object returned by run_gazepoint_cluster_permutation().
observed_line	Should observed cluster statistics be added when available?
title	Optional plot title.

Value

A ggplot object.

plot_gazepoint_cluster_permutation

Plot a Gazepoint cluster-permutation result

Description

plot_gazepoint_cluster_permutation() is a compatibility wrapper around plot_gazepoint_cluster_results(). It uses the existing validated gp3tools plotting engine while providing a name aligned with the cluster-permutation workflow.

Usage

```
plot_gazepoint_cluster_permutation(result, ...)
```

Arguments

result	A result object returned by run_gazepoint_cluster_permutation().
...	Additional arguments passed to plot_gazepoint_cluster_results().

Value

A ggplot object.

`plot_gazepoint_cluster_results` *Plot cluster-based permutation results*

Description

Create a publication-ready time-course plot from the output of `run_gazepoint_cluster_permutation()`. The plot can show the mean condition difference, the time-wise test statistic, or both. Candidate time bins and cluster-level significant windows can be highlighted.

Usage

```
plot_gazepoint_cluster_results(
  result,
  plot_type = c("both", "difference", "statistic"),
  alpha = 0.05,
  significant_only = TRUE,
  show_clusters = TRUE,
  show_candidates = TRUE,
  show_threshold = TRUE,
  show_zero_line = TRUE,
  title = NULL,
  subtitle = NULL,
  x_label = "Time (ms)",
  y_label = NULL,
  line_width = 0.7,
  point_size = 1.8,
  cluster_alpha = 0.12
)
```

Arguments

`result`	A result object returned by `run_gazepoint_cluster_permutation()`.
`plot_type`	Character. One of `"both"`, `"difference"`, or `"statistic"`.
`alpha`	Cluster-level significance threshold used to decide which clusters are significant for plotting.
`significant_only`	Logical. If `TRUE`, only significant clusters are shaded. If `FALSE`, all observed clusters are shaded.
`show_clusters`	Logical. If `TRUE`, shade cluster windows.
`show_candidates`	Logical. If `TRUE`, mark time bins exceeding the cluster-forming threshold.

show_threshold	Logical. If TRUE, show the cluster-forming threshold on the statistic panel.
show_zero_line	Logical. If TRUE, add a horizontal zero reference line.
title	Optional plot title.
subtitle	Optional plot subtitle.
x_label	X-axis label.
y_label	Optional y-axis label. If NULL, a label is chosen automatically.
line_width	Width of the time-course line.
point_size	Size of candidate-bin points.
cluster_alpha	Transparency for shaded cluster windows.

Details

Cluster-based permutation tests are intended for time-course inference. They should not be used to discover a confirmatory time window and then test that same window again in a second confirmatory model.

Value

A ggplot object.

---

plot_gazepoint_gca *Plot observed and fitted Growth Curve Analysis trajectories*

Description

Plot observed and fitted pupil trajectories from a gp3_gca_model object. The function aggregates observed and fitted values by condition and time, and returns a ggplot2 object.

Usage

```
plot_gazepoint_gca(
  model,
  data = NULL,
  time_col = "gca_time",
  observed_col = "gca_pupil",
  fitted_col = "gca_fitted",
  condition_col = "condition",
  subject_col = "subject",
  summarise = TRUE,
  show_observed = TRUE,
  show_fitted = TRUE,
  show_subjects = FALSE,
  interval = TRUE,
  title = NULL,
  point_size = 1.6,
```

```
  line_width = 0.8,
  alpha = 0.75
)
```

Arguments

model	A fitted object returned by fit_gazepoint_gca(), or a data frame containing observed and fitted values.
data	Optional data frame. If NULL and model is a gp3_gca_model, the model data are used.
time_col	Name of the time column.
observed_col	Name of the observed outcome column.
fitted_col	Name of the fitted-value column. If unavailable and model is a gp3_gca_model, fitted values are computed from the model.
condition_col	Name of the condition column.
subject_col	Optional subject column, used only when show_subjects = TRUE.
summarise	Logical. If TRUE, plot mean trajectories by condition and time. If FALSE, plot row-level values.
show_observed	Logical. If TRUE, include observed trajectory.
show_fitted	Logical. If TRUE, include fitted trajectory.
show_subjects	Logical. If TRUE, add faint subject-level observed trajectories when a subject column is available.
interval	Logical. If TRUE, add a standard-error ribbon around the observed mean trajectory when summarise = TRUE.
title	Optional plot title.
point_size	Point size for observed means.
line_width	Line width for trajectories.
alpha	Alpha value for observed points/lines.

Value

A ggplot2 object.

---

plot_gazepoint_heatmap

Plot a Gazepoint gaze or fixation heatmap

Description

plot_gazepoint_heatmap() creates a binned spatial heatmap from gaze or fixation coordinates. Points may optionally be weighted by duration.

Usage

```
plot_gazepoint_heatmap(
  data,
  x_col = NULL,
  y_col = NULL,
  weight_col = NULL,
  display_width = NULL,
  display_height = NULL,
  coordinate_space = c("auto", "normalized", "pixel"),
  bins = 60,
  alpha = 0.85,
  normalize = TRUE,
  show_points = FALSE,
  show_legend = TRUE
)
```

Arguments

data	A data frame or an object returned by prepare_gazepoint_heatmap_data().
x_col, y_col	Character strings giving x and y coordinate columns. These may be omitted when data is already prepared by prepare_gazepoint_heatmap_data().
weight_col	Optional non-negative weight column, such as fixation duration.
display_width, display_height	Display width and height in pixels.
coordinate_space	One of "auto", "normalized", or "pixel".
bins	Number of bins. Either one integer or two integers for x and y.
alpha	Heatmap layer transparency.
normalize	Logical. If TRUE, bin intensities are scaled to the range 0–1.
show_points	Logical. If TRUE, raw points are added over the heatmap.
show_legend	Logical. If TRUE, the fill legend is shown.

Value

A ggplot object.

Examples

```
gaze <- data.frame(
  x = c(0.20, 0.25, 0.27, 0.70, 0.75),
  y = c(0.30, 0.32, 0.34, 0.55, 0.60),
  duration = c(120, 180, 160, 90, 100)
)

plot_gazepoint_heatmap(
  gaze,
  x_col = "x",
```

```
  y_col = "y",
  weight_col = "duration",
  display_width = 1920,
  display_height = 1080,
  bins = 20
)
```

---

plot_gazepoint_heatmap_overlay *Plot a Gazepoint heatmap over a background image*

Description

`plot_gazepoint_heatmap_overlay()` overlays a binned gaze or fixation heatmap on a PNG background image, such as a stimulus screenshot. The `png` package is used only when this helper is called.

Usage

```
plot_gazepoint_heatmap_overlay(
  data,
  background_image,
  x_col = NULL,
  y_col = NULL,
  weight_col = NULL,
  display_width = NULL,
  display_height = NULL,
  coordinate_space = c("auto", "normalized", "pixel"),
  bins = 60,
  heatmap_alpha = 0.7,
  background_alpha = 1,
  normalize = TRUE,
  show_legend = TRUE
)
```

Arguments

`data`	A data frame or prepared heatmap data.
`background_image`	Path to a PNG background image.
`x_col`, `y_col`	Character strings giving x and y coordinate columns.
`weight_col`	Optional non-negative weight column.
`display_width`, `display_height`	Display width and height in pixels. If omitted, the PNG image dimensions are used.
`coordinate_space`	One of `"auto"`, `"normalized"`, or `"pixel"`.

bins	Number of heatmap bins. Either one integer or two integers.
heatmap_alpha	Heatmap layer transparency.
background_alpha	Background image transparency.
normalize	Logical. If TRUE, bin intensities are scaled to 0–1.
show_legend	Logical. If TRUE, the fill legend is shown.

Value

A ggplot object.

Examples

```
gaze <- data.frame(
  x = c(0.20, 0.25, 0.70),
  y = c(0.30, 0.35, 0.60),
  duration = c(120, 200, 80)
)

if (requireNamespace("png", quietly = TRUE)) {
  bg <- tempfile(fileext = ".png")
  img <- array(1, dim = c(200, 300, 3))
  png::writePNG(img, bg)

  plot_gazepoint_heatmap_overlay(
    gaze,
    background_image = bg,
    x_col = "x",
    y_col = "y",
    weight_col = "duration"
  )
}
```

---

plot_gazepoint_model_predictions

Plot observed summaries and model-implied predictions

Description

Create a reporting plot that overlays observed outcome summaries with fitted/model-predicted trajectories. The helper is intentionally generic and can be used with linear models, GLMs, mixed models, GAMMs, GCA-style models, AOI GLMMs, and pupil LMMs when the fitted object supports `predict()`.

Usage

```
plot_gazepoint_model_predictions(
  data,
  model = NULL,
  x_col,
  outcome_col,
  condition_col = NULL,
  group_cols = NULL,
  facet_cols = NULL,
  newdata = NULL,
  prediction_type = c("response", "link"),
  include_random_effects = FALSE,
  observed_summary_function = c("mean", "median"),
  ci = 0.95,
  show_observed = TRUE,
  show_observed_ci = TRUE,
  show_predictions = TRUE,
  show_prediction_ci = TRUE,
  point_alpha = 0.55,
  line_width = 1,
  name = "gazepoint_model_predictions"
)
```

Arguments

data	A data frame containing the observed data.
model	Optional fitted model object. If supplied, predictions are computed using `predict()`.
x_col	Column used on the x-axis, usually time or time bin.
outcome_col	Observed outcome column.
condition_col	Optional condition column used for colour/grouping.
group_cols	Optional additional grouping columns for observed and predicted trajectories.
facet_cols	Optional columns used for faceting.
newdata	Optional prediction grid. If `NULL`, predictions are computed on `data` and then summarised by x/group/facet.
prediction_type	Prediction scale passed to `predict()`. Common values are `"response"` and `"link"`.
include_random_effects	Logical. For `lme4` mixed models, `FALSE` requests population-level predictions via `re.form = NA`; `TRUE` includes conditional random effects where possible.
observed_summary_function	Summary for observed outcomes. Options are `"mean"` and `"median"`.
ci	Confidence level for observed and prediction intervals when standard errors are available.
show_observed	Logical. Plot observed summaries.

show_observed_ci
: Logical. Plot observed normal-approximation intervals.

show_predictions
: Logical. Plot model predictions when `model` is supplied.

show_prediction_ci
: Logical. Plot prediction intervals when standard errors are available from `predict()`.

point_alpha
: Alpha value for observed points.

line_width
: Line width for prediction trajectories.

name
: Character label stored in plot attributes.

Value

A `ggplot` object with attributes containing the observed summary, prediction summary, overview, and settings.

---

plot_gazepoint_model_residuals

Plot model residual diagnostics

Description

Create a compact residual diagnostic plot from either a fitted model object with `residuals()` and `fitted()` methods, or a data frame that already contains fitted values and residuals.

Usage

```
plot_gazepoint_model_residuals(
  model = NULL,
  data = NULL,
  fitted_col = NULL,
  residual_col = NULL,
  type = c("residuals_fitted", "qq"),
  title = NULL
)
```

Arguments

model
: Optional fitted model object.

data
: Optional data frame containing fitted and residual columns.

fitted_col
: Fitted-value column when `data` is supplied.

residual_col
: Residual column when `data` is supplied.

type
: Diagnostic plot type: residuals-versus-fitted or QQ plot.

title
: Optional plot title.

Value

A ggplot object.

plot_gazepoint_multiverse_results

Plot Gazepoint preprocessing multiverse results

Description

Create diagnostic plots from preprocessing multiverse summaries or from pupil/AOI multiverse result objects.

Usage

```
plot_gazepoint_multiverse_results(
  x,
  plot = c("status", "rows", "pupil_parameters", "aoi_denominators"),
  family = c("all", "pupil", "aoi"),
  title = NULL,
  show_labels = TRUE
)
```

Arguments

x	A gp3_multiverse_summary_results, gp3_pupil_multiverse_results, or gp3_aoi_multiverse_results object.
plot	Character. Plot type. One of "status", "rows", "pupil_parameters", or "aoi_denominators".
family	Character. Which family to show. One of "all", "pupil", or "aoi".
title	Optional plot title.
show_labels	Logical. If TRUE, show branch labels on the y-axis.

Value

A ggplot object.

plot_gazepoint_pupil_preprocessing

Plot Gazepoint pupil preprocessing for one trial

Description

Create a visual audit plot for one selected subject, media item, trial, or trial-global identifier. The plot can show raw pupil, cleaned pupil, interpolated pupil, baseline-corrected pupil, smoothed pupil, and artifact flags.

Usage

```
plot_gazepoint_pupil_preprocessing(
  data,
  subject = NULL,
  media_id = NULL,
  trial = NULL,
  trial_global = NULL,
  condition = NULL,
  subject_col = "subject",
  media_col = "MEDIA_ID",
  trial_col = "trial",
  trial_global_col = "trial_global",
  condition_col = "condition",
  time_col = "time",
  raw_pupil_col = "pupil",
  clean_pupil_col = "pupil_clean",
  interpolated_pupil_col = "pupil_interpolated",
  baseline_pupil_col = "pupil_baseline_corrected",
  smoothed_pupil_col = "pupil_smoothed",
  artifact_col = NULL,
  artifact_reason_col = NULL,
  status_col = "pupil_interpolation_status",
  plot_style = c("faceted", "overlaid"),
  bin_width_ms = 50,
  max_event_marks = 150,
  point_size = 0.8,
  line_width = 0.35,
  alpha = 0.95
)
```

Arguments

data	A Gazepoint pupil data frame.
subject	Optional subject value to filter.
media_id	Optional media identifier value to filter.
trial	Optional trial value to filter.
trial_global	Optional global trial identifier value to filter.
condition	Optional condition value to filter.
subject_col	Name of the subject column.
media_col	Name of the media identifier column.
trial_col	Name of the trial column.
trial_global_col	Name of the global trial identifier column.
condition_col	Name of the condition column.
time_col	Name of the time column.

`raw_pupil_col` Optional raw pupil column.

`clean_pupil_col`
Optional cleaned pupil column.

`interpolated_pupil_col`
Optional interpolated pupil column.

`baseline_pupil_col`
Optional baseline-corrected pupil column.

`smoothed_pupil_col`
Optional smoothed pupil column.

`artifact_col` Optional artifact flag column. If `NULL`, the function tries `pupil_artifact_flag`, `pupil_flag_invalid`, and `artifact_flag`.

`artifact_reason_col`
Optional artifact-reason column. If `NULL`, the function tries `pupil_artifact_reason`, `pupil_flag_reason`, and `artifact_reason`.

`status_col` Optional interpolation-status column.

`plot_style` Either `"faceted"` or `"overlaid"`.

`bin_width_ms` Width of time bins in milliseconds. This is used only for visual smoothing of dense sample-level traces.

`max_event_marks`
Maximum number of artifact/interpolation rug marks to draw. Event marks are evenly thinned if there are more events.

`point_size` Size control for artifact/interpolation rug marks.

`line_width` Line width for pupil series.

`alpha` Line and marker transparency.

Value

A `ggplot2` plot object.

`plot_gazepoint_pupil_status`
Plot Gazepoint pupil preprocessing status

Description

Visualise observed, interpolated, missing, artifact, and other pupil-sample statuses over time or as grouped percentages.

Usage

```
plot_gazepoint_pupil_status(
  data,
  time_col = "time",
  pupil_col = NULL,
  status_col = "pupil_interpolation_status",
  interpolated_col = "pupil_was_interpolated",
  artifact_col = NULL,
  artifact_reason_col = NULL,
  group_cols = c("subject", "trial_global"),
  facet_cols = NULL,
  plot_type = c("timeline", "summary"),
  point_size = 0.7,
  alpha = 0.8,
  max_points = 50000
)
```

Arguments

data	A Gazepoint pupil data frame.
time_col	Name of the time column.
pupil_col	Optional pupil column used to detect remaining missing samples. If NULL, the function tries pupil_smoothed, pupil_baseline_corrected, pupil_interpolated, pupil_clean, and pupil.
status_col	Optional interpolation-status column.
interpolated_col	Optional logical interpolation flag column.
artifact_col	Optional artifact flag column. If NULL, the function tries pupil_artifact_flag, pupil_flag_invalid, and artifact_flag.
artifact_reason_col	Optional artifact-reason column. If NULL, the function tries pupil_artifact_reason, pupil_flag_reason, and artifact_reason.
group_cols	Character vector used to define timeline rows or summary groups.
facet_cols	Optional character vector of columns used for faceting.
plot_type	Either "timeline" or "summary".
point_size	Point size for timeline plots.
alpha	Point/column transparency.
max_points	Maximum number of rows to plot in timeline mode. If the input has more rows, rows are evenly thinned for plotting only.

Value

A ggplot2 plot object.

plot_gazepoint_pupil_timecourse
Plot Gazepoint pupil time course

Description

Plot a binned pupil time course with a mean line and confidence band. The function can plot one overall time course or condition-wise time courses, with optional faceting by variables such as condition, media, AOI, subject, or trial.

Usage

```
plot_gazepoint_pupil_timecourse(
  data,
  pupil_col = NULL,
  time_col = "time",
  condition_col = "condition",
  facet_cols = NULL,
  bin_width_ms = 100,
  ci_level = 0.95,
  min_samples = 1,
  band_alpha = 0.2,
  line_width = 0.8
)
```

Arguments

data	A Gazepoint pupil data frame.
pupil_col	Name of the pupil column to plot. If NULL, the function tries pupil_smoothed, pupil_baseline_corrected, pupil_baseline_percent_change, pupil_interpolated, pupil_clean, and pupil.
time_col	Name of the time column.
condition_col	Optional condition column used for separate lines. If the column is missing or contains only missing values, the function plots a single "all_data" time course.
facet_cols	Optional character vector of columns used for faceting.
bin_width_ms	Width of time bins in milliseconds.
ci_level	Confidence level for the band.
min_samples	Minimum number of valid pupil samples required per time bin.
band_alpha	Transparency of the confidence band.
line_width	Width of the mean time-course line.

Value

A ggplot2 plot object.

plot_gazepoint_scanpath *Plot a fixation scanpath*

Description

Plot fixation coordinates connected in temporal order. This is a static ggplot2 scanpath helper for fixation-level Gazepoint exports. It does not require a stimulus image, but the returned plot can be extended by users with additional ggplot2 layers.

Usage

```
plot_gazepoint_scanpath(
  data,
  x_col,
  y_col,
  group_cols = NULL,
  time_col = NULL,
  fixation_index_col = NULL,
  label_col = NULL,
  point_size = 2,
  line_width = 0.4,
  show_order = TRUE,
  add_arrows = TRUE,
  reverse_y = FALSE,
  title = NULL
)
```

Arguments

data	A fixation-level data frame.
x_col	Name of the horizontal fixation-coordinate column.
y_col	Name of the vertical fixation-coordinate column.
group_cols	Optional columns defining scanpaths.
time_col	Optional column used to order fixations.
fixation_index_col	Optional fixation index column used for labels.
label_col	Optional label column. If supplied, labels use this column.
point_size	Size of fixation points.
line_width	Width of connecting path lines.
show_order	Should fixation order labels be drawn?
add_arrows	Should arrows be added to scanpath lines?
reverse_y	Should the y-axis be reversed for screen-coordinate plots?
title	Optional plot title.

Value

A ggplot object.

`plot_gazepoint_scanpaths` *Plot multiple Gazepoint scanpaths*

Description

Creates a descriptive multi-scanpath plot from gaze coordinates. This helper is intended for visual quality review, participant/trial inspection, and documentation examples. It should not be interpreted as an inferential scanpath-comparison method.

Usage

```
plot_gazepoint_scanpaths(
  data,
  x_col,
  y_col,
  order_col = NULL,
  group_cols = NULL,
  colour_col = NULL,
  facet_col = NULL,
  screen_width = NULL,
  screen_height = NULL,
  reverse_y = TRUE,
  show_points = TRUE,
  alpha = 0.45,
  linewidth = 0.4,
  point_size = 0.7,
  title = NULL
)
```

Arguments

`data`	A data frame.
`x_col, y_col`	Character names of gaze coordinate columns.
`order_col`	Optional column used to order gaze samples before plotting.
`group_cols`	Optional character vector used to define separate paths.
`colour_col`	Optional column used for colour.
`facet_col`	Optional column used for faceting.
`screen_width, screen_height`	Optional screen dimensions. If supplied, axis limits are set to the screen bounds.
`reverse_y`	If `TRUE`, reverses the y-axis so the origin is displayed at the top-left, matching common screen-coordinate conventions.

show_points	If TRUE, sample points are added on top of paths.
alpha	Line opacity.
linewidth	Line width.
point_size	Point size when show_points = TRUE.
title	Optional plot title.

Value

A ggplot object.

Examples

```
x <- simulate_gazepoint_pupil_data(n_subjects = 2, n_trials = 2, n_time_bins = 5, seed = 1)
plot_gazepoint_scanpaths(
  x,
  x_col = "gaze_x",
  y_col = "gaze_y",
  order_col = "time_bin",
  group_cols = c("subject", "trial"),
  colour_col = "condition"
)
```

---

plot_gazepoint_time_series

Plot a Gazepoint-style time series

Description

Creates a compact line plot for pupil, gaze, AOI, or other time-varying Gazepoint-derived measures. The helper is intentionally descriptive: it does not smooth, model, or infer effects unless the user has already prepared the plotted values.

Usage

```
plot_gazepoint_time_series(
  data,
  time_col,
  value_col,
  group_cols = NULL,
  colour_col = NULL,
  facet_col = NULL,
  alpha = 0.55,
  linewidth = 0.4,
  title = NULL,
  x_label = NULL,
  y_label = NULL
)
```

Arguments

data	A data frame.
time_col	Character name of the time column.
value_col	Character name of the value column.
group_cols	Optional character vector of grouping columns used to draw separate trajectories.
colour_col	Optional character name of a column used for colour.
facet_col	Optional character name of a column used for faceting.
alpha	Line opacity.
linewidth	Line width.
title	Optional plot title.
x_label, y_label	Optional axis labels.

Value

A ggplot object.

Examples

```
x <- simulate_gazepoint_pupil_data(n_subjects = 2, n_trials = 2, n_time_bins = 5, seed = 1)
plot_gazepoint_time_series(
  x,
  time_col = "time_bin",
  value_col = "pupil",
  group_cols = c("subject", "trial"),
  colour_col = "condition"
)
```

---

plot_gazepoint_time_varying_effect

Plot a time-varying effect curve

Description

Plot a time-varying effect, difference curve, or model-prediction contrast from a tidy data frame. This helper is intentionally lightweight: it does not refit a model, but visualises already computed estimates and optional interval bounds from GAMM, GCA, cluster, bootstrap, or prediction workflows.

Usage

```
plot_gazepoint_time_varying_effect(
  data,
  time_col,
  estimate_col,
  lower_col = NULL,
  upper_col = NULL,
  group_col = NULL,
  zero_line = TRUE,
  title = NULL,
  x_label = NULL,
  y_label = NULL
)
```

Arguments

data	A data frame containing time-varying estimates.
time_col	Name of the time column.
estimate_col	Name of the estimate/effect column.
lower_col	Optional lower interval column.
upper_col	Optional upper interval column.
group_col	Optional grouping/contrast column.
zero_line	Should a horizontal zero reference line be shown?
title	Optional plot title.
x_label	Optional x-axis label.
y_label	Optional y-axis label.

Value

A ggplot object.

---

plot_sampling_rate *Plot Gazepoint sampling-rate diagnostics*

Description

Creates a diagnostic plot of estimated sampling rate by participant/file and media stimulus.

Usage

```
plot_sampling_rate(
  sampling,
  user_col = "USER_FILE",
  media_col = "MEDIA_ID",
  expected_hz = 60,
  hz_tolerance = 5
)
```

Arguments

sampling	Sampling-rate table, usually from check_sampling_rate().
user_col	Column identifying the source/user file.
media_col	Column identifying the media/stimulus.
expected_hz	Expected sampling rate.
hz_tolerance	Allowed deviation from the expected sampling rate.

Value

A ggplot object.

---

plot_tracking_quality *Plot Gazepoint tracking-quality diagnostics*

Description

Creates a readable diagnostic plot of selected gaze and pupil validity percentages by participant/file and media stimulus.

Usage

```
plot_tracking_quality(
  data,
  metric_cols = NULL,
  user_col = "USER_FILE",
  media_col = "MEDIA_ID",
  review_col = "review_required",
  min_valid_pct = 70
)
```

Arguments

data	A tracking-quality or flagged-quality table, usually from summarise_tracking_quality() or flag_tracking_quality().
metric_cols	Validity percentage columns to plot. If NULL, the default is FPOGV_valid_pct and RPV_valid_pct, which provide a compact diagnostic view of gaze and right-pupil validity.
user_col	Column identifying the source/user file.
media_col	Column identifying the media/stimulus.
review_col	Optional column indicating whether a row requires review.
min_valid_pct	Vertical threshold line for acceptable validity.

Value

A ggplot object.

plot_transition_heatmap *Plot an AOI transition heatmap*

Description

Plot an AOI transition heatmap

Usage

```
plot_transition_heatmap(transitions)
```

Arguments

transitions	Output of compute_transition_matrix().

Value

A ggplot object.

prepare_gazepoint_aoi_gamm_data *Prepare AOI time-course data for GAMM analysis*

Description

Prepare sample-level or binned Gazepoint AOI data for AOI time-course GAMM analysis. The function creates binned subject-by-condition-by-time summaries with binomial success/failure counts for target-AOI looking over time.

Usage

```
prepare_gazepoint_aoi_gamm_data(
  data,
  aoi_col = "aoi_current",
  target_aoi_values = NULL,
  outcome_col = NULL,
  subject_col = "subject",
  condition_col = "condition",
  time_col = "time",
  trial_col = NULL,
  time_bin_col = NULL,
  conditions = NULL,
  time_window = NULL,
  bin_size_ms = 50,
```

```
  denominator = c("valid", "all", "aoi_only"),
  valid_aoi_values = NULL,
  non_aoi_values = c("non_aoi"),
  missing_aoi_values = c("missing", ""),
  min_denominator_samples = 1,
  drop_invalid = TRUE,
  missing_condition_label = "all_data",
  outcome_label = "target_aoi"
)
```

Arguments

data	A data frame containing sample-level or binned AOI data.
aoi_col	Name of the AOI-state column. Used when outcome_col = NULL.
target_aoi_values	Character vector identifying target AOI values. Required when outcome_col = NULL.
outcome_col	Optional logical or 0/1 numeric column indicating target AOI looking at the sample level. If supplied, this takes priority over aoi_col and target_aoi_values.
subject_col	Name of the subject/participant column.
condition_col	Name of the condition column. If unavailable, a single fallback condition is created.
time_col	Name of the time column, in milliseconds.
trial_col	Optional trial identifier column.
time_bin_col	Optional existing time-bin column. If NULL, time bins are created from time_col using bin_size_ms.
conditions	Optional character vector of condition levels to retain and order.
time_window	Optional numeric vector of length 2 defining the retained time window in milliseconds.
bin_size_ms	Time-bin width in milliseconds when time_bin_col = NULL.
denominator	Denominator definition. "valid" uses non-missing AOI states, "all" uses all retained rows, and "aoi_only" uses only explicit AOI states.
valid_aoi_values	Optional character vector defining explicit AOI values for "aoi_only" denominators. If NULL, values beginning with "AOI" are treated as explicit AOIs, excluding non_aoi_values.
non_aoi_values	Character vector identifying non-AOI/background states.
missing_aoi_values	Character vector identifying missing AOI-state labels.
min_denominator_samples	Minimum number of denominator samples required per subject-condition-time bin.
drop_invalid	Logical. If TRUE, bins with zero or low denominators are removed from the returned data.

`missing_condition_label`
: Fallback condition label when no usable condition column is available.

`outcome_label`
: Descriptive label for the AOI-GAMM outcome.

Details

This helper is intended for modelling AOI time-course trajectories, such as target-AOI looking probability over time. It is separate from confirmatory AOI-window GLMMs and from cluster-based permutation tests.

Value

A tibble with standardised AOI-GAMM columns.

---

prepare_gazepoint_aoi_glmm_data

Prepare AOI-window data for binomial GLMMs

Description

Prepare AOI-window summaries for confirmatory binomial mixed-effects modelling. The function creates success, failure, denominator, proportion, subject, condition, and window columns from output produced by `summarise_gazepoint_aoi_windows()`.

Usage

```
prepare_gazepoint_aoi_glmm_data(
  data,
  success_col = "n_target_samples",
  denominator = c("valid", "all", "aoi", "custom"),
  denominator_col = NULL,
  valid_denominator_col = "n_valid_denominator_samples",
  all_denominator_col = "n_window_samples",
  aoi_denominator_col = "n_aoi_samples",
  subject_col = "subject",
  condition_col = "condition",
  window_col = "window_label",
  window_start_col = "window_start_ms",
  window_end_col = "window_end_ms",
  group_cols = NULL,
  min_denominator_samples = 1,
  drop_invalid = TRUE,
  missing_condition_label = "all_data",
  outcome_label = "target"
)
```

Arguments

data	AOI-window summary data.
success_col	Column containing the success count. For target-looking models this is usually n_target_samples.
denominator	Denominator definition. Use "valid" for valid AOI-window denominator samples, "all" for all window samples, "aoi" for AOI-only samples, or "custom" with denominator_col.
denominator_col	Custom denominator column when denominator = "custom".
valid_denominator_col	Column used when denominator = "valid".
all_denominator_col	Column used when denominator = "all".
aoi_denominator_col	Column used when denominator = "aoi".
subject_col	Subject/participant column.
condition_col	Optional condition column.
window_col	AOI-window label column.
window_start_col	Optional window-start column.
window_end_col	Optional window-end column.
group_cols	Optional extra grouping columns to keep/check.
min_denominator_samples	Minimum acceptable denominator.
drop_invalid	Logical. If TRUE, rows with invalid binomial counts or too-small denominators are removed.
missing_condition_label	Label used when condition is missing.
outcome_label	Label stored in the output to identify the modelled AOI outcome.

Value

A tibble of GLMM-ready AOI-window rows.

---

prepare_gazepoint_aoi_sequences

Prepare Gazepoint AOI sequences

Description

Create ordered AOI-state sequences from sample-level Gazepoint AOI data or from the output of summarise_gazepoint_aoi_entries(). The output is transition-ready and includes the current AOI state, previous state, next state, dwell time before transition, and self-transition flags.

Usage

```
prepare_gazepoint_aoi_sequences(
  data,
  aoi_col = NULL,
  time_col = "time",
  group_cols = c("subject", "MEDIA_ID", "trial_global"),
  include_non_aoi = TRUE,
  non_aoi_values = c("non_aoi", "none", "background", "outside", "outside_aoi",
    "missing", "missing_aoi"),
  missing_aoi_label = "missing_aoi",
  include_terminal = TRUE
)
```

Arguments

data	A Gazepoint sample-level data frame or an AOI-entry table created by summarise_gazepoint_aoi_entr
aoi_col	Name of the AOI-state column. Used only when data is sample-level data. If NULL, the function tries aoi_current, AOI, and aoi_state.
time_col	Name of the time column, in milliseconds. Used only when data is sample-level data.
group_cols	Character vector of columns defining independent AOI sequences, usually subject/media/trial.
include_non_aoi	Logical. If TRUE, non-AOI/background states are retained. If FALSE, non-AOI/background states are removed before sequence and transition fields are computed.
non_aoi_values	Character vector of AOI labels treated as background or non-AOI states.
missing_aoi_label	Label used when the AOI value is missing.
include_terminal	Logical. If TRUE, the final state of each sequence is retained with next_state = NA. If FALSE, terminal states are removed so that each output row represents an observed transition.

Value

A tibble with ordered AOI sequence and transition fields.

---

prepare_gazepoint_cluster_data

Prepare time-course data for cluster-based permutation tests

Description

Prepare sample-level or already binned Gazepoint time-course data for cluster-based permutation testing. The function standardises subject, condition, time-bin, outcome, sample-count, trial-count, and status columns. It can be used for AOI proportions, pupil time-course outcomes, or other continuous time-varying measures.

Usage

```
prepare_gazepoint_cluster_data(
  data,
  outcome_col,
  subject_col = "subject",
  condition_col = "condition",
  time_col = "time",
  trial_col = NULL,
  time_bin_col = NULL,
  conditions = NULL,
  time_window = NULL,
  bin_size_ms = 50,
  aggregation = c("mean", "proportion", "sum", "median"),
  min_samples_per_bin = 1,
  paired = TRUE,
  drop_invalid = TRUE,
  missing_condition_label = "all_data",
  outcome_label = "outcome"
)
```

Arguments

`data`	A data frame containing sample-level or binned time-course data.
`outcome_col`	Column containing the outcome to test. For AOI analyses this is often a 0/1 or logical AOI column. For pupil analyses this is often a processed pupil column.
`subject_col`	Subject/participant column.
`condition_col`	Optional condition column.
`time_col`	Time column in milliseconds.
`trial_col`	Optional trial identifier column.
`time_bin_col`	Optional existing time-bin column. If `NULL`, time bins are created from `time_col` and `bin_size_ms`.
`conditions`	Optional character vector of condition levels to keep. Cluster tests are usually pairwise, so this is typically length 2.
`time_window`	Optional numeric vector of length 2 giving the time range to retain, in milliseconds.
`bin_size_ms`	Bin size in milliseconds when `time_bin_col = NULL`.
`aggregation`	How to aggregate samples within subject-condition-time bins. Supported values are `"mean"`, `"proportion"`, `"sum"`, and `"median"`. `"proportion"` is equivalent to the mean of a numeric/logical 0/1 outcome.
`min_samples_per_bin`	Minimum number of samples required per subject-condition-time bin.
`paired`	Logical. If `TRUE`, retain only subjects with all retained condition levels.
`drop_invalid`	Logical. If `TRUE`, rows and bins that are not suitable for cluster testing are removed.

`missing_condition_label`
: Label used when condition is missing or `condition_col` is unavailable.

`outcome_label`
: Label stored in the output to identify the outcome.

Details

Cluster-based permutation tests are intended for time-course inference. They should not be used to discover a time window and then test that same window again as a confirmatory analysis.

Value

A tibble with standardised cluster-test preparation columns.

---

prepare_gazepoint_eyetools_data

Prepare Gazepoint master data for eyetools-style workflows

Description

Convert a `gp3tools` master table into a dependency-free, eyetools-friendly sample-level table. The returned data frame keeps one row per sample and creates standard participant, trial, time, gaze-coordinate, binocular coordinate, pupil, AOI, fixation, event, validity, trackloss, and status columns.

Usage

```
prepare_gazepoint_eyetools_data(
  data,
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  x_col = NULL,
  y_col = NULL,
  left_x_col = NULL,
  left_y_col = NULL,
  right_x_col = NULL,
  right_y_col = NULL,
  pupil_col = NULL,
  left_pupil_col = NULL,
  right_pupil_col = NULL,
  media_col = NULL,
  condition_col = NULL,
  aoi_col = NULL,
  fixation_col = NULL,
  event_col = NULL,
  validity_cols = NULL,
  trackloss_col = NULL,
  screen_x_range = c(0, 1),
```

```
  screen_y_range = c(0, 1),
  missing_aoi_label = "missing_aoi",
  keep_original_cols = TRUE
)
```

Arguments

data	A Gazepoint master table or sample-level gaze data frame.
participant_col	Participant/subject identifier column.
trial_col	Trial identifier column. If NULL, a trial identifier is created from media_col when available.
time_col	Sample time column.
x_col	Optional primary gaze x-coordinate column.
y_col	Optional primary gaze y-coordinate column.
left_x_col	Optional left-eye x-coordinate column.
left_y_col	Optional left-eye y-coordinate column.
right_x_col	Optional right-eye x-coordinate column.
right_y_col	Optional right-eye y-coordinate column.
pupil_col	Optional primary pupil column.
left_pupil_col	Optional left-eye pupil column.
right_pupil_col	Optional right-eye pupil column.
media_col	Optional media/stimulus identifier column.
condition_col	Optional condition/grouping column.
aoi_col	Optional AOI label/state column.
fixation_col	Optional fixation identifier column.
event_col	Optional event/marker column.
validity_cols	Optional validity columns used to define trackloss.
trackloss_col	Optional existing trackloss column. If supplied, it is used directly after coercion to logical.
screen_x_range	Numeric length-2 vector defining the screen x range.
screen_y_range	Numeric length-2 vector defining the screen y range.
missing_aoi_label	Label used for missing AOI values.
keep_original_cols	Logical. If TRUE, original columns are retained after the standard adapter columns.

Value

A tibble with class gp3_eyetools_data.

prepare_gazepoint_eyetrackingr_data
Prepare Gazepoint master data for eyetrackingR-style workflows

Description

Convert a gp3tools master table into a dependency-free, eyetrackingR-friendly sample-level table. The returned data frame keeps one row per gaze sample and creates standard participant, trial, time, gaze-coordinate, AOI, trackloss, and AOI-indicator columns.

Usage

```
prepare_gazepoint_eyetrackingr_data(
  data,
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  aoi_col = NULL,
  x_col = NULL,
  y_col = NULL,
  media_col = NULL,
  condition_col = NULL,
  validity_cols = NULL,
  aoi_values = NULL,
  aoi_prefix = "aoi_",
  missing_aoi_label = "missing_aoi",
 non_aoi_values = c("outside", "none", "no_aoi", "non_aoi", "background", "off_aoi",
    "missing", "NA"),
  trackloss_col = NULL,
  keep_original_cols = TRUE
)
```

Arguments

data	A Gazepoint master table or sample-level gaze data frame.
participant_col	Participant/subject identifier column.
trial_col	Trial identifier column. If NULL, a trial identifier is created from media_col when available.
time_col	Sample time column.
aoi_col	AOI label/state column.
x_col	Optional gaze x-coordinate column.
y_col	Optional gaze y-coordinate column.
media_col	Optional media/stimulus identifier column.
condition_col	Optional condition/grouping column.

validity_cols	Optional validity columns used to define trackloss.
aoi_values	Optional AOI values for which logical indicator columns should be created. If NULL, values are detected from aoi_col.
aoi_prefix	Prefix for generated AOI indicator columns.
missing_aoi_label	Label used for missing AOI values.
non_aoi_values	Character values treated as non-AOI/background states.
trackloss_col	Optional existing trackloss column. If supplied, it is used directly after coercion to logical.
keep_original_cols	Logical. If TRUE, original columns are retained after the standard adapter columns.

Value

A tibble with class gp3_eyetrackingr_data.

---

prepare_gazepoint_fixation_aligned_data

Prepare fixation- or saccade-contingent aligned Gazepoint data

---

Description

Align Gazepoint observations to a within-trial event such as first fixation, first target-AOI entry, first fixation to a target AOI, first saccade to a target AOI, or a custom event marker. The helper returns the original data with event-aligned time, event metadata, pre-event/post-event flags, and trial-level summaries that help separate event-driven looking from looks that were already present before the event.

Usage

```
prepare_gazepoint_fixation_aligned_data(
  data,
  time_col,
  participant_col = NULL,
  trial_col = NULL,
  aoi_col = NULL,
  target_aoi = NULL,
  fixation_col = NULL,
  saccade_col = NULL,
  event_col = NULL,
  event_value = NULL,
  alignment_event = c("first_target_entry", "first_fixation_to_target",
    "first_saccade_to_aoi", "first_fixation", "custom"),
  baseline_window = NULL,
  analysis_window = NULL,
  keep_unaligned = FALSE,
  name = "gazepoint_fixation_aligned_data"
)
```

Arguments

data	A data frame containing Gazepoint samples, fixation rows, or trial-level time-course rows.
time_col	Time column.
participant_col	Optional participant column.
trial_col	Optional trial column.
aoi_col	Optional AOI column.
target_aoi	Optional character vector identifying the target AOI(s).
fixation_col	Optional fixation indicator column.
saccade_col	Optional saccade indicator column.
event_col	Optional custom event indicator column.
event_value	Optional value(s) in event_col defining the custom event. If NULL and alignment_event = "custom", event_col is interpreted as a logical-like indicator.
alignment_event	Alignment event. Options are "first_target_entry", "first_fixation_to_target", "first_saccade_to_aoi", "first_fixation", and "custom".
baseline_window	Optional numeric vector of length two giving the aligned-time baseline window, for example c(-200, 0).
analysis_window	Optional numeric vector of length two giving the aligned-time analysis window, for example c(0, 1000).
keep_unaligned	Logical. If FALSE, groups without an alignment event are removed from aligned_data. Their status remains in event_table.
name	Character label stored in the returned object.

Value

A list with class gp3_fixation_aligned_data.

---

prepare_gazepoint_gazer_data

Prepare Gazepoint master data for gazer-style workflows

Description

Convert a gp3tools master table into a dependency-free, gazer-friendly sample-level table. The returned data frame keeps one row per gaze sample and creates standard participant, trial, time, gaze-coordinate, pupil, AOI, fixation, validity, trackloss, and screen-bound status columns.

Usage

```
prepare_gazepoint_gazer_data(
  data,
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  x_col = NULL,
  y_col = NULL,
  pupil_col = NULL,
  media_col = NULL,
  condition_col = NULL,
  aoi_col = NULL,
  fixation_col = NULL,
  validity_cols = NULL,
  trackloss_col = NULL,
  screen_x_range = c(0, 1),
  screen_y_range = c(0, 1),
  missing_aoi_label = "missing_aoi",
  keep_original_cols = TRUE
)
```

Arguments

`data`	A Gazepoint master table or sample-level gaze data frame.
`participant_col`	Participant/subject identifier column.
`trial_col`	Trial identifier column. If `NULL`, a trial identifier is created from `media_col` when available.
`time_col`	Sample time column.
`x_col`	Gaze x-coordinate column.
`y_col`	Gaze y-coordinate column.
`pupil_col`	Optional pupil column.
`media_col`	Optional media/stimulus identifier column.
`condition_col`	Optional condition/grouping column.
`aoi_col`	Optional AOI label/state column.
`fixation_col`	Optional fixation identifier column.
`validity_cols`	Optional validity columns used to define trackloss.
`trackloss_col`	Optional existing trackloss column. If supplied, it is used directly after coercion to logical.
`screen_x_range`	Numeric length-2 vector defining the screen x range.
`screen_y_range`	Numeric length-2 vector defining the screen y range.
`missing_aoi_label`	Label used for missing AOI values.
`keep_original_cols`	Logical. If `TRUE`, original columns are retained after the standard adapter columns.

Value

A tibble with class `gp3_gazer_data`.

`prepare_gazepoint_gca_data` *Prepare Gazepoint Growth Curve Analysis data*

Description

Prepare binned pupil time-course data for Growth Curve Analysis (GCA). The function creates orthogonal polynomial time terms, preserves subject and condition information, and standardises key columns for later mixed-model fitting.

Usage

```
prepare_gazepoint_gca_data(
  data,
  pupil_col = "mean_pupil",
  time_col = "time_bin_center_ms",
  subject_col = "subject",
  condition_col = "condition",
  degree = 3,
  orthogonal = TRUE,
  time_window = NULL,
  valid_samples_col = "n_valid_samples",
  min_valid_samples = 1,
  weights_col = NULL,
  missing_condition_label = "all_data",
  drop_missing = TRUE
)
```

Arguments

`data`	A binned pupil time-course data frame, usually created by `prepare_gazepoint_pupil_gamm_data()`.
`pupil_col`	Name of the pupil outcome column.
`time_col`	Name of the time column.
`subject_col`	Name of the subject column.
`condition_col`	Name of the condition column. If unavailable or entirely missing, a single condition label is used.
`degree`	Number of polynomial time terms to create.
`orthogonal`	Logical. If `TRUE`, use orthogonal polynomial terms from `stats::poly()`. If `FALSE`, use raw powers of z-scored time.
`time_window`	Optional numeric vector of length 2 giving the time window to retain.

`valid_samples_col`
: Optional column containing valid sample counts.

`min_valid_samples`
: Minimum valid samples required per row when `valid_samples_col` is available.

`weights_col`
: Optional weights column to preserve for later modelling.

`missing_condition_label`
: Label used when condition values are missing.

`drop_missing`
: Logical. If `TRUE`, rows with missing outcome/time/subject values are removed.

Value

A tibble of class `gp3_gca_data` with standard GCA columns and polynomial time terms.

---

prepare_gazepoint_heatmap_data

Prepare gaze or fixation coordinates for heatmap plotting

Description

`prepare_gazepoint_heatmap_data()` standardises gaze or fixation coordinates for spatial heatmap visualisation. It supports normalised Gazepoint-style coordinates in the range 0–1 and pixel coordinates.

Usage

```
prepare_gazepoint_heatmap_data(
  data,
  x_col,
  y_col,
  weight_col = NULL,
  display_width = NULL,
  display_height = NULL,
  coordinate_space = c("auto", "normalized", "pixel")
)
```

Arguments

`data`
: A data frame containing gaze or fixation coordinates.

`x_col, y_col`
: Character strings giving the x and y coordinate columns.

`weight_col`
: Optional character string giving a non-negative weight column, such as fixation duration. If `NULL`, each point receives equal weight.

`display_width, display_height`
: Display width and height in pixels. For normalised coordinates, these values are used to convert coordinates to pixel space. If omitted for normalised coordinates, a unit display is used. If omitted for pixel coordinates, bounds are inferred from the observed coordinates.

coordinate_space
: One of "auto", "normalized", or "pixel". "auto" treats coordinates as normalised only when all finite x and y values fall between 0 and 1.

Value

A data frame with the original retained rows and standardised columns .gp3_x_px, .gp3_y_px, and .gp3_weight.

Examples

```
gaze <- data.frame(
  x = c(0.20, 0.25, 0.75),
  y = c(0.30, 0.35, 0.60),
  duration = c(120, 200, 80)
)

prepare_gazepoint_heatmap_data(
  gaze,
  x_col = "x",
  y_col = "y",
  weight_col = "duration",
  display_width = 1920,
  display_height = 1080
)
```

---

prepare_gazepoint_hmm_data

Prepare Gazepoint AOI/state sequences for HMM-style workflows

---

Description

Convert ordered Gazepoint AOI/state observations into a dependency-free hidden-Markov-model-ready structure. The helper creates ordered sequence data, transition tables, initial-state probabilities, transition-probability matrices, and observation/emission summaries. It does not fit an HMM and does not import external HMM packages.

Usage

```
prepare_gazepoint_hmm_data(
  data,
  state_col = NULL,
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  observation_cols = NULL,
  sequence_id_cols = NULL,
  covariate_cols = NULL,
  state_order = NULL,
```

```
  exclude_states = c("missing", "missing_aoi", "missing_coordinate", "trackloss",
    "track_loss"),
  missing_state_label = NULL,
  scale_numeric_observations = FALSE,
  include_terminal_state = FALSE,
  terminal_state_label = "END",
  name = "gazepoint_hmm_data"
)
```

Arguments

data	A data frame containing ordered AOI/state observations.
state_col	AOI/state column. If NULL, common AOI/state columns are detected automatically.
participant_col	Optional participant/subject column.
trial_col	Optional trial/sequence column.
time_col	Optional time/order column.
observation_cols	Optional observation columns to carry into the HMM data. If NULL, common gaze, pupil, fixation, and validity columns are detected automatically.
sequence_id_cols	Optional character vector of columns defining separate sequences. If NULL, participant and trial columns are used when available.
covariate_cols	Optional covariate columns to carry into the HMM data.
state_order	Optional preferred hidden-state order.
exclude_states	Character vector of states to exclude before sequence construction.
missing_state_label	Optional label used to retain missing states. If NULL, missing/blank states are removed.
scale_numeric_observations	Logical. If TRUE, z-scored versions of numeric observation columns are added with suffix _z.
include_terminal_state	Logical. If TRUE, each sequence contributes a final transition to terminal_state_label.
terminal_state_label	Terminal-state label.
name	Character label stored in the returned object.

Value

A list with class gp3_hmm_data.

prepare_gazepoint_pupil_gamm_data
Prepare Gazepoint pupil GAMM data

Description

Prepare binned pupil time-course data for GAMM modelling with `mgcv::bam()`. The function aggregates processed sample-level pupil data into subject-by- condition-by-time-bin rows and creates an `AR.start` indicator for autoregressive GAMM models.

Usage

```
prepare_gazepoint_pupil_gamm_data(
  data,
  pupil_col = NULL,
  time_col = "time",
  subject_col = "subject",
  condition_col = "condition",
  x_col = NULL,
  y_col = NULL,
  group_cols = c("subject", "condition"),
  bin_width_ms = 50,
  time_window = NULL,
  min_valid_samples = 1,
  missing_condition_label = "all_data"
)
```

Arguments

`data`	A Gazepoint sample-level data frame, usually after pupil preprocessing, interpolation, baseline correction, and optional smoothing.
`pupil_col`	Name of the pupil column to aggregate. If `NULL`, the function tries common processed pupil columns such as `pupil_smoothed`, `pupil_baseline_corrected`, `pupil_interpolated`, `pupil_clean`, and `pupil_for_preprocessing`.
`time_col`	Name of the time column in milliseconds. If the requested column is not available, the function tries common alternatives.
`subject_col`	Name of the subject column. If unavailable, the function tries common participant identifiers.
`condition_col`	Name of the condition column. If unavailable or entirely missing, a single condition label is used.
`x_col`	Optional gaze x-coordinate column. If `NULL`, common x-coordinate columns are auto-detected when available.
`y_col`	Optional gaze y-coordinate column. If `NULL`, common y-coordinate columns are auto-detected when available.

`group_cols` Columns defining independent time series before binning. Defaults to `c("subject", "condition")`.

`bin_width_ms` Width of time bins in milliseconds.

`time_window` Optional numeric vector of length 2 giving the time window to retain before binning.

`min_valid_samples` Minimum number of valid pupil samples required for a bin to be retained.

`missing_condition_label` Label used when condition values are missing or when no usable condition column is available.

Value

A tibble with binned pupil time-course data for GAMM modelling.

`prepare_gazepoint_pupil_window_model_data` *Prepare pupil-window data for confirmatory mixed models*

Description

Prepare pupil-window summaries or pupil trial-feature tables for confirmatory window-level modelling. The function standardises subject, condition, window, trial/media identifiers, outcome, valid-sample counts, total-sample counts, valid-sample proportions, weights, and model-readiness status columns.

Usage

```
prepare_gazepoint_pupil_window_model_data(
  data,
  outcome_col = "mean_pupil",
  subject_col = "subject",
  condition_col = "condition",
  window_col = "window_label",
  window_start_col = "window_start_ms",
  window_end_col = "window_end_ms",
  trial_col = NULL,
  media_col = "media_id",
  valid_samples_col = "n_valid_pupil",
  total_samples_col = "n_samples",
  min_valid_samples = 5,
  min_valid_prop = 0.7,
  drop_invalid = TRUE,
  missing_condition_label = "all_data",
  outcome_label = "pupil"
)
```

Arguments

data	Pupil-window summary data.
outcome_col	Column containing the pupil outcome to model. The default is mean_pupil.
subject_col	Subject/participant column.
condition_col	Optional condition column. Common aliases such as condition, Condition, and CONDITION are detected when available.
window_col	Pupil-window label column.
window_start_col	Optional window-start column.
window_end_col	Optional window-end column.
trial_col	Optional trial identifier column.
media_col	Optional media/stimulus identifier column. Common aliases such as media_id and MEDIA_ID are detected when available.
valid_samples_col	Optional column containing the number of valid pupil samples in the window. Common aliases such as n_valid_pupil and n_valid_samples are detected when available.
total_samples_col	Optional column containing the total number of samples in the window. Common aliases such as n_samples and n_window_samples are detected when available.
min_valid_samples	Minimum acceptable number of valid pupil samples.
min_valid_prop	Minimum acceptable valid-sample proportion.
drop_invalid	Logical. If TRUE, rows with invalid or low-quality model inputs are removed.
missing_condition_label	Label used when condition is missing.
outcome_label	Label stored in the output to identify the modelled pupil outcome.

Value

A tibble of pupil-window rows prepared for confirmatory modelling.

---

prepare_gazepoint_pupillometryr_data

Prepare Gazepoint master data for pupillometryR-style workflows

---

Description

Convert a gp3tools master table into a dependency-free, pupillometryR-friendly sample-level pupil table. The returned data frame keeps one row per sample and creates standard participant, trial, time, pupil, condition, event, baseline, validity, trackloss, and status columns.

Usage

```
prepare_gazepoint_pupillometryr_data(
  data,
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  pupil_col = NULL,
  media_col = NULL,
  condition_col = NULL,
  event_col = NULL,
  baseline_col = NULL,
  validity_cols = NULL,
  pupil_status_col = NULL,
  trackloss_col = NULL,
 invalid_pupil_status = c("missing", "artifact", "blink", "trackloss", "track_loss",
    "invalid", "excluded", "bad", "outlier"),
  keep_original_cols = TRUE
)
```

Arguments

data	A Gazepoint master table or sample-level gaze/pupil data frame.
participant_col	Participant/subject identifier column.
trial_col	Trial identifier column. If NULL, a trial identifier is created from media_col when available.
time_col	Sample time column.
pupil_col	Pupil column to export.
media_col	Optional media/stimulus identifier column.
condition_col	Optional condition/grouping column.
event_col	Optional event/marker column.
baseline_col	Optional baseline-period indicator column.
validity_cols	Optional validity columns used to define trackloss.
pupil_status_col	Optional pupil-status column used to mark invalid pupil samples.
trackloss_col	Optional existing trackloss column. If supplied, it is used directly after coercion to logical.
invalid_pupil_status	Character values in pupil_status_col treated as invalid pupil samples.
keep_original_cols	Logical. If TRUE, original columns are retained after the standard adapter columns.

Value

A tibble with class gp3_pupillometryr_data.

prepare_gazepoint_semimarkov_data *Prepare Gazepoint AOI sequences for semi-Markov modelling*

Description

Convert ordered AOI/state observations into state-visit and transition-level semi-Markov data. Consecutive repeated states can be collapsed into dwell episodes, producing one row per state visit with dwell duration and next-state information.

Usage

```
prepare_gazepoint_semimarkov_data(
  data,
  state_col = NULL,
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  duration_col = NULL,
  sequence_id_cols = NULL,
  covariate_cols = NULL,
  exclude_states = c("missing", "missing_aoi", "missing_coordinate", "trackloss",
    "track_loss"),
  missing_state_label = NULL,
  collapse_repeated_states = TRUE,
  include_terminal_states = TRUE,
  terminal_next_state_label = "END",
  name = "gazepoint_semimarkov_data"
)
```

Arguments

data	A data frame containing ordered AOI/state observations.
state_col	AOI/state column. If NULL, common AOI/state columns are detected automatically.
participant_col	Optional participant/subject column.
trial_col	Optional trial/sequence column.
time_col	Optional time/order column.
duration_col	Optional sample-duration column. If supplied, dwell durations are computed by summing this column within each state visit.
sequence_id_cols	Optional character vector of columns defining separate sequences. If NULL, participant and trial columns are used when available.

`covariate_cols` Optional character vector of covariate columns to carry into the state-visit and transition tables using the first value within each state visit.

`exclude_states` Character vector of states to exclude before creating state visits.

`missing_state_label`
Optional label used to retain missing states. If `NULL`, missing/blank states are removed.

`collapse_repeated_states`
Logical. If `TRUE`, consecutive repeated states within a sequence are collapsed into a single dwell episode.

`include_terminal_states`
Logical. If `TRUE`, the final state visit in each sequence is retained as a transition to `terminal_next_state_label`.

`terminal_next_state_label`
Label used for the terminal next state.

`name` Character label stored in the returned object.

Value

A list with class `gp3_semimarkov_data`.

`prepare_gazepoint_timecourse_test_data`
Prepare time-course data for Gazepoint cluster-permutation testing

---

Description

`prepare_gazepoint_timecourse_test_data()` converts a long-format subject-by-condition-by-time data frame into the internal column contract used by `run_gazepoint_cluster_permutation()`. It is intended for conservative two-condition, within-subject, one-dimensional time-course workflows.

Usage

```
prepare_gazepoint_timecourse_test_data(
  data,
  subject_col,
  condition_col,
  time_col,
  outcome_col,
  condition_order = NULL,
  aggregate_fun = mean,
  complete_only = TRUE
)
```

Arguments

data	A long-format data frame.
subject_col	Column identifying participants or paired units.
condition_col	Column identifying the two within-subject conditions.
time_col	Numeric time or time-bin column.
outcome_col	Numeric outcome column.
condition_order	Optional character vector of length two giving the condition order used for contrasts.
aggregate_fun	Function used when duplicate subject-condition-time rows are present. Defaults to mean.
complete_only	If TRUE, keep only subject-by-time cells with both conditions present.

Value

A data frame with internal cluster columns: .gp3_cluster_subject, .gp3_cluster_condition, .gp3_cluster_time_bin, and .gp3_cluster_outcome.

Examples

```
d <- data.frame(
  subject = rep(1:4, each = 6),
  condition = rep(rep(c("A", "B"), each = 3), 4),
  time = rep(1:3, 8),
  value = rnorm(24)
)

prepare_gazepoint_timecourse_test_data(
  d,
  subject_col = "subject",
  condition_col = "condition",
  time_col = "time",
  outcome_col = "value"
)
```

---

prepare_gazepoint_traminer_data

Prepare AOI sequences for TraMineR-style workflows

Description

Convert long AOI observations into one row per sequence and one column per ordered state position. If **TraMineR** is installed and as_traminer = TRUE, the function also returns a TraMineR sequence object.

Usage

```
prepare_gazepoint_traminer_data(
  data,
  aoi_col,
  sequence_cols,
  time_col = NULL,
  include_missing = FALSE,
  missing_label = "missing",
  collapse_repeats = FALSE,
  state_prefix = "state_",
  as_traminer = FALSE
)
```

Arguments

data	Long-format AOI data.
aoi_col	AOI/state column.
sequence_cols	Columns defining each sequence.
time_col	Optional ordering column.
include_missing	Should missing AOIs be kept as a state?
missing_label	Label used for retained missing AOIs.
collapse_repeats	Should consecutive repeated states be collapsed?
state_prefix	Prefix for wide state columns.
as_traminer	Should TraMineR::seqdef() be called if available?

Value

A list containing wide data, state columns, alphabet, and optionally a TraMineR sequence object.

---

read_gazepoint *Read a Gazepoint all-gaze or fixation CSV export*

Description

Reads Gazepoint all-gaze and fixation CSV exports, standardises timestamped column names, and removes empty trailing columns produced by Gazepoint exports.

Usage

```
read_gazepoint(path, standardise_names = TRUE, drop_empty_cols = TRUE)
```

Arguments

path	Path to a Gazepoint CSV export.
standardise_names	Logical. If TRUE, standardise TIME(...) and TIMETICK(...) headers.
drop_empty_cols	Logical. If TRUE, remove empty trailing or unnamed columns created by Gazepoint export formatting.

Value

A tibble with attributes gp3_file_type and gp3_source_file.

---

read_gazepoint_folder *Read multiple Gazepoint CSV exports from a folder*

Description

Reads all Gazepoint all-gaze or fixation CSV exports in a folder that match a filename pattern and combines them into one tibble.

Usage

```
read_gazepoint_folder(
  folder,
  pattern = "\\.csv$",
  source_col = "USER_FILE",
  recursive = FALSE,
  ...
)
```

Arguments

folder	Path to the folder containing Gazepoint CSV exports.
pattern	Regular expression used to select files. For example, "_all_gaze\\.csv$" or "_fixations\\.csv$".
source_col	Name of the column storing the source filename.
recursive	Logical. If TRUE, search subfolders recursively.
...	Additional arguments passed to read_gazepoint().

Value

A tibble containing all matching files combined row-wise.

read_gazepoint_summary *Read a Gazepoint Analysis Data Summary export*

Description

Parses the multi-section `Data_Summary_export_*.csv` file into metadata, `aoi_summary`, and `aoi_by_user` tables.

Usage

```
read_gazepoint_summary(path)
```

Arguments

`path`	Path to `Data_Summary_export_*.csv`.

Value

A list with `metadata`, `aoi_summary`, and `aoi_by_user`.

recalibrate_gazepoint_gaze *Offline gaze recalibration using known target coordinates*

Description

Apply an offline drift-correction shift to Gazepoint gaze coordinates using known fixation/check-target coordinates. For each group, the helper estimates the horizontal and vertical gaze offset from valid target samples and applies the correction to all gaze samples in the same group.

Usage

```
recalibrate_gazepoint_gaze(
  data,
  x_col,
  y_col,
  target_x_col,
  target_y_col,
  time_col = NULL,
  grouping_cols = NULL,
  calibration_col = NULL,
  calibration_value = NULL,
  method = c("median_shift", "mean_shift"),
  min_valid_points = 3L,
```

```
  max_shift = NULL,
  output_x_col = "gaze_x_recalibrated",
  output_y_col = "gaze_y_recalibrated",
  dx_col = "gaze_recalibration_dx",
  dy_col = "gaze_recalibration_dy",
  shift_col = "gaze_recalibration_shift",
  error_before_col = "gaze_error_before_recalibration",
  error_after_col = "gaze_error_after_recalibration",
  status_col = "gaze_recalibration_status",
  overwrite = FALSE,
  name = "gazepoint_gaze_recalibration"
)
```

Arguments

data	A data frame containing gaze and target coordinates.
x_col	Horizontal gaze coordinate column.
y_col	Vertical gaze coordinate column.
target_x_col	Known horizontal target coordinate column.
target_y_col	Known vertical target coordinate column.
time_col	Optional time column used only for stable ordering.
grouping_cols	Optional grouping columns used to estimate one correction per participant, trial, block, stimulus, or other unit.
calibration_col	Optional column identifying rows to use for estimating the correction.
calibration_value	Optional value in calibration_col identifying calibration/check rows. If calibration_col is supplied and calibration_value = NULL, logical TRUE rows are used.
method	Shift estimator. "median_shift" uses median target-minus-gaze offsets; "mean_shift" uses mean offsets.
min_valid_points	Minimum valid target/gaze pairs required per group.
max_shift	Optional maximum Euclidean correction shift. If exceeded, the shift is reported but not applied.
output_x_col	Corrected horizontal gaze output column.
output_y_col	Corrected vertical gaze output column.
dx_col	Estimated horizontal correction column.
dy_col	Estimated vertical correction column.
shift_col	Estimated Euclidean shift-distance column.
error_before_col	Row-wise gaze-to-target error before correction.
error_after_col	Row-wise gaze-to-target error after correction.
status_col	Row-level recalibration status column.
overwrite	Logical. If FALSE, existing output columns are protected.
name	Character label stored in object attributes.

Details

This helper is useful only when known target coordinates are available, for example from calibration checks, fixation targets, validation targets, or drift-check trials.

Value

A tibble with recalibrated gaze columns and recalibration attributes.

`recommend_gazepoint_exclusions` *Recommend trial and participant exclusions*

Description

Create explicit trial-level and participant-level exclusion recommendations from Gazepoint sample-level quality information. The helper can use validity flags, gaze-coordinate missingness, pupil missingness, and optional artifact flags to produce transparent exclusion tables.

Usage

```
recommend_gazepoint_exclusions(
  data,
  participant_col,
  trial_col = NULL,
  condition_col = NULL,
  validity_col = NULL,
  x_col = NULL,
  y_col = NULL,
  pupil_col = NULL,
  artifact_col = NULL,
  min_trial_samples = 10L,
  max_trial_missing_prop = 0.5,
  max_trial_artifact_prop = 0.5,
  min_participant_trials = 2L,
  min_participant_valid_trials = 1L,
  max_participant_missing_prop = 0.5,
  max_participant_artifact_prop = 0.5,
  require_both_gaze_coordinates = TRUE,
  name = "gazepoint_exclusion_recommendations"
)
```

Arguments

`data`	A data frame containing sample-level or trial-level data.
`participant_col`	Participant identifier column.

`trial_col` Optional trial identifier column.

`condition_col` Optional condition column retained in summaries.

`validity_col` Optional logical/numeric/character validity column.

`x_col` Optional horizontal gaze coordinate column.

`y_col` Optional vertical gaze coordinate column.

`pupil_col` Optional pupil column.

`artifact_col` Optional logical/numeric/character artifact flag column.

`min_trial_samples`
Minimum samples required per trial.

`max_trial_missing_prop`
Maximum missing/unusable sample proportion per trial.

`max_trial_artifact_prop`
Maximum artifact proportion per trial.

`min_participant_trials`
Minimum total trials required per participant.

`min_participant_valid_trials`
Minimum retained trials required per participant.

`max_participant_missing_prop`
Maximum missing/unusable sample proportion per participant.

`max_participant_artifact_prop`
Maximum artifact proportion per participant.

`require_both_gaze_coordinates`
Logical. If both gaze columns are supplied, should a sample be usable only when both coordinates are finite?

`name` Character label stored in object attributes.

Details

This function recommends exclusions only. It does not remove rows.

Value

A list with overview, trial recommendations, participant recommendations, an explicit exclusion table, and settings.

`report_gazepoint_cluster_permutation` *Report a Gazepoint cluster-permutation result*

Description

Create a compact, cautious, text-ready report from a cluster-permutation result. The report avoids exact onset/offset claims and describes detected clusters as time ranges surviving the specified cluster procedure.

Usage

```
report_gazepoint_cluster_permutation(result, alpha = 0.05)
```

Arguments

result	A result object returned by run_gazepoint_cluster_permutation().
alpha	Significance threshold.

Value

A list with cluster table, settings, and report text.

---

report_gazepoint_multiverse

Report multiverse-analysis results

Description

Create compact branch-, status-, and term-level summaries from a multiverse result object. This helper is intentionally generic and can summarise the package's multiverse output after it has been tidied to data frames.

Usage

```
report_gazepoint_multiverse(
  multiverse_results,
  branch_col = NULL,
  term_col = NULL,
  estimate_col = NULL,
  p_col = NULL,
  status_col = NULL,
  alpha = 0.05
)
```

Arguments

multiverse_results	A data frame, or a list containing data frames.
branch_col	Optional branch/specification column.
term_col	Optional model term column.
estimate_col	Optional estimate/effect column.
p_col	Optional p-value column.
status_col	Optional status column.
alpha	Significance threshold used for descriptive counts.

Value

A list with branch, status, and term summaries.

`run_gazepoint_aoi_multiverse` *Run a Gazepoint AOI preprocessing multiverse*

Description

Run all AOI preprocessing branches defined by `create_gazepoint_preprocessing_multiverse()`. Each branch creates AOI-window summaries and then prepares binomial AOI GLMM data using the branch-specific denominator and minimum denominator threshold.

Usage

```
run_gazepoint_aoi_multiverse(
  data,
  multiverse,
  branch_ids = NULL,
  windows,
  time_col = "time",
  aoi_col = "aoi_current",
  subject_col = "subject",
  condition_col = NULL,
  group_cols = NULL,
  target_aoi_values,
  distractor_aoi_values = NULL,
  success_col = "n_target_samples",
  outcome_label = "target",
  keep_outputs = TRUE,
  stop_on_error = FALSE
)
```

Arguments

`data`	A Gazepoint master table or sample-level AOI table.
`multiverse`	A `gp3_preprocessing_multiverse` object returned by `create_gazepoint_preprocessing_multiver`
`branch_ids`	Optional character vector of AOI branch IDs to run.
`windows`	Numeric vector or labelled window table passed to `summarise_gazepoint_aoi_windows()`.
`time_col`	Time column.
`aoi_col`	AOI-state column.
`subject_col`	Subject column.
`condition_col`	Optional condition column.
`group_cols`	Optional grouping columns for AOI-window summaries.

`target_aoi_values`
: Target AOI values.

`distractor_aoi_values`
: Optional distractor AOI values.

`success_col`
: Success-count column passed to `prepare_gazepoint_aoi_glmm_data()`.

`outcome_label`
: Outcome label passed to AOI helpers.

`keep_outputs`
: Logical. If `TRUE`, keep branch outputs in `branch_outputs`.

`stop_on_error`
: Logical. If `TRUE`, stop when a branch fails. If `FALSE`, record the branch error and continue.

Value

A list with class `gp3_aoi_multiverse_results` containing overview, branch results, optional branch outputs, and settings.

---

run_gazepoint_cluster_permutation

Run paired cluster-based permutation tests

Description

Run a paired cluster-based permutation test on time-course data prepared by `prepare_gazepoint_cluster_data()`. The function tests whether two conditions diverge over time while controlling cluster-level inference using a permutation distribution of maximum cluster statistics.

Usage

```
run_gazepoint_cluster_permutation(
  data,
  condition_order = NULL,
  n_permutations = 1000,
  cluster_threshold = 2,
  tail = c("two_sided", "greater", "less"),
  cluster_stat = c("sum_abs_t", "sum_t", "size"),
  min_time_bins = 1,
  seed = NULL,
  paired = TRUE
)
```

Arguments

`data`
: Cluster-ready data produced by `prepare_gazepoint_cluster_data()`.

`condition_order`
: Optional character vector of length 2 defining the two conditions and their order. The tested difference is condition 2 minus condition 1.

`n_permutations`
: Number of sign-flip permutations.

`cluster_threshold`
: Absolute t-statistic threshold for forming candidate clusters. For `tail = "greater"` or `tail = "less"`, the same positive threshold is used in the requested direction.

`tail`
: Direction of the test. `"two_sided"` tests positive and negative clusters. `"greater"` tests condition 2 greater than condition 1. `"less"` tests condition 2 less than condition 1.

`cluster_stat`
: Cluster statistic. `"sum_abs_t"` sums absolute t-statistics within a cluster. `"sum_t"` sums signed t-statistics and then uses the absolute value for cluster-level inference. `"size"` uses the number of time bins.

`min_time_bins`
: Minimum number of adjacent time bins required for a cluster to be retained.

`seed`
: Optional random seed for reproducible permutations.

`paired`
: Logical. Currently only paired within-subject sign-flip permutation is supported.

Details

Cluster-based permutation tests are intended for time-course inference. They should not be used to discover a confirmatory time window and then test that same window again in a second confirmatory model.

Value

A list containing observed time-course statistics, observed clusters, the permutation distribution, settings, and status fields.

`run_gazepoint_cluster_permutation_anova` *Guardrail for cluster-permutation ANOVA*

Description

This function intentionally fails safely. Cluster-permutation ANOVA is not implemented as an active inferential engine in gp3tools because it requires additional design, exchangeability, and error-term choices that are outside the currently validated two-condition workflow.

Usage

```
run_gazepoint_cluster_permutation_anova(...)
```

Arguments

`...`
: Arguments reserved for a future implementation.

Value

This function always stops with an explanatory error.

run_gazepoint_cluster_permutation_covariate_adjusted

Guardrail for covariate-adjusted cluster permutation

Description

This function intentionally fails safely. Covariate-adjusted cluster permutation is not implemented as an active inferential engine in gp3tools.

Usage

```
run_gazepoint_cluster_permutation_covariate_adjusted(...)
```

Arguments

...	Arguments reserved for a future implementation.

Value

This function always stops with an explanatory error.

run_gazepoint_cluster_permutation_lmer

Guardrail for mixed-model cluster permutation

Description

This function intentionally fails safely. Mixed-model cluster permutation is not implemented as an active inferential engine in gp3tools.

Usage

```
run_gazepoint_cluster_permutation_lmer(...)
```

Arguments

...	Arguments reserved for a future implementation.

Value

This function always stops with an explanatory error.

run_gazepoint_cluster_permutation_parallel

Guardrail for parallel cluster permutation

Description

This function intentionally fails safely. Parallel cluster permutation is not implemented as a separate active engine in gp3tools.

Usage

```
run_gazepoint_cluster_permutation_parallel(...)
```

Arguments

`...`	Arguments reserved for a future implementation.

Value

This function always stops with an explanatory error.

run_gazepoint_cluster_threshold_sensitivity

Run threshold-sensitivity checks for Gazepoint cluster permutation

Description

Re-run `run_gazepoint_cluster_permutation()` across a small set of cluster-forming thresholds and summarize how many clusters are detected.

Usage

```
run_gazepoint_cluster_threshold_sensitivity(
  data,
  thresholds = c(1.5, 2, 2.5),
  ...
)
```

Arguments

`data`	Prepared cluster-permutation data.
`thresholds`	Numeric vector of cluster-forming thresholds.
`...`	Additional arguments passed to `run_gazepoint_cluster_permutation()`.

Value

A list containing threshold-level summaries and full result objects.

`run_gazepoint_eyetools_fixation_detection` *Run optional eyetools fixation and saccade detection*

Description

Prepare Gazepoint sample-level gaze data for the optional `eyetools` package and, when `eyetools` is installed, run fixation and/or saccade detection using `eyetools::fixation_dispersion()`, `eyetools::fixation_VTI()` and/or `eyetools::saccade_VTI()`.

Usage

```
run_gazepoint_eyetools_fixation_detection(
  data,
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  x_col = NULL,
  y_col = NULL,
  condition_col = NULL,
  stimulus_col = NULL,
  method = c("dispersion", "vti", "saccade", "all"),
  sample_rate = NULL,
  threshold = 100,
  min_dur = 150,
  min_dur_sac = 20,
  disp_tol = 100,
  NA_tol = 0.25,
  smooth = FALSE,
  drop_missing = TRUE,
  progress = FALSE,
  name = "gazepoint_eyetools_fixation_detection"
)
```

Arguments

`data`	A data frame containing sample-level gaze data.
`participant_col`	Participant/subject column. If `NULL`, common names are detected.
`trial_col`	Trial column. If `NULL`, common names are detected.
`time_col`	Time column. If `NULL`, common names are detected.
`x_col`	Horizontal gaze coordinate column. If `NULL`, common names are detected.
`y_col`	Vertical gaze coordinate column. If `NULL`, common names are detected.
`condition_col`	Optional condition/group column.
`stimulus_col`	Optional stimulus/media column.

method	Detector branch. Options are "dispersion", "vti", "saccade", and "all".
sample_rate	Optional sample rate passed to velocity-threshold functions.
threshold	Velocity threshold passed to velocity-threshold functions.
min_dur	Minimum fixation duration in milliseconds.
min_dur_sac	Minimum saccade duration in milliseconds.
disp_tol	Dispersion tolerance in pixels.
NA_tol	Missing-data tolerance passed to fixation_dispersion().
smooth	Logical; passed to fixation_VTI().
drop_missing	Logical. If TRUE, rows with non-finite time, x, or y are removed before detector execution.
progress	Logical. Passed to eyetools detector functions.
name	Character label stored in the returned object.

Details

This helper is an optional external-detector branch. It does not replace the main gp3tools summaries or AOI/transition workflows.

Value

A list with class gp3_eyetools_fixation_detection.

---

run_gazepoint_gazer_crosscheck

Run an optional gazeR pupil-preprocessing cross-check

Description

Prepare Gazepoint pupil data for the optional gazer package and, when gazer is installed, run a conservative pupil-preprocessing cross-check using gazeR-style blink extension, smoothing/interpolation, optional baseline correction, and optional downsampling.

Usage

```
run_gazepoint_gazer_crosscheck(
  data,
  participant_col = NULL,
  trial_col = NULL,
  time_col = NULL,
  pupil_col = NULL,
  condition_col = NULL,
  message_col = NULL,
  blink_col = NULL,
  hz = 60,
```

```
  fillback = 100,
  fillforward = 100,
  smooth_n = 5,
  step_first = c("smooth", "interpolate"),
  interpolation_type = "linear",
  maxgap = Inf,
  baseline_window = NULL,
  baseline_event = NULL,
  baseline_dur = 100,
  baseline_method = "sub",
  bin_length = NULL,
  name = "gazepoint_gazer_crosscheck"
)
```

Arguments

data	A data frame containing Gazepoint or gp3tools pupil time-series data.
participant_col	Participant/subject column. If NULL, common names are detected.
trial_col	Trial column. If NULL, common names are detected.
time_col	Time column. If NULL, common names are detected.
pupil_col	Pupil column. If NULL, common processed/raw pupil columns are detected.
condition_col	Optional condition column. If NULL, common names are detected; otherwise "all_data" is used.
message_col	Optional message/event column.
blink_col	Optional blink/trackloss column.
hz	Sampling rate passed to gazeR functions.
fillback	Blink-extension window before missing/blink samples, in ms.
fillforward	Blink-extension window after missing/blink samples, in ms.
smooth_n	Smoothing window parameter passed to gazer::smooth_interpolate_pupil().
step_first	Processing order passed to gazer::smooth_interpolate_pupil().
interpolation_type	Interpolation type passed to gazer::smooth_interpolate_pupil().
maxgap	Maximum gap passed to gazer::smooth_interpolate_pupil().
baseline_window	Optional numeric vector of length 2 passed to gazer::baseline_correction_pupil().
baseline_event	Optional event label passed to gazer::baseline_correction_pupil_msg().
baseline_dur	Baseline duration used with baseline_event.
baseline_method	Baseline method used with baseline_event.
bin_length	Optional bin length passed to gazer::downsample_gaze().
name	Character label stored in the returned object.

Details

This helper is a cross-check branch. It is not intended to replace the main `gp3tools` pupil preprocessing pipeline.

Value

A list with class `gp3_gazer_crosscheck`.

`run_gazepoint_model_leave_one_out`
Run leave-one-unit model sensitivity analysis

Description

Refit the same model repeatedly while removing one participant, item, stimulus, trial, or other analysis unit at a time. The helper compares leave-one-out estimates with the full-data model to assess whether a key effect is driven by a single unit.

Usage

```
run_gazepoint_model_leave_one_out(
  data,
  unit_col,
  fit_function,
  extract_function = NULL,
  effect_terms = NULL,
  min_rows = 2L,
  keep_models = FALSE,
  name = "gazepoint_model_leave_one_out"
)
```

Arguments

`data`	A data frame used for model fitting.
`unit_col`	Column identifying the unit to leave out, for example subject, participant, item, stimulus, or trial.
`fit_function`	Function that takes one data frame argument and returns a fitted model.
`extract_function`	Optional function that takes a fitted model and returns a data frame of effects. If `NULL`, a default coefficient extractor is used for common model objects.
`effect_terms`	Optional character vector of terms/effects to retain in the sensitivity summary.
`min_rows`	Minimum number of rows required after leaving one unit out.
`keep_models`	Logical. If `TRUE`, keep the full model and refitted models.
`name`	Character label stored in the returned object.

Details

This is a generic robustness wrapper. It can be used with linear models, GLMs, mixed models, GAMMs, GCA models, AOI GLMMs, pupil LMMs, or any custom model as long as a fitting function is supplied.

Value

A list with class `gp3_model_leave_one_out_sensitivity`.

`run_gazepoint_multidimensional_cluster_permutation`
Guardrail for multidimensional cluster permutation

Description

This function intentionally fails safely. Multidimensional cluster permutation is not implemented as an active inferential engine in gp3tools.

Usage

```
run_gazepoint_multidimensional_cluster_permutation(...)
```

Arguments

`...`	Arguments reserved for a future implementation.

Value

This function always stops with an explanatory error.

`run_gazepoint_pupil_multiverse`
Run a Gazepoint pupil preprocessing multiverse

Description

Run all pupil preprocessing branches defined by `create_gazepoint_preprocessing_multiverse()`. Each branch can apply pupil artifact flagging, interpolation, baseline correction, smoothing, and optional pupil-window summarisation.

Usage

```
run_gazepoint_pupil_multiverse(
  data,
  multiverse,
  branch_ids = NULL,
  pupil_col = NULL,
  time_col = NULL,
  group_cols = NULL,
  summarise_windows = FALSE,
  windows = NULL,
  keep_outputs = TRUE,
  stop_on_error = FALSE
)
```

Arguments

data	A Gazepoint master table or processed pupil table.
multiverse	A gp3_preprocessing_multiverse object returned by create_gazepoint_preprocessing_multiver
branch_ids	Optional character vector of pupil branch IDs to run.
pupil_col	Optional pupil column passed to downstream preprocessing helpers when supported.
time_col	Optional time column passed to downstream preprocessing helpers when supported.
group_cols	Optional grouping columns passed to downstream preprocessing helpers when supported.
summarise_windows	Logical. If TRUE, summarise each processed pupil branch into pupil analysis windows.
windows	Optional windows passed to summarise_gazepoint_pupil_windows() when summarise_windows = TRUE.
keep_outputs	Logical. If TRUE, keep processed branch data in branch_outputs.
stop_on_error	Logical. If TRUE, stop when a branch fails. If FALSE, record the branch error and continue.

Value

A list with class gp3_pupil_multiverse_results containing overview, branch results, optional branch outputs, and settings.

run_gazepoint_tfce *Guardrail for threshold-free cluster enhancement*

Description

This function intentionally fails safely. TFCE is not implemented as an active inferential engine in gp3tools.

Usage

```
run_gazepoint_tfce(...)
```

Arguments

...	Arguments reserved for a future implementation.

Value

This function always stops with an explanatory error.

run_gazepoint_workflow *Run a complete Gazepoint analysis workflow*

Description

Reads Gazepoint all-gaze and fixation exports from a folder, computes sampling-rate checks, tracking-quality summaries, quality flags, and AOI-level metrics, and optionally exports output tables, diagnostic plots, and an HTML diagnostic report.

Usage

```
run_gazepoint_workflow(
  export_dir,
  all_gaze_pattern = "_all_gaze\\.csv$",
  fixation_pattern = "_fixations\\.csv$",
  check_file_pairs = TRUE,
  group_cols = c("USER_FILE", "MEDIA_ID"),
  user_col = "USER_FILE",
  sample_rate = 60,
  min_gaze_valid_pct = 70,
  min_pupil_valid_pct = 70,
  expected_hz = 60,
  hz_tolerance = 5,
  min_duration_sec = NULL,
```

```
  output_dir = NULL,
  prefix = "gazepoint",
  overwrite = TRUE,
  save_plots = FALSE,
  plot_output_dir = NULL,
  create_report = FALSE,
  report_file = NULL,
  report_title = "Gazepoint diagnostic report",
  report_plot_dir = NULL,
  report_max_rows = 30
)
```

Arguments

export_dir	Folder containing Gazepoint CSV export files.
all_gaze_pattern	Regular expression for selecting all-gaze files.
fixation_pattern	Regular expression for selecting fixation files.
check_file_pairs	Logical. If TRUE, check that each participant/source has both an all-gaze file and a fixation file before importing.
group_cols	Columns used for grouped sampling and tracking-quality summaries.
user_col	Column name used to identify the source/user file.
sample_rate	Sampling rate used for approximate sample-based AOI viewed time.
min_gaze_valid_pct	Minimum acceptable FPOGV validity percentage.
min_pupil_valid_pct	Minimum acceptable pupil validity percentage.
expected_hz	Expected sampling rate.
hz_tolerance	Allowed deviation from the expected sampling rate.
min_duration_sec	Optional minimum acceptable recording duration in seconds.
output_dir	Optional folder where output CSV files should be written.
prefix	Filename prefix used when exporting output tables, plots, and report.
overwrite	Logical. If FALSE, stop when output files already exist.
save_plots	Logical. If TRUE, save standard diagnostic plots.
plot_output_dir	Optional folder where diagnostic plots should be saved. If NULL, output_dir is used.
create_report	Logical. If TRUE, create an HTML diagnostic report.
report_file	Optional path to the HTML report. If NULL, a report file is created in output_dir using prefix.
report_title	Title used in the HTML diagnostic report.

report_plot_dir
: Optional folder for plots used inside the HTML report.

report_max_rows
: Maximum number of rows shown in report preview tables.

Value

A named list containing file-pair checks, imported data, analysis tables, quality flags, written table paths, written plot paths, and written report path.

---

save_gazepoint_plots *Save standard Gazepoint diagnostic plots*

Description

Saves standard diagnostic plots produced from `gp3tools` workflow outputs.

Usage

```
save_gazepoint_plots(
  flagged_quality = NULL,
  sampling = NULL,
  output_dir,
  prefix = "gazepoint",
  overwrite = TRUE,
  width = 9,
  height_quality = 6,
  height_sampling = 5,
  dpi = 300
)
```

Arguments

flagged_quality
: Flagged tracking-quality table, usually from `flag_tracking_quality()` or `run_gazepoint_workflow(`

sampling
: Sampling-rate table, usually from `check_sampling_rate()` or `run_gazepoint_workflow()`.

output_dir
: Folder where plot files should be saved.

prefix
: Filename prefix used for saved plot files.

overwrite
: Logical. If `FALSE`, stop when output plot files already exist.

width
: Plot width in inches.

height_quality
: Tracking-quality plot height in inches.

height_sampling
: Sampling-rate plot height in inches.

dpi
: Plot resolution.

Value

A tibble with plot names and written file paths.

`simulate_gazepoint_cluster_timecourse_data` *Simulate simple Gazepoint cluster time-course data*

Description

Generate synthetic two-condition within-subject time-course data for examples and tests. The simulation is intentionally simple and should not be treated as a realistic model of gaze, pupil, or biometric time-series data.

Usage

```
simulate_gazepoint_cluster_timecourse_data(
  n_subjects = 20,
  n_time_bins = 60,
  conditions = c("control", "treatment"),
  effect_start = 25,
  effect_end = 40,
  effect_size = 0.5,
  subject_sd = 0.3,
  noise_sd = 0.4,
  seed = NULL
)
```

Arguments

`n_subjects`	Number of subjects.
`n_time_bins`	Number of time bins.
`conditions`	Two condition labels.
`effect_start`	First time bin with an injected treatment effect.
`effect_end`	Last time bin with an injected treatment effect.
`effect_size`	Added treatment effect inside the effect window.
`subject_sd`	Standard deviation of subject random shifts.
`noise_sd`	Standard deviation of observation noise.
`seed`	Optional random seed.

Value

A long-format data frame.

`simulate_gazepoint_data` *Simulate simple Gazepoint-style gaze data*

Description

Generate a compact synthetic Gazepoint-style data set for examples, tests, teaching, and workflow demonstrations. The simulation is intentionally simple and should not be treated as a realistic generative model of visual attention.

Usage

```
simulate_gazepoint_data(
  n_subjects = 12,
  n_trials = 8,
  trial_duration_ms = 2000,
  sampling_rate_hz = 60,
  conditions = c("control", "treatment"),
  aoi_labels = c("target", "other"),
  effect_size = 0.5,
  target_aoi = aoi_labels[1L],
  seed = NULL,
  include_fixations = TRUE
)
```

Arguments

`n_subjects`	Number of synthetic participants.
`n_trials`	Number of trials per participant.
`trial_duration_ms`	Trial duration in milliseconds.
`sampling_rate_hz`	Sampling rate in Hz.
`conditions`	Character vector of condition labels.
`aoi_labels`	Character vector of AOI labels.
`effect_size`	Logit-scale increase in target-AOI probability for the second and later conditions.
`target_aoi`	AOI receiving the simulated condition effect.
`seed`	Optional random seed.
`include_fixations`	Should a simple fixation-level table be returned?

Value

A list containing `all_gaze`, `aoi_windows`, optional `fixations`, and simulation metadata.

simulate_gazepoint_pupil_data *Simulate Gazepoint-like pupil data*

Description

Generates a privacy-safe synthetic pupil data set with balanced conditions, left/right pupil channels, a combined pupil column, blink/trackloss flags, and simple gaze coordinates. The generator is intended for examples and unit tests, not for claims about empirical pupil physiology.

Usage

```
simulate_gazepoint_pupil_data(
  n_subjects = 12,
  n_trials = 8,
  n_time_bins = 60,
  conditions = c("control", "treatment"),
  baseline_mean = 3.5,
  condition_effect = 0.15,
  noise_sd = 0.08,
  subject_sd = 0.25,
  blink_probability = 0.03,
  seed = NULL
)
```

Arguments

n_subjects	Number of synthetic participants.
n_trials	Number of trials per participant.
n_time_bins	Number of time bins per trial.
conditions	Character vector of condition labels.
baseline_mean	Mean pupil size around which synthetic data are generated.
condition_effect	Numeric effect added to non-reference conditions. If a single value is supplied, it is applied to all non-reference conditions. If multiple values are supplied, they are recycled across conditions.
noise_sd	Standard deviation of sample-level noise.
subject_sd	Standard deviation of participant-level random offsets.
blink_probability	Probability that a sample is marked as blink/trackloss.
seed	Optional random seed.

Value

A data frame with synthetic Gazepoint-like pupil and gaze columns.

Examples

```
simulate_gazepoint_pupil_data(n_subjects = 2, n_trials = 2, n_time_bins = 5, seed = 1)
```

`smooth_gazepoint_pupil` *Smooth Gazepoint pupil data*

Description

Applies sample-based rolling smoothing to a Gazepoint pupil time series, typically after `flag_gazepoint_pupil()`, `interpolate_gazepoint_pupil()`, and optionally `baseline_correct_gazepoint_pupil()`. The function preserves the original pupil column and adds smoothed-output columns.

Usage

```
smooth_gazepoint_pupil(
  data,
  pupil_col = NULL,
  time_col = NULL,
  group_cols = c("subject", "media_id"),
  window_samples = 5,
  method = c("mean", "median"),
  align = c("center", "right", "left"),
  min_points = 1,
  preserve_missing = TRUE
)
```

Arguments

`data`	A Gazepoint master table, preferably after pupil preprocessing.
`pupil_col`	Optional name of the pupil column to smooth. If `NULL`, the function detects one of `pupil_baseline_corrected`, `pupil_baseline_percent_change`, `pupil_interpolated`, `pupil_for_preprocessing`, `mean_pupil`, `pupil`, `pupil_raw`, `left_pupil`, or `right_pupil`.
`time_col`	Optional name of the time column. If `NULL`, the function detects one of `time_ms`, `time`, `time_orig`, or `time_orig_ms`.
`group_cols`	Character vector of grouping columns used to keep smoothing within independent time series. Defaults to `c("subject", "media_id")`. Columns such as `"trial"` or `"trial_global"` can be added when available. Use `character(0)` for global smoothing.
`window_samples`	Number of samples in the rolling smoothing window. Defaults to `5`.
`method`	Smoothing statistic. One of `"mean"` or `"median"`. Defaults to `"mean"`.
`align`	Window alignment. One of `"center"`, `"right"`, or `"left"`. Defaults to `"center"`.
`min_points`	Minimum number of finite values required inside a window to return a smoothed value. Defaults to `1`.

preserve_missing
: Logical. If TRUE, rows with missing/non-finite input remain missing in pupil_smoothed. Defaults to TRUE.

Value

A tibble containing the original data plus pupil-smoothing columns.

Examples

```
## Not run:
smoothed <- smooth_gazepoint_pupil(
  baseline_corrected,
  pupil_col = "pupil_baseline_corrected",
  window_samples = 5,
  method = "mean"
)

dplyr::count(smoothed, pupil_smoothing_status)

## End(Not run)
```

---

standardise_gazepoint_names

Standardise Gazepoint column names

Description

Converts timestamped Gazepoint headers such as TIME(2026/02/20 00:53:57.275) to TIME, converts TIMETICK(f=10000000) to TIMETICK, trims whitespace, and removes empty columns created by trailing commas in Gazepoint exports.

Usage

```
standardise_gazepoint_names(x)
```

Arguments

x
: A data frame or character vector of column names.

Value

If x is a data frame, the same data frame with standardised names and empty Gazepoint columns removed. If x is a character vector, a character vector.

summarise_aoi_samples *Summarise sample-level AOI viewing*

Description

Computes transparent AOI metrics from sample-level rows. These may not exactly reproduce Gazepoint Analysis summary metrics; use `read_gazepoint_summary()` when official Gazepoint summary values are available.

Usage

```
summarise_aoi_samples(
  data,
  group_cols = "MEDIA_ID",
  aoi_col = "AOI",
  time_col = "TIME"
)
```

Arguments

`data`	A Gazepoint all-gaze data frame.
`group_cols`	Grouping columns.
`aoi_col`	AOI column name.
`time_col`	Time column name.

Value

A tibble with AOI sample count, TTFF, and approximate dwell time.

summarise_fixations *Summarise fixation-level AOI metrics*

Description

Summarise fixation-level AOI metrics

Usage

```
summarise_fixations(data, group_cols = "MEDIA_ID", aoi_col = "AOI")
```

Arguments

`data`	A Gazepoint fixation data frame.
`group_cols`	Grouping columns.
`aoi_col`	AOI column name.

Value

A tibble with fixation counts and summed fixation duration by AOI.

`summarise_gazepoint_aoi`
Summarise Gazepoint AOI metrics from gaze and fixation exports

---

Description

Combines sample-level AOI viewing information from all-gaze data with fixation-level AOI metrics from fixation data.

Usage

```
summarise_gazepoint_aoi(
  gaze_data,
  fixation_data,
  user_col = "USER_FILE",
  sample_rate = 60
)
```

Arguments

`gaze_data`	A Gazepoint all-gaze data frame imported with `read_gazepoint()`.
`fixation_data`	A Gazepoint fixation data frame imported with `read_gazepoint()`.
`user_col`	Name of the column identifying the user file. Default is `"USER_FILE"`.
`sample_rate`	Assumed sampling rate used to approximate viewed time from sample counts.

Value

A tibble with one row per user, media, and AOI.

`summarise_gazepoint_aoi_entries`
Summarise Gazepoint AOI entry episodes

Description

Convert sample-level AOI states into AOI entry episodes. An entry starts whenever the AOI state changes within a subject, media, trial, or other grouping unit.

Usage

```
summarise_gazepoint_aoi_entries(
  data,
  aoi_col = NULL,
  time_col = "time",
  group_cols = c("subject", "MEDIA_ID", "trial_global"),
  include_non_aoi = TRUE,
  non_aoi_values = c("non_aoi", "none", "background", "outside", "outside_aoi",
    "missing", "missing_aoi"),
  missing_aoi_label = "missing_aoi"
)
```

Arguments

`data`	A Gazepoint master/sample-level data frame.
`aoi_col`	Name of the AOI-state column. If `NULL`, the function tries `aoi_current`, `AOI`, and `aoi_state`.
`time_col`	Name of the time column, in milliseconds.
`group_cols`	Character vector of columns defining independent sequences, usually subject/media/trial.
`include_non_aoi`	Logical. If `TRUE`, non-AOI/background episodes are retained. If `FALSE`, they are removed after entry order and neighbouring states have been computed.
`non_aoi_values`	Character vector of AOI labels treated as background or non-AOI states.
`missing_aoi_label`	Label used when the AOI value is missing.

Value

A tibble with one row per AOI entry episode.

`summarise_gazepoint_aoi_transitions` *Summarise Gazepoint AOI transition features*

Description

Summarise AOI transitions at the trial or group level. The function can work from sample-level Gazepoint AOI data, AOI-entry tables created by `summarise_gazepoint_aoi_entries()`, or AOI-sequence tables created by `prepare_gazepoint_aoi_sequences()`.

Usage

```
summarise_gazepoint_aoi_transitions(
  data,
  aoi_col = NULL,
  time_col = "time",
  group_cols = c("subject", "MEDIA_ID", "trial_global"),
  include_non_aoi = TRUE,
  target_aoi_values = NULL,
  distractor_aoi_values = NULL,
  non_aoi_values = c("non_aoi", "none", "background", "outside", "outside_aoi",
    "missing", "missing_aoi"),
  missing_aoi_label = "missing_aoi"
)
```

Arguments

`data`	A Gazepoint sample-level data frame, AOI-entry table, or AOI-sequence table.
`aoi_col`	Name of the AOI-state column. Used only when `data` is sample-level data. If `NULL`, the function tries `aoi_current`, `AOI`, and `aoi_state`.
`time_col`	Name of the time column, in milliseconds. Used only when `data` is sample-level data.
`group_cols`	Character vector of columns defining independent AOI sequences, usually subject/media/trial.
`include_non_aoi`	Logical. If `TRUE`, non-AOI/background states are retained before transition summaries are computed. This is useful for background-to-target and target-to-background features.
`target_aoi_values`	Optional character vector defining target AOI labels.
`distractor_aoi_values`	Optional character vector defining distractor AOI labels.
`non_aoi_values`	Character vector of AOI labels treated as background or non-AOI states.
`missing_aoi_label`	Label used when the AOI value is missing.

Value

A tibble with one row per group and trial-level AOI transition features.

summarise_gazepoint_aoi_trial_features
Summarise Gazepoint AOI trial features

Description

Create trial-level AOI features from sample-level Gazepoint AOI data or from AOI-entry tables created by `summarise_gazepoint_aoi_entries()`. The output includes AOI dwell, entry, TTFF, revisit, and transition features.

Usage

```
summarise_gazepoint_aoi_trial_features(
  data,
  aoi_col = NULL,
  time_col = "time",
  group_cols = c("subject", "MEDIA_ID", "trial_global"),
  include_non_aoi = TRUE,
  target_aoi_values = NULL,
  distractor_aoi_values = NULL,
  non_aoi_values = c("non_aoi", "none", "background", "outside", "outside_aoi",
    "missing", "missing_aoi"),
  missing_aoi_label = "missing_aoi"
)
```

Arguments

`data`	A Gazepoint sample-level data frame, AOI-entry table, or compatible AOI table.
`aoi_col`	Name of the AOI-state column. Used only when `data` is sample-level data. If `NULL`, the function tries `aoi_current`, `AOI`, and `aoi_state`.
`time_col`	Name of the time column, in milliseconds. Used only when `data` is sample-level data.
`group_cols`	Character vector of columns defining independent trials, usually subject/media/trial.
`include_non_aoi`	Logical. If `TRUE`, non-AOI/background states are kept when computing trial-duration and transition features.
`target_aoi_values`	Optional character vector defining target AOI labels.
`distractor_aoi_values`	Optional character vector defining distractor AOI labels.
`non_aoi_values`	Character vector of AOI labels treated as background or non-AOI states.
`missing_aoi_label`	Label used when the AOI value is missing.

Value

A tibble with one row per trial/group and AOI trial-level features.

`summarise_gazepoint_aoi_windows` *Summarise Gazepoint AOI samples within predefined time windows*

Description

Summarise sample-level AOI states into predefined analysis windows. This is intended for confirmatory AOI window modelling, especially binomial target-looking models where target samples are modelled relative to a denominator such as all valid window samples.

Usage

```
summarise_gazepoint_aoi_windows(
  data,
  windows,
  time_col = "time",
  aoi_col = NULL,
  subject_col = "subject",
  condition_col = "condition",
  group_cols = NULL,
  target_aoi_values = NULL,
  distractor_aoi_values = NULL,
  non_aoi_values = c("non_aoi", "none", "background", "outside", "outside_aoi",
    "missing", "missing_aoi"),
  window_label_col = "window_label",
  window_start_col = "window_start_ms",
  window_end_col = "window_end_ms",
  include_right_endpoint = FALSE,
  missing_condition_label = "all_data",
  missing_aoi_label = "missing_aoi"
)
```

Arguments

`data`	A Gazepoint master table or sample-level gaze data.
`windows`	Numeric breakpoints, for example `c(0, 500, 1000, 2000)`, or a data frame with window labels and start/end columns.
`time_col`	Name of the time column.
`aoi_col`	Optional AOI-state column. If `NULL`, the function attempts to detect `aoi_current`, `AOI`, or `aoi_state`.
`subject_col`	Name of the subject column.
`condition_col`	Optional condition column.

`group_cols` Additional grouping columns. Defaults to subject, condition, media, trial-global, and trial columns when available.

`target_aoi_values`
Character vector identifying target AOIs.

`distractor_aoi_values`
Character vector identifying distractor AOIs.

`non_aoi_values` Character vector identifying background/non-AOI states.

`window_label_col`
Window label column when `windows` is a data frame.

`window_start_col`
Window start column when `windows` is a data frame.

`window_end_col` Window end column when `windows` is a data frame.

`include_right_endpoint`
Logical. If `TRUE`, include the right endpoint of each window.

`missing_condition_label`
Label used when condition is missing.

`missing_aoi_label`
Label used when AOI state is missing.

Value

A tibble with one row per group and AOI window.

`summarise_gazepoint_clusters` *Summarise cluster-based permutation results*

Description

Create compact reporting tables from the output of `run_gazepoint_cluster_permutation()`. The function returns an overview table, all observed clusters, significant clusters, time-course summary, permutation-distribution summary, settings table, and circularity warning.

Usage

```
summarise_gazepoint_clusters(
  result,
  alpha = 0.05,
  round_digits = NULL,
  include_timecourse = TRUE
)
```

Arguments

result	A result object returned by run_gazepoint_cluster_permutation().
alpha	Cluster-level significance threshold.
round_digits	Optional number of digits for rounding numeric reporting columns. If NULL, no rounding is applied.
include_timecourse	Logical. If TRUE, include the full observed time-course table in the returned object.

Details

Cluster-based permutation tests are intended for time-course inference. They should not be used to discover a confirmatory time window and then test that same window again in a second confirmatory model.

Value

A list of summary tables.

---

summarise_gazepoint_emmeans

Summarise estimated marginal means and contrasts

Description

Create manuscript-ready estimated marginal means and pairwise contrast tables from fitted models used in gp3tools workflows.

Usage

```
summarise_gazepoint_emmeans(
  model,
  specs,
  by = NULL,
  model_name = NULL,
  type = "response",
  contrast_method = "pairwise",
  adjust = "tukey",
  conf_level = 0.95,
  include_contrasts = TRUE
)
```

Arguments

model	A fitted model object, or a gp3tools fit object containing a $model element.
specs	Character vector or formula passed to emmeans::emmeans().
by	Optional character vector of grouping variables passed to emmeans::emmeans().
model_name	Optional model label used in returned tables.
type	Scale passed to emmeans summaries. Common values are "link" and "response".
contrast_method	Contrast method passed to emmeans::contrast().
adjust	Multiplicity adjustment for contrasts.
conf_level	Confidence level.
include_contrasts	Logical. If TRUE, compute contrasts.

Details

The function uses the optional emmeans package. If emmeans is not installed, the function returns structured skipped tables rather than failing. This keeps emmeans as an optional suggested dependency.

Value

A list with overview, emmeans, contrasts, and settings. The returned object has class gp3_emmeans_summary.

---

summarise_gazepoint_fixation_trials

Summarise Gazepoint fixation trial features

Description

Create trial-level fixation features from Gazepoint fixation-level data. The function supports common Gazepoint fixation export columns such as FPOGS, FPOGD, FPOGX, FPOGY, FPOGID, FPOGV, and AOI, as well as already-standardised columns.

Usage

```
summarise_gazepoint_fixation_trials(
  data,
  group_cols = NULL,
  fixation_id_col = NULL,
  start_col = NULL,
  duration_col = NULL,
  x_col = NULL,
  y_col = NULL,
  valid_col = NULL,
  aoi_col = NULL,
```

```
  start_time_unit = c("auto", "ms", "s"),
  duration_unit = c("auto", "ms", "s"),
  valid_only = TRUE,
  include_non_aoi = TRUE,
  target_aoi_values = NULL,
  distractor_aoi_values = NULL,
  non_aoi_values = c("non_aoi", "none", "background", "outside", "outside_aoi",
    "missing", "missing_aoi"),
  missing_aoi_label = "missing_aoi"
)
```

Arguments

`data`	A Gazepoint fixation-level data frame.
`group_cols`	Character vector of columns defining independent trials. If `NULL`, the function tries to infer sensible grouping columns from participant, media, and trial columns.
`fixation_id_col`	Optional fixation ID column. If `NULL`, the function tries `FPOGID`, `fixation_id`, and related names.
`start_col`	Optional fixation start-time column. If `NULL`, the function tries `FPOGS`, `fixation_start_time`, `time`, `TIME`, and `TIMETICK`.
`duration_col`	Optional fixation-duration column. If `NULL`, the function tries `FPOGD`, `fixation_duration_ms`, `fixation_duration`, and related names.
`x_col`	Optional fixation x-coordinate column.
`y_col`	Optional fixation y-coordinate column.
`valid_col`	Optional fixation-validity column. If detected and `valid_only = TRUE`, invalid fixations are removed.
`aoi_col`	Optional AOI column. If `NULL`, the function tries `AOI`, `aoi_current`, and `aoi_state`.
`start_time_unit`	Unit for the start-time column: `"auto"`, `"ms"`, or `"s"`.
`duration_unit`	Unit for the duration column: `"auto"`, `"ms"`, or `"s"`.
`valid_only`	Logical. If `TRUE`, invalid fixations are removed when a validity column is available.
`include_non_aoi`	Logical. If `TRUE`, non-AOI/background fixations are included. If `FALSE`, they are removed before summaries are computed.
`target_aoi_values`	Optional character vector defining target AOI labels.
`distractor_aoi_values`	Optional character vector defining distractor AOI labels.
`non_aoi_values`	Character vector of AOI labels treated as background or non-AOI states.
`missing_aoi_label`	Label used when the AOI value is missing.

Value

A tibble with one row per trial/group and fixation-level features.

`summarise_gazepoint_fixed_effects`
Summarise fixed effects from fitted models

Description

Create a compact manuscript-ready fixed-effect summary table from common models used in `gp3tools` workflows.

Usage

```
summarise_gazepoint_fixed_effects(
  model,
  model_name = NULL,
  conf_level = 0.95,
  exponentiate = FALSE,
  drop_intercept = FALSE
)
```

Arguments

`model`	A fitted model object, or a `gp3tools` fit object containing a `$model` element.
`model_name`	Optional model label used in the returned table.
`conf_level`	Confidence level for Wald confidence intervals.
`exponentiate`	Logical. If `TRUE`, exponentiate estimates and confidence intervals. This is useful for logistic models when reporting odds ratios.
`drop_intercept`	Logical. If `TRUE`, remove the intercept row.

Details

The function supports `lm`, `glm`, `lme4` mixed models, and `mgcv` GAM/BAM objects. It can also accept a `gp3tools` fit object containing a `$model` element. Confidence intervals are computed using a Wald approximation from the estimate and standard error so that the function remains lightweight and fast for mixed models.

Value

A tibble with fixed-effect estimates, standard errors, test statistics, p-values when available, confidence intervals, significance stars, and status fields.

summarise_gazepoint_markovchain
Summarise a Gazepoint Markov-chain object

Description

Convert a Gazepoint Markov-chain object, transition matrix, or transition data frame into a tidy transition summary. The function is deliberately permissive so that it can summarise objects created by `create_gazepoint_markovchain_object()` as well as simple matrices used in examples or tests.

Usage

```
summarise_gazepoint_markovchain(
  markov_object,
  include_zero = FALSE,
  from_col = NULL,
  to_col = NULL,
  count_col = NULL,
  probability_col = NULL
)
```

Arguments

`markov_object`	A Markov-chain object, matrix, table, list, or data frame containing transition information.
`include_zero`	Should zero-valued transitions be retained?
`from_col`	Optional source-state column when `markov_object` is a data frame.
`to_col`	Optional destination-state column when `markov_object` is a data frame.
`count_col`	Optional transition-count column when available.
`probability_col`	Optional transition-probability column when available.

Value

A data frame with source state, destination state, transition count or weight, row total, transition probability, and status columns.

summarise_gazepoint_multiverse_results

Summarise Gazepoint preprocessing multiverse results

Description

Summarise pupil and/or AOI preprocessing multiverse result objects created by `run_gazepoint_pupil_multiverse()` and `run_gazepoint_aoi_multiverse()`.

Usage

```
summarise_gazepoint_multiverse_results(..., results = NULL)
```

Arguments

`...`	One or more multiverse result objects.
`results`	Optional named list of multiverse result objects.

Value

A list with class `gp3_multiverse_summary_results` containing overview, branch summary, failure summary, and settings tables.

summarise_gazepoint_pupil

Summarise Gazepoint pupil data

Description

Creates compact pupil-quality and pupil-distribution summaries from a Gazepoint master sample-level table created by `as_gazepoint_master()` or `create_gazepoint_master()`. This function is intended as the first pupil preprocessing gate before interpolation, filtering, baseline correction, or pupil-based modelling.

Usage

```
summarise_gazepoint_pupil(
  master,
  group_cols = c("subject", "media_id"),
  pupil_col = NULL,
  time_col = NULL,
  missing_pupil_col = NULL,
  min_pupil = 0,
  max_pupil = Inf,
  outlier_k = 1.5
)
```

Arguments

master	A Gazepoint master sample-level table.
group_cols	Character vector of grouping columns. Defaults to c("subject", "media_id") using internally standardised names. Use character(0) for an overall summary.
pupil_col	Optional name of the pupil column to summarise. If NULL, the function detects one of mean_pupil, pupil, pupil_raw, left_pupil, or right_pupil.
time_col	Optional name of the time column. If NULL, the function detects one of time_ms, time, time_orig, or time_orig_ms.
missing_pupil_col	Optional name of the missing-pupil flag column. If NULL, the function uses missing_pupil when available.
min_pupil	Minimum plausible pupil value. Defaults to 0.
max_pupil	Maximum plausible pupil value. Defaults to Inf. Use narrower values, such as 1 and 9, only when the pupil column is known to be measured in millimetres.
outlier_k	Multiplier for IQR-based outlier detection. Defaults to 1.5.

Value

A tibble with pupil-quality and pupil-distribution summaries.

Examples

```
## Not run:
master <- create_gazepoint_master(
  gaze_data = results$all_gaze,
  screen_width_px = 1920,
  screen_height_px = 1080
)

summarise_gazepoint_pupil(master)
summarise_gazepoint_pupil(master, group_cols = "subject")
summarise_gazepoint_pupil(master, group_cols = character(0))

## End(Not run)
```

---

summarise_gazepoint_pupil_trial_features

Summarise Gazepoint pupil trial-level features

Description

Convert sample-level Gazepoint pupil time series into trial-level pupil features for statistical modelling.

Usage

```
summarise_gazepoint_pupil_trial_features(
  data,
  group_cols = c("subject", "trial_global"),
  pupil_col = NULL,
  time_col = "time",
  interpolated_col = "pupil_was_interpolated",
  artifact_col = NULL,
  artifact_reason_col = NULL,
  early_window = c(0, 500),
  middle_window = c(500, 1500),
  late_window = c(1500, 3000),
  min_valid_samples = 1
)
```

Arguments

`data`	A Gazepoint pupil data frame.
`group_cols`	Character vector of grouping columns. The default is `c("subject", "trial_global")`.
`pupil_col`	Name of the processed pupil column to summarise. If `NULL`, the function tries `pupil_smoothed`, `pupil_baseline_corrected`, `pupil_baseline_percent_change`, `pupil_interpolated`, `pupil_clean`, and `pupil`.
`time_col`	Name of the time column.
`interpolated_col`	Optional logical interpolation flag column.
`artifact_col`	Optional artifact flag column. If `NULL`, the function tries to detect `pupil_artifact_flag`, `pupil_flag_invalid`, or `artifact_flag`.
`artifact_reason_col`	Optional artifact-reason column. If `NULL`, the function tries to detect `pupil_artifact_reason`, `pupil_flag_reason`, or `artifact_reason`.
`early_window`	Numeric vector of length 2 defining the early window in milliseconds.
`middle_window`	Numeric vector of length 2 defining the middle window in milliseconds.
`late_window`	Numeric vector of length 2 defining the late window in milliseconds.
`min_valid_samples`	Minimum number of valid pupil samples required for a trial to be labelled `"ok"`.

Details

The function summarises one row per trial or other user-defined grouping. It computes mean pupil, peak pupil, time-to-peak, AUC, early/middle/late window means, valid-sample percentage, interpolation percentage, artifact percentage, and missingness summaries.

Value

A tibble with one row per trial/group.

summarise_gazepoint_pupil_windows
Summarise Gazepoint pupil responses within time windows

Description

Aggregates processed Gazepoint pupil data into user-defined analysis windows, typically after `flag_gazepoint_pupil()`, `interpolate_gazepoint_pupil()`, `baseline_correct_gazepoint_pupil()`, and `smooth_gazepoint_pupil()`. The function can summarise raw, interpolated, baseline-corrected, percent-change, or smoothed pupil columns.

Usage

```
summarise_gazepoint_pupil_windows(
  data,
  pupil_col = NULL,
  time_col = NULL,
  windows = c(0, 500, 1000, 2000),
  group_cols = c("subject", "media_id"),
  include_window_end = FALSE,
  min_valid_samples = 1
)
```

Arguments

`data`	A Gazepoint master table or processed pupil table.
`pupil_col`	Optional name of the pupil column to summarise. If `NULL`, the function detects one of `pupil_smoothed`, `pupil_baseline_corrected`, `pupil_baseline_percent_change`, `pupil_interpolated`, `pupil_for_preprocessing`, `mean_pupil`, `pupil`, `pupil_raw`, `left_pupil`, or `right_pupil`.
`time_col`	Optional name of the time column used for assigning samples to windows. If `NULL`, the function detects one of `time_relative_ms`, `relative_time_ms`, `event_time_ms`, `time_ms`, `time`, `time_orig`, or `time_orig_ms`.
`windows`	Window definitions. Either a numeric vector of breakpoints, such as `c(0, 500, 1000, 2000)`, or a data frame with window start and end columns. Supported names include `window_start_ms`, `window_start`, `start_ms`, or `start`, and `window_end_ms`, `window_end`, `end_ms`, or `end`. A `window_label` or `label` column is optional.
`group_cols`	Character vector of grouping columns. Standard roles such as `"subject"`, `"media_id"`, `"trial"`, and `"trial_global"` are internally standardised when available. Other columns, such as `"condition"` or `"AOI"`, can also be used if present in `data`. Use `character(0)` for overall window summaries.
`include_window_end`	Logical. If `FALSE`, windows are left-closed and right-open: `[start, end)`. If `TRUE`, the end point is included: `[start, end]`. Defaults to `FALSE`.

`min_valid_samples`
: Minimum number of finite pupil samples required for a window to be labelled `"valid"`. Defaults to 1.

Value

A tibble with one row per group-by-window combination present in the data.

Examples

```
## Not run:
pupil_windows <- summarise_gazepoint_pupil_windows(
  smoothed_pupil,
  pupil_col = "pupil_smoothed",
  windows = c(0, 500, 1000, 2000),
  group_cols = c("subject", "media_id")
)

## End(Not run)
```

---

summarise_gazepoint_semimarkov

Summarise Gazepoint semi-Markov data

Description

Summarise state visits and state-to-state transitions from semi-Markov preparation output or a compatible data frame. The function returns a list with a state-duration summary and a transition summary.

Usage

```
summarise_gazepoint_semimarkov(
  semimarkov_data,
  state_col = NULL,
  duration_col = NULL,
  sequence_col = NULL,
  time_col = NULL,
  from_col = NULL,
  to_col = NULL
)
```

Arguments

`semimarkov_data`
: Output from `prepare_gazepoint_semimarkov_data()` or a compatible data frame/list.

state_col	Optional state/AOI column.
duration_col	Optional state-duration column.
sequence_col	Optional sequence, subject, or trial column.
time_col	Optional time/order column.
from_col	Optional transition source-state column.
to_col	Optional transition destination-state column.

Value

A list with state_summary, transition_summary, columns, and summary_status.

---

summarise_gazepoint_workflow

Summarise a Gazepoint workflow result

Description

Creates a compact one-row summary from a result object returned by run_gazepoint_workflow(). This is useful for quickly checking how many rows, file pairs, flagged recordings, exported tables, exported plots, and reports were produced by the workflow.

Usage

```
summarise_gazepoint_workflow(results)
```

Arguments

results	A named list returned by run_gazepoint_workflow().

Value

A tibble with one row containing workflow-level summary counts.

Examples

```
## Not run:
results <- run_gazepoint_workflow(
  export_dir = "C:/Users/YourName/Desktop/gp3_test_exports",
  output_dir = "C:/Users/YourName/Desktop/gp3_outputs",
  prefix = "study1",
  save_plots = TRUE,
  create_report = TRUE
)

summarise_gazepoint_workflow(results)

## End(Not run)
```

summarise_tracking_quality
Summarise Gazepoint tracking quality

Description

Summarise Gazepoint tracking quality

Usage

```
summarise_tracking_quality(data, group_cols = "MEDIA_ID")
```

Arguments

data	A Gazepoint data frame.
group_cols	Grouping columns.

Value

A tibble with validity percentages for available validity columns.

summarize_gazepoint_time_clusters
Summarize Gazepoint time clusters

Description

summarize_gazepoint_time_clusters() provides a compact US-spelling summary of cluster-permutation output from run_gazepoint_cluster_permutation().

Usage

```
summarize_gazepoint_time_clusters(result, alpha = 0.05)
```

Arguments

result	A result object returned by run_gazepoint_cluster_permutation().
alpha	Significance threshold used for the descriptive cluster_significant flag.

Value

A data frame with one row per cluster. If no clusters are present, an empty data frame with the expected columns is returned.

Examples

```
# See run_gazepoint_cluster_permutation() for the inferential workflow.
```

`tidy_gazepoint_model_summary` *Create a tidy model summary for manuscript tables*

Description

Create a compact model-summary object from common fitted models used in `gp3tools` workflows. The function combines model metadata, fixed-effect summaries, and optional model diagnostics into one structured object.

Usage

```
tidy_gazepoint_model_summary(
  model,
  model_name = NULL,
  conf_level = 0.95,
  exponentiate = FALSE,
  drop_intercept = FALSE,
  include_diagnostics = TRUE,
  use_dharma = FALSE,
  dharma_simulations = 250,
  seed = 123
)
```

Arguments

`model`	A fitted model object, or a `gp3tools` fit object containing a `$model` element.
`model_name`	Optional model label used in returned tables.
`conf_level`	Confidence level for Wald confidence intervals.
`exponentiate`	Logical. If `TRUE`, exponentiate fixed-effect estimates and confidence intervals.
`drop_intercept`	Logical. If `TRUE`, remove the intercept from the fixed-effect table.
`include_diagnostics`	Logical. If `TRUE`, include model diagnostics when supported.
`use_dharma`	Logical. If `TRUE`, request optional DHARMa diagnostics.
`dharma_simulations`	Number of DHARMa simulations.
`seed`	Random seed used before DHARMa simulation.

Value

A list with overview, model_info, fixed_effects, diagnostics, and settings. The returned object has class `gp3_model_summary`.

`transform_gazepoint_aoi_empirical_logit` *Transform AOI proportions to empirical logits*

Description

Convert bounded AOI proportions into empirical logits for linear mixed models, growth-curve analysis, or other approximately Gaussian time-course models.

Usage

```
transform_gazepoint_aoi_empirical_logit(
  data,
  numerator_col = NULL,
  denominator_col = NULL,
  proportion_col = NULL,
  correction = 0.5,
  pseudo_denominator = 1,
  output_col = "aoi_empirical_logit",
  adjusted_proportion_col = "aoi_proportion_adjusted",
  raw_proportion_col = "aoi_proportion_raw",
  numerator_output_col = "aoi_numerator",
  denominator_output_col = "aoi_denominator",
  status_col = "aoi_empirical_logit_status",
  overwrite = FALSE,
  name = "gazepoint_aoi_empirical_logit"
)
```

Arguments

`data`	A data frame containing AOI proportions or AOI count data.
`numerator_col`	Optional numerator column, for example number of samples or fixations inside the AOI.
`denominator_col`	Optional denominator column, for example total valid samples or total fixations in the window.
`proportion_col`	Optional bounded AOI proportion column. If `numerator_col` and `denominator_col` are supplied, the raw proportion is computed from those columns. If only `proportion_col` is supplied, a pseudo-denominator is used and recorded in the output.
`correction`	Positive correction constant added to numerator and non-AOI count. The common empirical-logit correction is `0.5`.
`pseudo_denominator`	Positive pseudo-denominator used only when `proportion_col` is supplied without `denominator_col`.

`output_col` Name of the empirical-logit output column.

`adjusted_proportion_col`
Name of the adjusted proportion output column.

`raw_proportion_col`
Name of the raw proportion output column.

`numerator_output_col`
Name of the numerator output column used in the transformation.

`denominator_output_col`
Name of the denominator output column used in the transformation.

`status_col` Name of the row-level transformation status column.

`overwrite` Logical. If `FALSE`, the function errors when output columns already exist in `data`.

`name` Character label stored in object attributes.

Details

Binomial GLMMs are usually preferable when numerator and denominator counts are available. This helper is intended for sensitivity analyses, GCA-style models, and linear time-course summaries where a transformed AOI proportion is needed.

Value

A tibble with empirical-logit transformation columns added. The object has class `gp3_aoi_empirical_logit_data`.

`validate_gazepoint_master`
Validate a Gazepoint master sample table

Description

Performs formal validation checks on a Gazepoint master sample-level table created by `as_gazepoint_master()` or `create_gazepoint_master()`. This function is intended as a gate between master-table construction and more advanced steps such as pupil preprocessing, AOI modelling, or statistical analysis.

Usage

```
validate_gazepoint_master(
  master,
  min_valid_sample_pct = 75,
  max_missing_gaze_pct = 25,
  max_missing_pupil_pct = 50,
  max_offscreen_gaze_pct = 25,
  require_pupil = FALSE,
  require_aoi = FALSE,
  fail_on_error = FALSE
)
```

Arguments

`master`	A Gazepoint master sample-level table.
`min_valid_sample_pct`	Minimum acceptable percentage of valid gaze samples. Defaults to `75`.
`max_missing_gaze_pct`	Maximum acceptable percentage of missing gaze samples. Defaults to `25`.
`max_missing_pupil_pct`	Maximum acceptable percentage of missing pupil samples. Defaults to `50`.
`max_offscreen_gaze_pct`	Maximum acceptable percentage of off-screen gaze samples. Defaults to `25`.
`require_pupil`	Logical. If `TRUE`, the validation fails when no usable pupil column is present. Defaults to `FALSE`.
`require_aoi`	Logical. If `TRUE`, the validation fails when no real AOI samples are present. Defaults to `FALSE`.
`fail_on_error`	Logical. If `TRUE`, the function aborts when one or more validation checks fail. Defaults to `FALSE`.

Value

A named list with:

summary One-row validation summary.

checks A tibble containing all validation checks.

failed_checks Validation checks with status `"fail"`.

warning_checks Validation checks with status `"warning"`.

column_map Detected column mapping used for validation.

Examples

```
## Not run:
master <- create_gazepoint_master(
  gaze_data = results$all_gaze,
  screen_width_px = 1920,
  screen_height_px = 1080
)

validation <- validate_gazepoint_master(master)

validation$summary
validation$checks

## End(Not run)
```

`write_gazepoint_outputs` *Write standard Gazepoint analysis outputs*

Description

Convenience wrapper for exporting standard `gp3tools` outputs such as sampling checks, tracking quality summaries, flagged quality rows, and AOI tables.

Usage

```
write_gazepoint_outputs(
  sampling = NULL,
  quality = NULL,
  flagged_quality = NULL,
  aoi_table = NULL,
  output_dir,
  prefix = "gazepoint",
  overwrite = TRUE
)
```

Arguments

`sampling`	Sampling-rate table, usually from `check_sampling_rate()`.
`quality`	Tracking-quality table, usually from `summarise_tracking_quality()`.
`flagged_quality`	Flagged quality table, usually from `flag_tracking_quality()`.
`aoi_table`	AOI summary table, usually from `summarise_gazepoint_aoi()`.
`output_dir`	Folder where CSV files should be written.
`prefix`	Optional filename prefix.
`overwrite`	Logical. If `FALSE`, stop when files already exist.

Value

A tibble with table names and written file paths.

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