Package 'BayesianReasoning'

October 12, 2022

Type Package

Title Plot Positive and Negative Predictive Values for Medical Tests

Version 0.4.1

Date 2022-01-03

Maintainer Gorka Navarrete <gorkang@gmail.com>

Description Functions to plot and help understand positive and negative predictive values (PPV and NPV), and their relationship with sensitivity, specificity, and prevalence. See Akobeng, A.K. (2007) <doi:10.1111/j.1651-2227.2006.00180.x> for a theoretical overview of the technical concepts and Navarrete et al. (2015) for a practical explanation about the importance of their understanding <doi:10.3389/fpsyg.2015.01327>.

License CC0

URL https://github.com/gorkang/BayesianReasoning

BugReports https://github.com/gorkang/BayesianReasoning/issues

Depends R (>= 3.5.0)

Imports dplyr, ggforce, ggplot2, magrittr, reshape2, stats, tibble, tidyr, utils

Suggests curl, httr, knitr, patchwork, purrr, rmarkdown, testthat

VignetteBuilder knitr

Encoding UTF-8

RoxygenNote 7.1.2

NeedsCompilation no

Author Gorka Navarrete [aut, cre] (<https://orcid.org/0000-0001-7678-8656>)

Repository CRAN

Date/Publication 2022-01-07 13:53:16 UTC

R topics documented:

`min_possible_prevalence` *Show minimum possible prevalence given the test characteristics*

Description

Given a FP and a desired PPV, what is the Minimum Prevalence of a Condition

Usage

```
min_possible_prevalence(Sensitivity = 95, FP_test = 1, min_PPV_desired = 90)
```

Arguments

`Sensitivity`	Sensitivity of the test: [0-100]
`FP_test`	False positive rate (1-Specificity): [0-100]
`min_PPV_desired`	Which PPV is what you consider the minimum to trust a positive result in the test: [0-100]

Value

A description showing the minimum necessary prevalence.

Examples

```
# Example 1
min_possible_prevalence(Sensitivity = 99.9, FP_test = .1, min_PPV_desired = 70)
"To reach a PPV of 70 when using a test with 99.9 % Sensitivity and 0.1 % False Positive Rate,
you need a prevalence of at least 1 out of 429"

# Example 2
min_possible_prevalence(100, 0.1, 98)
"To reach a PPV of 98 when using a test with 100 % Sensitivity and 0.1 % False Positive Rate,
you need a prevalence of at least 1 out of 21"
```

PPV_diagnostic_vs_screening *Plot PPV values for a diagnostic and a screening group*

Description

Plot PPV associated to different levels of FP and a specific Sensitivity, for two different Prevalence groups.

Usage

```
PPV_diagnostic_vs_screening(
  max_FP = 10,
  Sensitivity = 100,
  prevalence_screening_group = 100,
  prevalence_diagnostic_group = 2,
  labels_prevalence = c("Screening", "Diagnostic"),
  folder = ""
)
```

Arguments

max_FP	False positive rate (1-Specificity) [0-100].
Sensitivity	Sensitivity of the test [0-100].
prevalence_screening_group	Prevalence of the screening group, 1 out of x [1-Inf].
prevalence_diagnostic_group	Prevalence of the diagnostic group, 1 out of x [1-Inf].
labels_prevalence	Labels to use for both groups.
folder	Where to save the plot (the filename would be automatically created using the plot parameters)

Value

Shows a plot or, if given a folder argument, saves a .png version of the plot

Examples

```
# Example 1
PPV_diagnostic_vs_screening(max_FP = 10, Sensitivity = 100,
                            prevalence_screening_group = 1500,
                            prevalence_diagnostic_group = 3)

# Example 2. QWith custom labels
PPV_diagnostic_vs_screening(max_FP = 10, Sensitivity = 100,
```

```
 prevalence_screening_group = 1667,
 prevalence_diagnostic_group = 44,
labels_prevalence = c("20 y.o.", "50 y.o."))
```

PPV_heatmap *Plot PPV and NPV heatmaps*

Description

Plot heatmaps showing the PPV for a given Sensitivity and a range of Prevalences and False Positive values or NPV values for a given Specificity and a range of Prevalences and True Positive values

Usage

```
PPV_heatmap(
  min_Prevalence = 1,
  max_Prevalence = 1000,
  Sensitivity = NULL,
  Specificity = NULL,
  limits_Sensitivity = NULL,
  limits_Specificity = NULL,
  one_out_of = FALSE,
  overlay = "no",
  overlay_labels = "",
  overlay_extra_info = FALSE,
  overlay_position_FP = NULL,
  overlay_position_FN = NULL,
  overlay_prevalence_1 = NULL,
  overlay_prevalence_2 = NULL,
  uncertainty_prevalence = "high",
  label_title = "",
  label_subtitle = "",
  Language = "en",
  folder = "",
  PPV_NPV = "PPV",
  steps_matrix = 100,
  DEBUG = FALSE,
  ...
)
```

Arguments

min_Prevalence	[x] out of y prevalence of disease: [1-Inf]
max_Prevalence	x out of [y] prevalence of disease: [1-Inf]
Sensitivity	Sensitivity of test: [0-100]
Specificity	Specificity of test: [0-100]

limits_Sensitivity
: c(min Sensitivity, max Sensitivity)

limits_Specificity
: c(min Specificity, max Specificity)

one_out_of
: Show y scale as 1 out of x [TRUE, FALSE] FALSE by default

overlay
: Type of overlay: ["line", "area"]

overlay_labels
: Labels for each point in the overlay. For example: c("80", "70", "60", "50", "40", "30", "20 y.o.")

overlay_extra_info
: show extra info in overlay? [TRUE/FALSE]

overlay_position_FP
: FP value (position in the x-axis) for each point in the overlay. For example: c(7, 8, 9, 12, 14, 14)

overlay_position_FN
: FN value (position in the x-axis) for each point in the overlay. For example: c(7, 8, 9, 12, 14, 14)

overlay_prevalence_1
: Prevalence value (position in the y-axis) for each point in the overlay. For example: c(1, 1, 1, 2, 1, 1)

overlay_prevalence_2
: Prevalence value (position in the y-axis) for each point in the overlay. For example: c(26, 29, 44, 69, 227, 1667)

uncertainty_prevalence
: How much certainty we have about the prevalence ["high"/"low"]

label_title
: Title for the plot

label_subtitle
: Subtitle for the plot

Language
: Language for the plot labels: ["sp", "en"]

folder
: Where to save the plot (the filename would be automatically created using the plot parameters)

PPV_NPV
: Should show PPV or NPV ["PPV", "NPV"]

steps_matrix
: width of PPV/NPV matrix. 100 by default

DEBUG
: Shows debug warnings [TRUE/FALSE]

...
: Other parameters. Now used to pass dpi, height and width in the Show and Save plot section

Value

Shows a plot or, if given a folder argument, saves a .png version of the plot

Examples

```
PPV_heatmap(min_Prevalence = 1,
max_Prevalence = 1000,
Sensitivity = 100,
Specificity = 98,
Language = "en")
```

Index