Package ‘bayesROE’

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Title Bayesian Regions of Evidence
Version 0.1
Description Computation and visualization of Bayesian Regions of Evidence to systematically evaluate the sensitivity of a superiority or non-inferiority claim against any prior assumption of its assessors. Methodological details are elaborated by Hoefler and Miller (2023) <https://osf.io/jxnsv>. Besides generic functions, the package also provides an intuitive 'Shiny' application, that can be run in local R environments.
License GPL (>= 3)
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rasterROE

Bayesian Regions of Evidence Raster Plot

Description
Compute and visualize the Bayesian Regions of Evidence (Raster), that is, the set of normal priors for an effect size which - when combined with the observed data - lead to a specified posterior probability for the effect size being more extreme than a specified minimally relevant effect size.

Usage
rasterROE(
    ee,
    se,
    delta = 0,
    alpha = 0.025,
    type = "threshold",
    larger = TRUE,
    meanLim = c(-3 * abs(ee), 3 * abs(ee)),
    sdLim = c(0, 5 * se),
    nGrid = 200,
    cols = NULL,
    cols_alpha = 1,
    add = FALSE
)

Arguments

<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ee</td>
<td>Effect estimate.</td>
</tr>
<tr>
<td>se</td>
<td>Standard error of effect estimate.</td>
</tr>
<tr>
<td>delta</td>
<td>Minimally relevant effect size. Defaults to zero. Can also be a vector of numerical values to representing different regions.</td>
</tr>
<tr>
<td>alpha</td>
<td>Posterior probability that the effect size is less extreme than delta. Defaults to 0.025. Can also be a vector of numerical values representing different regions.</td>
</tr>
<tr>
<td>type</td>
<td>Character indicating if regions of evidence should be constructed for a non-inferiority claim using the first element of delta and all elements of alpha (&quot;threshold&quot;), for a non-inferiority claim using the all elements of delta and the first element of alpha (&quot;probability&quot;), for an equivalence claim using the first two elements of delta and all elements of alpha (&quot;equivalence&quot;), or for a prior-data conflict using only the first element of alpha (&quot;conflict&quot;). Defaults to &quot;threshold&quot;.</td>
</tr>
<tr>
<td>larger</td>
<td>Logical indicating if effect size should be larger (TRUE) or smaller (FALSE) than delta. Ignored when type = &quot;equivalence&quot; or type = &quot;conflict&quot;. Defaults to TRUE.</td>
</tr>
<tr>
<td>meanLim</td>
<td>Limits of prior mean axis.</td>
</tr>
</tbody>
</table>
ribbonROE

sdLim  Limits of prior standard deviation axis.
nGrid  Resolution of grid points (on both axes). Defaults to 200.
cols   Character containing the HEX color code of the upper and lower region of evidence, respectively. Defaults to NULL, which triggers automated color picking by calling ggplot2::scale_fill_viridis_d()
cols_alpha Numeric value indicating the relative opacity of any region of evidence (alpha channel). Defaults to 1 (no transparency).
add Logical indicating if a separate geom_raster layer should be created that can be added to an existing plot (TRUE), or if an entire regions of plot should be created (FALSE). Defaults to FALSE.

Value
A bayesROE object (a list containing the ggplot object, the data for the plot, and the empty tipping point function)

References
Hoefler, M., Miller, R. (2022, April 04). Bayesian regions of evidence (for normal distributions). doi: 10.31234/osf.io/mg23h

Examples
## data with p < 0.025 for H0: delta < 0, but p > 0.025 for H0: delta < 0.3
d <- 0.4
d_se <- 0.1
delta <- c(0, 0.3)
rasterROE(ee = d, se = d_se, delta = delta, meanLim = c(-1, 1))

## reproducing Figure 3 from Hoefler & Miller (2023)
ee <- 9
se <- 3.9
delta <- c(0, 3.75)
rasterROE(ee = ee, se = se, delta = delta, alpha = 0.05)$plot +
ggplot2::annotate(geom = "point", y = ee, x = se, shape = 4) +
ggplot2::coord_flip(xlim = c(0, 12), ylim = c(-5, 10))
Description

Compute and visualize the Bayesian Regions of Evidence (Ribbon), that is, the set of normal priors for an effect size which - when combined with the observed data - lead to a specified posterior probability for the effect size being more extreme than a specified minimally relevant effect size.

Usage

ribbonROE(
  ee,
  se,
  delta = 0,
  alpha = 0.025,
  type = "threshold",
  larger = TRUE,
  meanLim = c(pmin(2 * ee, 0), pmax(0, 2 * ee)),
  sdLim = c(0, 3 * se),
  nGrid = 500,
  relative = TRUE,
  cols = NULL,
  cols_alpha = 1,
  addRef = TRUE,
  addEst = FALSE
)

Arguments

ee Effect estimate.
se Standard error of effect estimate.
delta Minimally relevant effect size. Defaults to zero. Can also be a vector of numerical values to representing different regions.
alpha Posterior probability that the effect size is less extreme than delta. Defaults to 0.025. Can also be a vector of numerical values representing different regions.
type Character indicating if regions of evidence should be constructed for a non-inferiority claim using the first element of delta and all elements of alpha ("threshold") or for a non-inferiority claim using the all elements of delta and the first element of alpha ("probability"). Defaults to "threshold".
larger Logical indicating if effect size should be larger (TRUE) or smaller (FALSE) than delta. Defaults to TRUE.
meanLim Limits of prior mean axis. Defaults to interval between zero and two times the effect estimate.
sdLim Limits of prior standard deviation axis. Defaults to interval between zero and three times the standard error.
nGrid Number of grid points (on the standard error axis). Defaults to 500.
relative Logical indicating whether a second x-axis and y-axis with relative prior mean and relative prior variance should be displayed. Defaults to TRUE.
run_app

```r
cols
``` Character containing the HEX color code of the upper and lower region of evidence, respectively. Defaults to NULL, which triggers automated color picking by calling ggplot2::scale_fill_viridis_d()

```r
cols_alpha
``` Numeric value indicating the relative opacity of any region of evidence (alpha channel). Defaults to 1 (no transparency).

```r
addRef
``` Logical indicating if a reference cross representing the minimum sceptical prior is added to the plot. If delta or alpha are vectors, only their first element(s) will be processed. Defaults to TRUE.

```r
addEst
``` Logical indicating if a point symbol representing the mean and standard error of the effect estimate (ee, se) is added to the plot. Defaults to FALSE.

Value

A bayesROE object (a list containing the ggplot object, the data for the plot, and the tipping point function)

References


Examples

```r
## data with p < 0.025 for H0: delta < 0, but p > 0.025 for H0: delta < 0.3
d <- 0.4
d_se <- 0.1
delta <- c(0, 0.3)
ribbonROE(ee = d, se = d_se, delta = delta, meanLim = c(-1, 1))

## reproducing Figure 1 from Hoefler & Miller (2023)
e <- 3.07
se <- 1.19
ribbonROE(ee = ee, se = se, delta = c(0,3), alpha = 0.025,
cols = c("#F5FF82", "]27CC1E"))$plot +
ggplot2::annotate(geom = "point", y = ee, x = se, shape = 4) +
ggplot2::coord_flip(ylim = c(-5, 15))
```

Description

Initialize and execute a local Shiny session to interactively visualize and explore the Bayesian Regions of Evidence. Parameters entries from the sidebar are passed to the bayesROE function.
Usage

```r
run_app(
  onStart = NULL,
  options = list(launch.browser = TRUE),
  enableBookmarking = NULL,
  uiPattern = "/",
  init = NULL,
  cols = NULL,
  ...
)
```

Arguments

- **onStart**: A function that will be called before the app is actually run. This is only needed for `shinyAppObj`, since in the `shinyAppDir` case, a `global.R` file can be used for this purpose.
- **options**: Named options that should be passed to the `runApp` call (these can be any of the following: "port", "launch.browser", "host", "quiet", "display.mode" and "test.mode"). You can also specify `width` and `height` parameters which provide a hint to the embedding environment about the ideal height/width for the app.
- **enableBookmarking**: Can be one of "url", "server", or "disable". The default value, `NULL`, will respect the setting from any previous calls to `enableBookmarking()`. See `enableBookmarking()` for more information on bookmarking your app.
- **uiPattern**: A regular expression that will be applied to each GET request to determine whether the `ui` should be used to handle the request. Note that the entire request path must match the regular expression in order for the match to be considered successful.
- **init**: Named list containing the arguments that are passed to the `bayesROE` function: `ee`, `se`, `delta`, `alpha`.
- **cols**: Named list of RGB hexadecimal color keys.
- **...**: arguments to pass to `golem_opts`. See `'golem::get_golem_options` for more details.

Value

Start Shiny server and access application using browser

Examples

```r
# reproducing Figure 3 from Hoefler and Miller (2023)
init <- list(ee = 9, se = 3.9, delta = c(0, 3.75), alpha = 0.025)
cols <- list(col_lower = "#F5FF82", col_upper = "#27CC1E")
if(interactive()){
  run_app(init = init, cols = cols)
}
```
Description

Initialize and execute a local Shiny session to interactively visualize and explore the Bayesian Regions of Evidence. Parameters entries from the sidebar are passed to the bayesROE function. The function has been deprecated in favor of bayesROE::run_app() and is only retained for downward compatibility.

Usage

shinyROE(init = NULL, ...)

Arguments

init

Named list containing the arguments that are passed to the bayesROE function: ee, se, delta, alpha.

... arguments to pass to golem_opts. See ‘?golem::get_golem_options’ for more details.

Value

Start Shiny server and access application using browser

Examples

# reproducing Figure 3 from Hoefler and Miller (2023)
init <- list(ee = 9, se = 3.9, delta = c(0, 3.75), alpha = 0.025)
if(interactive()){  
  shinyROE(init = init)
}
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