

Package ‘memoryROC’

Jörn Alexander Quent

4 September 2016

Contents

General information	1
Introduction	1
Functions	2
sampleData	2
cumRates	2
fitDPSD	2
DPSD	2
rememberKnow	3
rocAUC	3
returnFittedROC	3
License	4

General information

Version: 1.0

License: GPL-2

URL: <https://github.com/JAQuent/memoryROC>

Contact: alexander.quent@rub.de

Introduction

This package was written to analyse recognition memory performance and estimate the Dual Process Signal Detection parameters within R. Additional functions might be added, once I need them. This manual is supposed to provide a short description and explanation how to use the functions. If you have corrections and/or questions, feel free to contact me.

Functions

sampleData

The sample data is taken from a pilot recognition experiment using the remember/know procedure. In this experiment, this subject was asked to rate the recognition confidence from 1 (sure new) to 5 (sure old) or recollected (= 6). The data frame is *sampleData* contains the variables *confidenceRatings*, which contains confidence ratings, and *oldNew*, which contains information whether a stimuli had been studied (i.e. old, = 1) or had not been studied (i.e. new, = 0). Add equations

cumRates

This function allows you to extract cumulative hit and false alarm rates for memory ROC analysis.

Example:

```
responseScale <- 6:1
rates <- cumRates(responseScale, sampleData$confidenceRatings, sampleData$oldNew)
rates
```

```
##   falseAlarm      hit
## 1 0.03333333 0.5666667
## 2 0.10000000 0.6833333
## 3 0.16666667 0.7666667
## 4 0.40000000 0.8666667
## 5 0.76666667 0.9666667
```

fitDPSD

This function allows to estimate recollection and familiarity by fitting it to DPSD model. The optimization is attempted by minimizing the total squared difference between observed and predicted hit and false alarm rates. The Broyden-Fletcher-Goldfarb-Shanno (BFGS) algorithm from the function.

Example:

```
fitDPSD(rates$falseAlarm, rates$hit)
```

```
## $recollection
## [1] 0.4895455
##
## $familiarity
## [1] 0.9709525
```

DPSD

This function combines the functions *cumRates* and *fitDPSD* for easy usage.

Example:

```
responseScale <- 6:1
DPSD(responseScale, sampleData$confidenceRatings, sampleData$oldNew)
```

```
## $recollection
## [1] 0.4895427
##
## $familiarity
## [1] 0.9709505
```

rememberKnow

This function allows to estimate recollection and familiarity using ROC Remember/Know procedure.

Example:

In the variable *confidenceRatings* 6 represents remember responses, while 5 & 4 represent know responses.

```
rememberLevels <- 6
knowLevels      <- c(5, 4)
rememberKnow(rememberLevels, knowLevels, sampleData$confidenceRatings, sampleData$oldNew)
```

```
## $recollection
## [1] 0.5666667
##
## $familiarity
## [1] 0.4615385
```

rocAUC

This function calculates the AUC by summing the tri- and rectangles, which can be made of each point. If missing, the y-intercept is added by linear interpolation. The last point, where both false Alarm rates reach 1, is also added.

```
rememberLevels <- 6
rates           <- cumRates(responseScale, sampleData$confidenceRatings, sampleData$oldNew)
rocAUC(rates$falseAlarm, rates$hit)
```

```
## [1] 0.8640278
```

returnFittedROC

This function allows you to get the corresponding false alarm and hit rates for a given set of recollection and familiarity assuming that the variance of the old item distribution is 1. This is helpful to compare raw hit and false alarm rates with fitted ones.

```
recollection <- 0.4895505
familiarity <- 0.9709519
fittedRates <- returnFittedROC(recollection, familiarity)
head(fittedRates)
```

```
##      falseAlarm      hit
## 1         0.001 0.4982452
## 2         0.011 0.5372852
## 3         0.021 0.5630496
## 4         0.031 0.5841376
## 5         0.041 0.6024469
## 6         0.051 0.6188243
```

License

memoryROC A package to analyse recognition memory data within R.

Copyright (C) 2016 Jörn Alexander Quent

This program is free software; you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation; either version 2 of the License, or (at your option) any later version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the GNU General Public License for more details.

You should have received a copy of the GNU General Public License along with this program; if not, write to the Free Software Foundation, Inc., 51 Franklin Street, Fifth Floor, Boston, MA 02110-1301, USA.