Package 'r4subscore'

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Title Submission Confidence Index Engine

Version 0.1.0

Description Converts standardized R4SUB (R for Regulatory Submission) evidence into indicator scores, pillar scores, and a Submission Confidence Index (SCI). Provides sensitivity analysis, explainability tables, and decision band classification to answer the question: are we ready for regulatory submission.

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URL https://github.com/R4SUB/r4subscore

BugReports https://github.com/R4SUB/r4subscore/issues

Depends R (>= 4.2)

Imports cli, dplyr, r4subcore, rlang, tibble

Suggests testthat (>= 3.0.0)

Config/testthat/edition 3

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Repository CRAN

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`classify_band` *Classify SCI Value into Decision Band*

Description

Classify SCI Value into Decision Band

Usage

```
classify_band(sci_value, bands = sci_config_default()$bands)
```

Arguments

`sci_value`	Numeric SCI score (0–100).
`bands`	Named list of band boundaries from `sci_config_default()`.

Value

Character band name.

Examples

```
classify_band(92)
classify_band(55)
```

`compute_indicator_scores`
Compute Indicator-Level Scores

Description

Converts each indicator in an evidence table into a numeric score (0–1) using severity-weighted result scoring.

Usage

```
compute_indicator_scores(evidence)
```

Arguments

`evidence`	A validated evidence data.frame (from `r4subcore`).

Details

For each evidence row:

- `result_score` = `r4subcore::result_to_score(result)` (pass=1, warn=0.5, fail=0)
- `severity_weight` = `r4subcore::severity_to_weight(severity)` (info=0, ..., critical=1)
- `weighted_score` = `result_score * (1 - severity_weight)`

Rows are grouped by `indicator_id` and `indicator_domain`, and the indicator score is the mean of `weighted_score` within each group.

Value

A tibble with columns: `indicator_id`, `indicator_name`, `indicator_domain`, `n_evidence`, `indicator_score`.

Examples

```
ctx <- r4subcore::r4sub_run_context(study_id = "STUDY01")
ev <- r4subcore::as_evidence(
  data.frame(
    asset_type = "dataset", asset_id = "ADSL",
    source_name = "test", source_version = "1.0",
    indicator_id = "Q-001", indicator_name = "Test",
    indicator_domain = "quality", severity = "high",
    result = "fail", metric_value = 1, metric_unit = "n",
    message = "Example finding", location = "ADSL",
    evidence_payload = "{}", stringsAsFactors = FALSE
  ), ctx = ctx
)
scores <- compute_indicator_scores(ev)
scores
```

`compute_pillar_scores` *Compute Pillar Scores*

Description

Aggregates indicator scores into pillar-level scores (one per domain). Each pillar score is the mean of its indicator scores.

Usage

```
compute_pillar_scores(evidence, config = sci_config_default())
```

Arguments

`evidence`	A validated evidence data.frame.
`config`	An `sci_config` from `sci_config_default()`.

Value

A tibble with columns: `pillar`, `pillar_score`, `n_indicators`, `weight`.

Examples

```
ctx <- r4subcore::r4sub_run_context(study_id = "STUDY01")
ev <- r4subcore::as_evidence(
  data.frame(
    asset_type = "dataset", asset_id = "ADSL",
    source_name = "test", source_version = "1.0",
    indicator_id = "Q-001", indicator_name = "Test",
    indicator_domain = "quality", severity = "high",
    result = "fail", metric_value = 1, metric_unit = "n",
    message = "Example finding", location = "ADSL",
    evidence_payload = "{}", stringsAsFactors = FALSE
  ), ctx = ctx
)
ps <- compute_pillar_scores(ev)
ps
```

---

compute_sci *Compute Submission Confidence Index (SCI)*

Description

Computes the SCI from pillar scores as a weighted sum scaled to 0–100, with decision band classification.

Usage

```
compute_sci(pillar_scores, config = sci_config_default())
```

Arguments

`pillar_scores`	A tibble from `compute_pillar_scores()` with columns `pillar`, `pillar_score`, `weight`.
`config`	An `sci_config` from `sci_config_default()`.

Details

The SCI is computed as:

`SCI = round(sum(pillar_score * weight) * 100, 1)`

Pillars with `NA` scores are excluded from both the numerator and the weight normalization denominator.

Value

A list of class "sci_result" with:

- SCI: numeric 0–100
- band: character band classification
- pillar_scores: the input pillar scores tibble
- weights_used: named numeric vector of effective weights

Examples

```
ctx <- r4subcore::r4sub_run_context(study_id = "STUDY01")
ev <- r4subcore::as_evidence(
  data.frame(
    asset_type = "dataset", asset_id = "ADSL",
    source_name = "test", source_version = "1.0",
    indicator_id = "Q-001", indicator_name = "Test",
    indicator_domain = "quality", severity = "high",
    result = "fail", metric_value = 1, metric_unit = "n",
    message = "Example finding", location = "ADSL",
    evidence_payload = "{}", stringsAsFactors = FALSE
  ), ctx = ctx
)
ps <- compute_pillar_scores(ev)
result <- compute_sci(ps)
result$SCI
result$band
```

---

print.sci_result *Print SCI Result*

Description

Print SCI Result

Usage

```
## S3 method for class 'sci_result'
print(x, ...)
```

Arguments

x	An sci_result object.
...	Ignored.

Value

Invisibly returns `x`. Called for its side effect of printing the Submission Confidence Index value, decision band, and per-pillar score breakdown (with weights) to the console.

`sci_config_default` *Default SCI Configuration*

Description

Returns a configuration list with default pillar weights, decision bands, and scoring parameters for the Submission Confidence Index.

Usage

```
sci_config_default(
  pillar_weights = c(quality = 0.35, trace = 0.25, risk = 0.25, usability = 0.15),
  bands = list(ready = c(85, 100), minor_gaps = c(70, 84), conditional = c(50, 69),
    high_risk = c(0, 49))
)
```

Arguments

`pillar_weights`	Named numeric vector of weights for each pillar. Must sum to 1. Names must be a subset of `"quality"`, `"trace"`, `"risk"`, `"usability"`.
`bands`	Named list of numeric length-2 vectors defining SCI band boundaries `c(lower, upper)`. Evaluated in order; first match wins.

Value

A list of class `"sci_config"` with elements: `pillar_weights`, `bands`.

Examples

```
cfg <- sci_config_default()
cfg$pillar_weights
cfg$bands

# Custom weights (must sum to 1)
sci_config_default(
  pillar_weights = c(quality = 0.40, trace = 0.20, risk = 0.30, usability = 0.10)
)
```

`sci_explain` *Explain SCI Contributors*

Description

Identifies which indicators contribute most to SCI loss and provides a breakdown of pillar contributions.

Usage

```
sci_explain(evidence, config = sci_config_default())
```

Arguments

`evidence`	A validated evidence data.frame.
`config`	An `sci_config` from `sci_config_default()`.

Details

For each indicator, the contribution to SCI loss is:

`loss = pillar_weight * (1 - indicator_score) / n_indicators_in_pillar`

This gives a sense of how much each indicator drags the SCI down. Results are sorted by `loss` descending (worst contributors first).

Value

A list with:

- `indicator_contributions`: tibble of per-indicator loss contributions
- `pillar_contributions`: tibble of per-pillar contributions to SCI

Examples

```
ctx <- r4subcore::r4sub_run_context(study_id = "STUDY01")
ev <- r4subcore::as_evidence(
  data.frame(
    asset_type = "dataset", asset_id = "ADSL",
    source_name = "test", source_version = "1.0",
    indicator_id = "Q-001", indicator_name = "Test",
    indicator_domain = "quality", severity = "high",
    result = "fail", metric_value = 1, metric_unit = "n",
    message = "Example finding", location = "ADSL",
    evidence_payload = "{}", stringsAsFactors = FALSE
  ), ctx = ctx
)
expl <- sci_explain(ev)
expl$indicator_contributions
expl$pillar_contributions
```

`sci_sensitivity_analysis` *SCI Sensitivity Analysis*

Description

Evaluates the stability of the Submission Confidence Index under alternative pillar weight scenarios.

Usage

```
sci_sensitivity_analysis(evidence, weight_grid)
```

Arguments

`evidence`	A validated evidence data.frame.
`weight_grid`	A data.frame where each row is a weight scenario. Column names must match pillar names (`quality`, `trace`, `risk`, `usability`). Each row must sum to 1.

Value

A tibble with one row per scenario, containing: `scenario` (row number), the weight columns, `SCI`, and band.

Examples

```
ctx <- r4subcore::r4sub_run_context(study_id = "STUDY01")
ev <- r4subcore::as_evidence(
  data.frame(
    asset_type = "dataset", asset_id = "ADSL",
    source_name = "test", source_version = "1.0",
    indicator_id = "Q-001", indicator_name = "Test",
    indicator_domain = "quality", severity = "high",
    result = "fail", metric_value = 1, metric_unit = "n",
    message = "Example finding", location = "ADSL",
    evidence_payload = "{}", stringsAsFactors = FALSE
  ), ctx = ctx
)
grid <- data.frame(
  quality   = c(0.4, 0.3, 0.25),
  trace     = c(0.2, 0.3, 0.25),
  risk      = c(0.3, 0.2, 0.25),
  usability = c(0.1, 0.2, 0.25)
)
sci_sensitivity_analysis(ev, grid)
```

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