

Public Abstract

First Name:April

Middle Name:Rebecca

Last Name:Swagman

Adviser's First Name:Jeffrey

Adviser's Last Name:Rouder

Co-Adviser's First Name:

Co-Adviser's Last Name:

Graduation Term:SS 2016

Department:Psychology

Degree:PhD

Title:Testing the Bayesian Brain Hypothesis in Visual Perception

Bayesian ideal observer theory describes perception as an ideal integration of sensory information with prior knowledge to produce optimal responses. Bayesian ideal perception models are popular in sensory domains; however, these models often prove unfalsifiable because of distributional assumptions and post-hoc estimation of participant beliefs.

Three visual perception tasks were designed to test Bayesian ideal observer theory under minimal assumptions. Prior distributions of stimuli were specified, likelihoods were manipulated across four stimulus reliability levels, and loss functions were established so that participants could choose posterior point estimates which minimize loss.

In each experiment, a Bayesian ideal observer model was fit against a Bayesian posterior matching model (adapted from the probability matching phenomenon) and one or more non-Bayesian mixture models. Results from two experiments in which participants were making location-based judgments overwhelmingly supported the posterior matching models. Data from a third experiment in which participants made estimations about the number of items in an array were fit best by a non-Bayesian mixture model. Overall, Bayesian ideal observer theory was not supported in three experiments of visual perception.