

Modeling visual working memory with the MemToolbox

The Author

Abstract

The *MemToolbox* is a collection of MATLAB functions designed for modeling visual working memory. Implements a number of popular models. (Includes visualization tools, Bayesian model comparison, calculation of AIC and BIC, demonstration data sets, ability to fit data from continuous report and 2-afc tasks, helper functions to convert between popular measures of circular variation, experiment scripts, data and model validation tools, bootstrapping for multiple subjects, hierarchical fits for multiple subjects, functions to simulate data from a model.) The MemToolbox is released under a BSD license and freely available at memtoolbox.org.

Introduction

1. Overview of visual working memory, the standard tasks used to measure it (e.g., those in Luck & Vogel (1997); Zhang & Luck (2008); Wilken & Ma (2004); Bays & Husain (2008)), and the data that those tasks produce.
2. Overview of the various models and the standard procedure used to fit them to the data. Include standard mixture model with and without bias, swap model, slots+averaging model, etc.
3. Highlight the problems with the standard approach. You might want to focus on the problems with MLE point estimates—i.e., how they don't provide a measure of uncertainty in the estimates, and how hide tradeoffs between the parameters of the model, like in the case of the standard deviation and guess rate parameters of the standard mixture model.
4. Describe the tools that the MemToolbox provides that allow you to reveal these aspects of the data—i.e., how MCMC and the visualization

tools provided in the toolbox let you uncover correlations between parameters and the full posterior distribution.

5. Talk about ways to measure how good your model fits the data, e.g., through posterior predictive fits and model comparison metrics such as the AIC, BIC, and through Bayesian model comparison.
6. Mention how the toolbox provides all of the tools you would need to learn how to use it, including a tutorial, sample data sets, and demos.

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References

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