

Package ‘TopicTestlet’

May 7, 2026

Title A Topic Testlet Model for Calibrating Testlet Constructed Responses

Version 0.1.0

Description Implements the Topic Testlet Model (TTM) as described by Xiong et al. (2025) <[doi:10.1111/jedm.70001](https://doi.org/10.1111/jedm.70001)>. The package integrates Latent Dirichlet Allocation (LDA) with the Partial Credit Model to account for local item dependence in testlets using latent topics from student textual responses.

Depends R (>= 4.0.0)

Imports topicmodels, tm, stats

License GPL (>= 3)

Encoding UTF-8

RoxygenNote 7.3.2

Suggests knitr, rmarkdown

VignetteBuilder knitr

NeedsCompilation no

Author Jiawei Xiong [aut, cre],
Cheng Tang [ctb],
Qidi Liu [ctb]

Maintainer Jiawei Xiong <jiawei.xiong@uga.edu>

Repository CRAN

Date/Publication 2025-12-01 14:00:02 UTC

Contents

aggregate_responses	2
tmm_est	2
tmm_lda	3
tmm_perplexity	4
Index	5

aggregate_responses *Concatenate Student Responses*

Description

Aggregates all written responses within a testlet for each student.

Usage

```
aggregate_responses(response_matrix)
```

Arguments

response_matrix
An N x J matrix of character strings (essays).

Value

A named character vector of length N.

ttm_est *Fit the Topic Testlet Model (TTM)*

Description

Calibrates the TTM using score data and pre-computed topic proportions. Uses a Variational Expectation-Maximization (VEM) approach to estimate student ability (theta), topic penalties (lambda), and item parameters (b).

Usage

```
ttm_est(scores, delta, max_iter = 100, tol = 1e-04)
```

Arguments

scores An N x J numeric matrix of item scores (0, 1, ...).
delta An N x K numeric matrix of topic proportions (from ttm_lda).
max_iter Maximum number of EM iterations.
tol Convergence tolerance.

Value

A list containing:

theta	Vector of estimated student abilities.
lambda	Matrix of estimated topic penalties.
gamma	Vector of person-specific testlet effects.
item_params	List of step difficulties for each item.
AIC	Akaike Information Criterion.
BIC	Bayesian Information Criterion.

ttm_lda	<i>Fit LDA and Extract Topic Proportions</i>
---------	--

Description

Fits a Latent Dirichlet Allocation model to the text and returns the person-specific topic proportion matrix (delta).

Usage

```
ttm_lda(text_vector, k, seed = 1234)
```

Arguments

text_vector	A character vector of aggregated student responses.
k	The number of latent topics.
seed	Integer seed for reproducibility.

Value

A matrix of dimension N x K containing topic proportions (delta).

ttm_perplexity	<i>Calculate Perplexity for Different Topic Numbers</i>
----------------	---

Description

Calculates the perplexity of LDA models over a range of K topics to help determine the optimal number of topics.

Usage

```
ttm_perplexity(text_vector, k_range = 2:5, seed = 1234)
```

Arguments

text_vector	A character vector of aggregated student responses (length N).
k_range	A numeric vector indicating the number of topics to try (e.g., 2:10).
seed	Integer seed for reproducibility.

Value

A data frame containing K and the corresponding perplexity score.

Index

`aggregate_responses`, [2](#)

`ttn_est`, [2](#)

`ttn_lda`, [3](#)

`ttn_perplexity`, [4](#)