BACKGROUND

How do we learn about rewarding cues in complex environments?

• Answer 1: through separate streams of information (separate error model).
• Answer 2: through a common representation of information (common error model).

Methods

• While a large body of literature favors the common PE paradigm, recent evidence challenged the common PE assumption by showing that separate PEs also play a significant role in learning (Rescorla 2000, 2001; Leung & Westbrook 2004; Leung & Westbrook 2008).
• The goal is to explore possibilities of how both PEs integrate and validate those models with experimental data.

THEORETICAL POSSIBILITIES OF PEs INTEGRATION

• We can describe PEs integration as a point in a spectrum with common PE paradigm in one end and separate PE in the other end.
• We suggest the Hybrid Error Model (HEM) and the Graded Error Model (GEM).
• In both models, the level of integration is controlled by $y$ that ranges from 1 (RW) to 0 (BM).
• Blocking explanations (A+/AB+):
  - RW: Conditioning to the blocked cue (B) is prevented by the already-predictive blocking cue (A).
  - HEM: Conditioning to the blocked cue (B) is modulated by the $y$-weighted sum of B and AB prediction errors.
  - GEM: Conditioning to the blocked cue (B) is modulated by the $y$-weighted sum of B and non-B outcome predictions.

Model Predictions

• In stage 2, separate PE paradigm predicts that X > Y while common PE paradigm predicts that Y > X.
• In both Hybrid Error Model (HEM) and Graded Error Model (GEM), gamma value modulates cue competition.

RESULTS

• Most rats solved the discrimination. However, there is a high variability.
• Left panel shows the overall average of behavioral data. The middle panel shows the average behavior from top 8 discriminators while the right panel highlights the bottom discriminators.
• In the bottom discriminators, rats did not discriminate between X and Y while at the same time they succeeded at the other discriminations.

REFERENCES