Inferring relevance in a changing world

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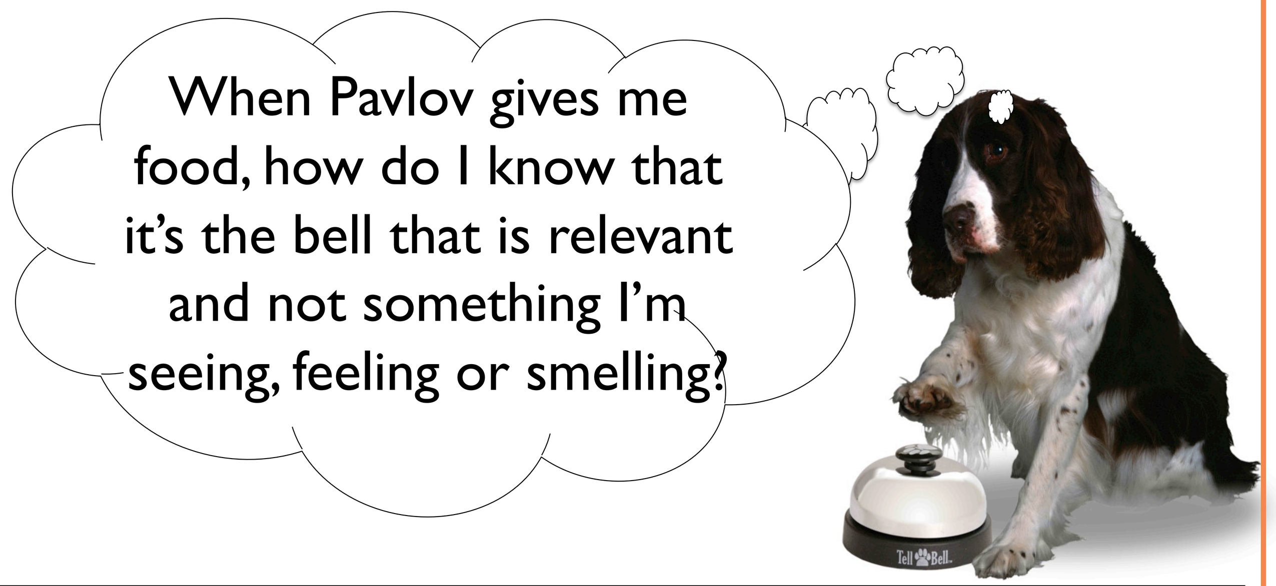
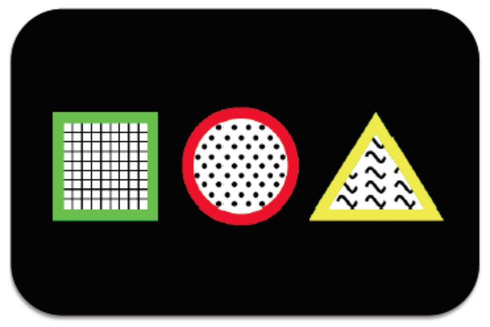
Introduction

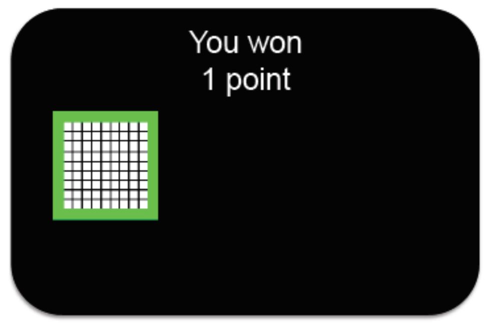


Q: How do we learn what to learn about in a multidimensional, noisy and dynamic world?

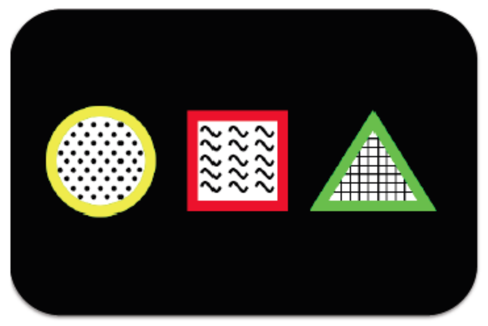
The Task



Each stimulus 3 features: shape, color and texture.

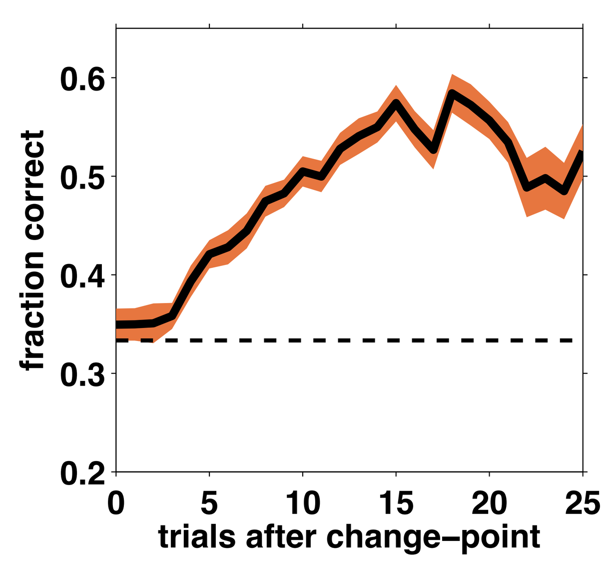


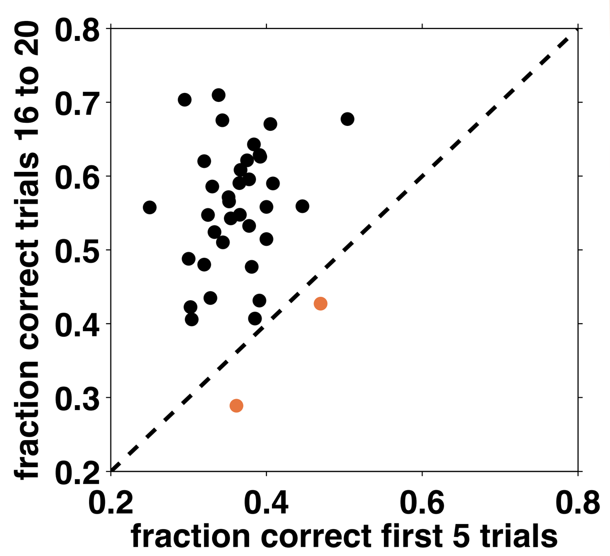
Subject chooses one. Probability of winning is high (75%) if chosen stimulus has relevant feature (e.g. **green**).



Next trial. Three options with different mixtures of features.

Identity of relevant feature changes periodically, unsignaled to subjects





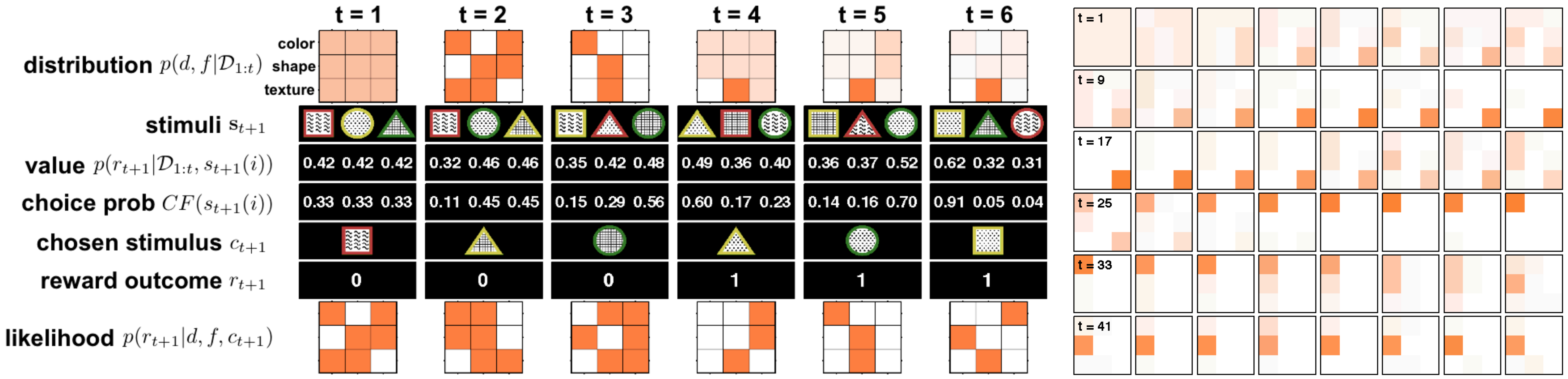
Conclusions

Behavioral data suggest that subjects use selective attention to solve the task. This is a suboptimal strategy, but feasible (tractable) in real world situations.

Models

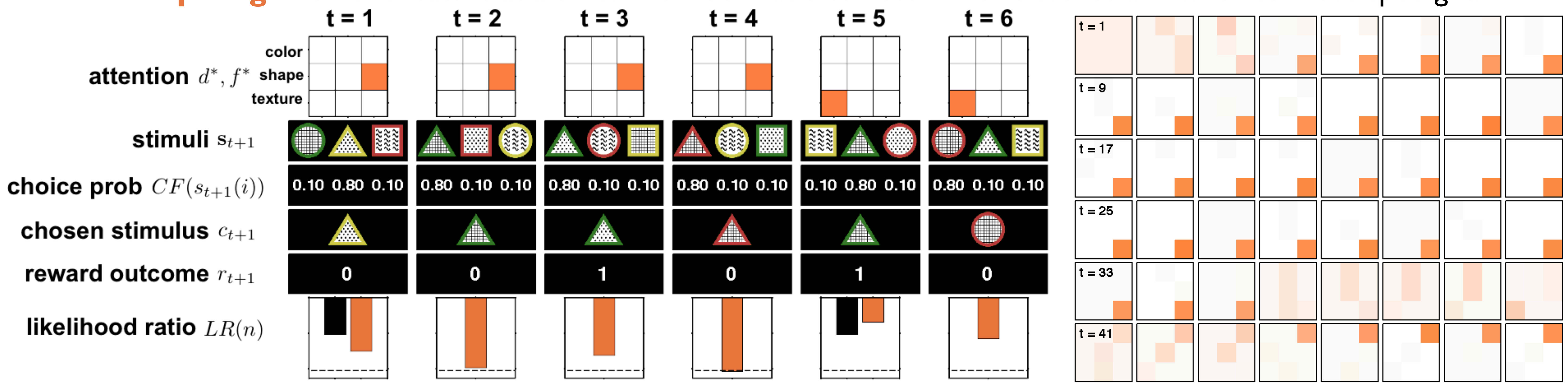
1. *Optimal inference (OI) model :*

Use Bayes' rule to compute **probability distribution** over identity of relevant dimension and value, averaging over possible change points. Use distribution to compute expected value of choosing each option.



2. *Selective attention (SA) model :*

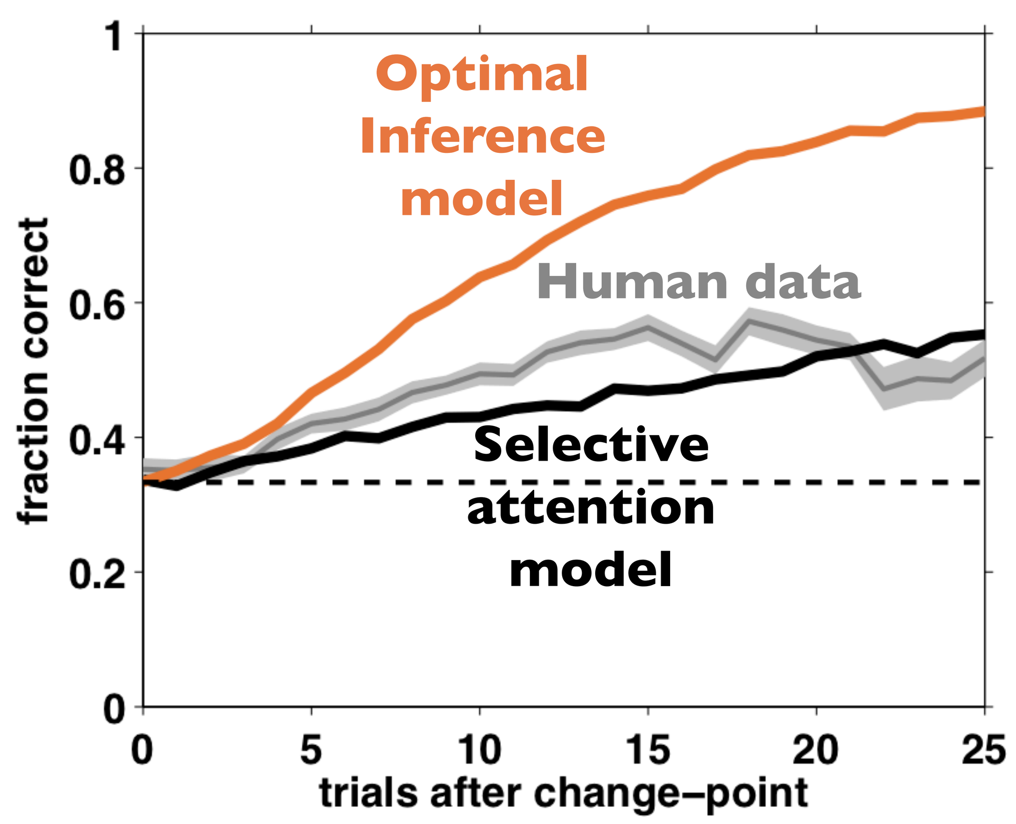
Attention spotlight on one feature at a time. Likelihood ratio to determine relevence and when to move spotlight.



Results

1. *Simulations*

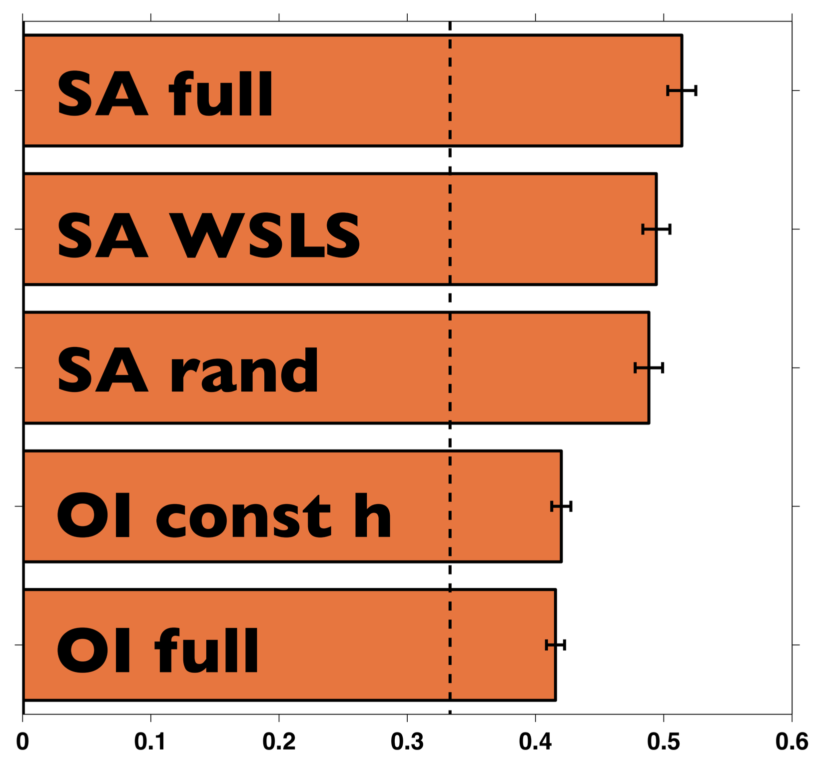
Learning curves for each model with optimal parameter values

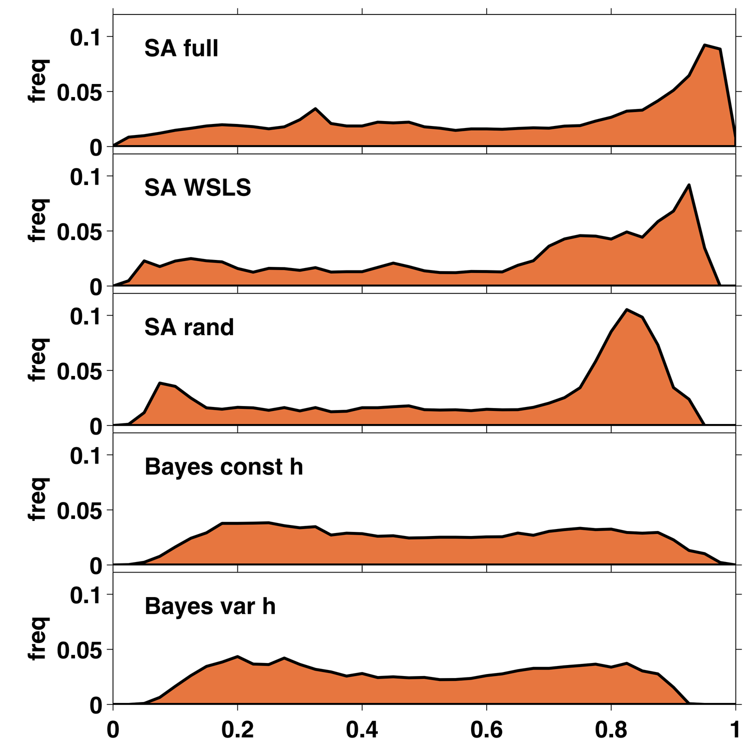


2. *Model fitting to trial by trial choice behavior & learning dynamics*

Average probability of each choice (related to Bayesian evidence)

Average across 35 subjects





Single subject data