Package ‘PCMRS’

Type Package
Title Model Response Styles in Partial Credit Models
Version 0.1-4
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Description Implementation of PCMRS (Partial Credit Model with Response Styles) as proposed in by Tutz, Schauberger and Berger (2018) <doi:10.1177/0146621617748322>. PCMRS is an extension of the regular partial credit model. PCMRS allows for an additional person parameter that characterizes the response style of the person. By taking the response style into account, the estimates of the item parameters are less biased than in partial credit models.
License GPL (>= 2)
Imports Rcpp (>= 0.12.4)
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Description

Performs PCMRS, a method to model response styles in Partial Credit Models

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References


See Also

PCMRS, person.posterior, tenseness, emotion

Examples

```
## Not run:
########################################################################
## Small example to illustrate model and person estimation
########################################################################

data(tenseness)

set.seed(5)
samples <- sample(1:nrow(tenseness), 100)
tense_small <- tenseness[samples,1:4]

m_small <- PCMRS(tense_small, cores = 2)
m_small
plot(m_small)

persons <- person.posterior(m_small, cores = 2)
plot(jitter(persons, 100))

########################################################################
## Example from Tutz et al. 2017: 
########################################################################

data(emotion)
```
emotion

```
m.emotion <- PCMRS(emotion)
m.emotion

plot(m.emotion)
## End(Not run)
```

<table>
<thead>
<tr>
<th>emotion</th>
<th>Emotional reactivity data from the Freiburg Complaint Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>emotion</td>
<td>(emotion)</td>
</tr>
</tbody>
</table>

**Description**

Data from the Freiburg Complaint Checklist. The data contain all 8 items corresponding to the scale *Emotional reactivity* for 2032 participants of the standardization sample of the Freiburg Complaint Checklist.

**Format**

A data frame containing data from the Freiburg Complaint Checklist with 2032 observations. All items refer to the scale *Emotional reactivity* and are measured on a 5-point Likert scale where low numbers correspond to low frequencies or low intensities of the respective complaint and vice versa.

- **Feel upset in whole body** Do you feel it in the whole body when you get upset about something?
- **Eyes well up with tears** Do your eyes well up with tears in certain situations?
- **Stammer** Do you sometimes start stammering in certain situations?
- **Blush** Do you blush?
- **Gasp for air** Do you have to gasp for air in exciting situations, so that you have to take a deep breath?
- **Rapid heartbeat in excitement** Do you feel a rapid heartbeat in excitement?
- **Urge to defecate in excitement** Do you feel the urge to defecate in excitement?
- **Trembling knees** Do you start trembling in excitement or do you get trembling knees?

**Source**


**References**

Examples

```r
## Not run:
data(emotion)
m.emotion <- PCMRS(emotion)
m.emotion

plot(m.emotion)

## End(Not run)
```

---

### Description

Performs PCMRS, a method to model response styles in Partial Credit Models

### Usage

```r
PCMRS(
  Y,
  Q = 10,
  scaled = TRUE,
  method = c("L-BFGS-B", "nlminb"),
  cores = 30,
  lambda = 0
)
```

### Arguments

- **Y**: Data frame containing the ordinal item response data (as ordered factors), one row per observation, one column per item.
- **Q**: Number of nodes to be used (per dimension) in two-dimensional Gauss-Hermite-Quadrature.
- **scaled**: Should the scaled version of the response style parameterization be used? Default is TRUE.
- **method**: Specifies optimization algorithm used by `optim`, either L-BFGS-B or `nlminb`.
- **cores**: Number of cores to be used in parallelized computation.
- **lambda**: Tuning parameter for optional L2 penalty on coefficient vector (for stabilized estimation)
Value

- **delta**
  - Matrix containing all item parameters for the PCMRS model, one row per item, one column per category.

- **Sigma**
  - 2x2 covariance matrix for both random effects, namely the ability parameters theta and the response style parameters gamma.

- **delta.PCM**
  - Matrix containing all item parameters for the simple PCM model, one row per item, one column per category.

- **sigma.PCM**
  - Estimate for variance of ability parameters theta in the simple PCM model.

- **Y**
  - Data frame containing the ordinal item response data, one row per observation, one column per item.

- **scaled**
  - Logical, TRUE if scaled version of the response style parameterization is used.

- **neg.loglik**
  - Negative marginal log-likelihood

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References


See Also

- `person.posterior` PCMRS-package

Examples

```r
## Not run:

data(tenseness)
set.seed(5)
samples <- sample(1:nrow(tenseness), 100)
tense_small <- tenseness[samples, 1:4]

m_small <- PCMRS(tense_small, cores = 2)
m_small
plot(m_small)

persons <- person.posterior(m_small, cores = 2)
```

---

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Value

- **delta**
  - Matrix containing all item parameters for the PCMRS model, one row per item, one column per category.

- **Sigma**
  - 2x2 covariance matrix for both random effects, namely the ability parameters theta and the response style parameters gamma.

- **delta.PCM**
  - Matrix containing all item parameters for the simple PCM model, one row per item, one column per category.

- **sigma.PCM**
  - Estimate for variance of ability parameters theta in the simple PCM model.

- **Y**
  - Data frame containing the ordinal item response data, one row per observation, one column per item.

- **scaled**
  - Logical, TRUE if scaled version of the response style parameterization is used.

- **neg.loglik**
  - Negative marginal log-likelihood

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References


See Also

- `person.posterior` PCMRS-package

Examples

```r
## Not run:

data(tenseness)
set.seed(5)
samples <- sample(1:nrow(tenseness), 100)
tense_small <- tenseness[samples, 1:4]

m_small <- PCMRS(tense_small, cores = 2)
m_small
plot(m_small)

persons <- person.posterior(m_small, cores = 2)
```
person.posterior

Calculate Posterior Estimates for Person Parameters

Description

Calculates posterior estimates for both person parameters, namely the ability parameters theta and the response style parameters gamma.

Usage

person.posterior(model, cores = 30, tol = 1e-04, maxEval = 600, which = NULL)

Arguments

model Object of class PCMRS.
cores Number of cores to be used in parallelized computation.
tol The maximum tolerance for numerical integration, default 1e-4. For more details see adaptIntegrate.
maxEval The maximum number of function evaluations needed in numerical integration. If specified as 0 implies no limit. For more details see adaptIntegrate.
which Optional vector to specify that only for a subset of all persons the posterior estimate is calculated.

Value

Matrix containing all estimates of person parameters, both theta and gamma.

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tenseness

References


See Also

PCMRS PCMRS-package

Examples

```r
## Not run:
###################################################################
## Small example to illustrate model and person estimation
###################################################################

data(tenseness)

set.seed(5)
samples <- sample(1:nrow(tenseness), 100)
tense_small <- tenseness[samples,1:4]

m_small <- PCMRS(tense_small, cores = 2)
m_small
plot(m_small)

persons <- person.posterior(m_small, cores = 2)
plot(jitter(persons, 100))

###################################################################
## Example from Tutz et al. 2017:
###################################################################

data(emotion)
m.emotion <- PCMRS(emotion)
m.emotion

plot(m.emotion)

## End(Not run)
```

tenseness

Data from the Freiburg Complaint Checklist. The data contain all 8 items corresponding to the scale *Tenseness* for 2042 participants of the standardization sample of the Freiburg Complaint Checklist.
Format

A data frame containing data from the Freiburg Complaint Checklist with 2042 observations. All items refer to the scale Tenseness and are measured on a 5-point Likert scale where low numbers correspond to low frequencies or low intensities of the respective complaint and vice versa.

Clammy hands Do you have clammy hands?
Sweat attacks Do you have sudden attacks of sweating?
Clumsiness Do you notice that you behave clumsy?
Wavering hands Are your hands wavering frequently, e.g. when lightning a cigarette or when holding a cup?
Restless hands Do you notice that your hands are restless?
Restless feet Do you notice that your feet are restless?
Twitching eyes Do you notice unvoluntary twitching of your eyes?
Twitching mouth Do you notice unvoluntary twitching of your mouth?

Source


References


Examples

```r
## Not run:
data(tenseness)

set.seed(1860)
samples <- sample(1:nrow(tenseness), 300)
tense_small <- tenseness[samples,]
m_small <- PCMRS(tense_small, cores = 25)
m_small
plot(m_small)

persons <- person.posterior(m_small, cores = 25)
plot(jitter(persons,100))

## End(Not run)
```
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