

# Stag-hunt Behavior Analysis

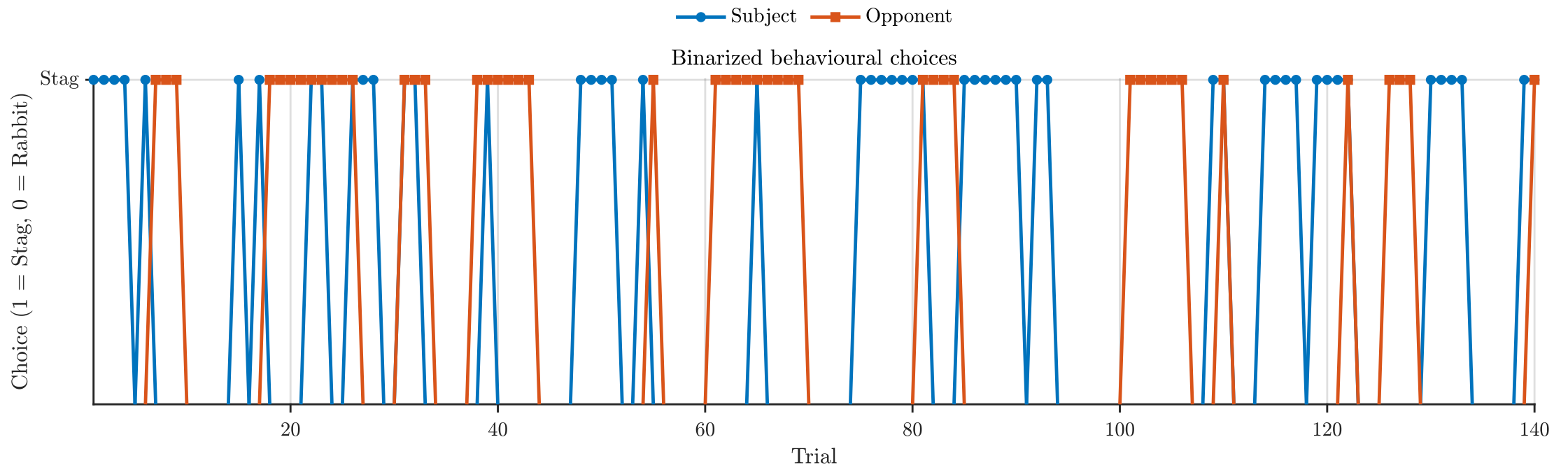
V1.0

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# Mapping to binary sequence

- Variable p (4 directions: 0,1,2,3) → choices(0: rabbit, 1: stag)



# K=2

Date: 12-Nov-2025 15:14:44

VB converged in 1 iterations (took ~7 min)

Dimensions of the model:

- data:  $p=1$
- time samples:  $t=140$
- hidden states:  $n=35$
- evolution parameters:  $n_{\theta}=1$
- observation parameters:  $n_{\phi}=2$
- inputs:  $n_u=2$

This was a deterministic dynamical system

- observation function:  $g_{kToM}$  (binomial data)
- evolution function:  $f_{kToM}$

Bayesian log model evidences:

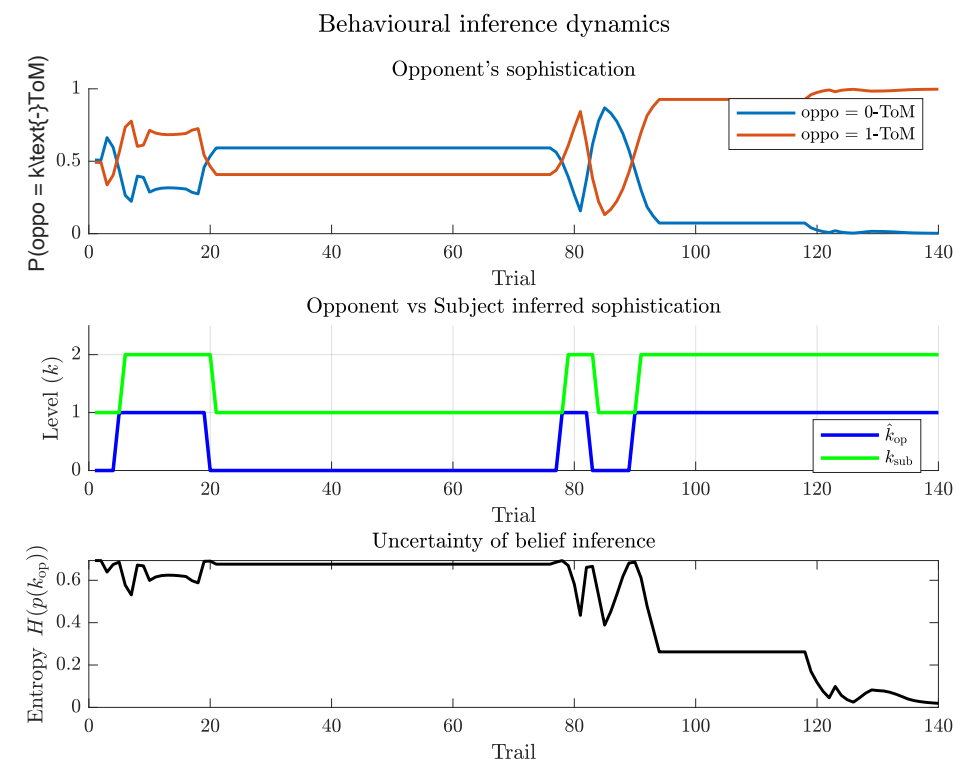
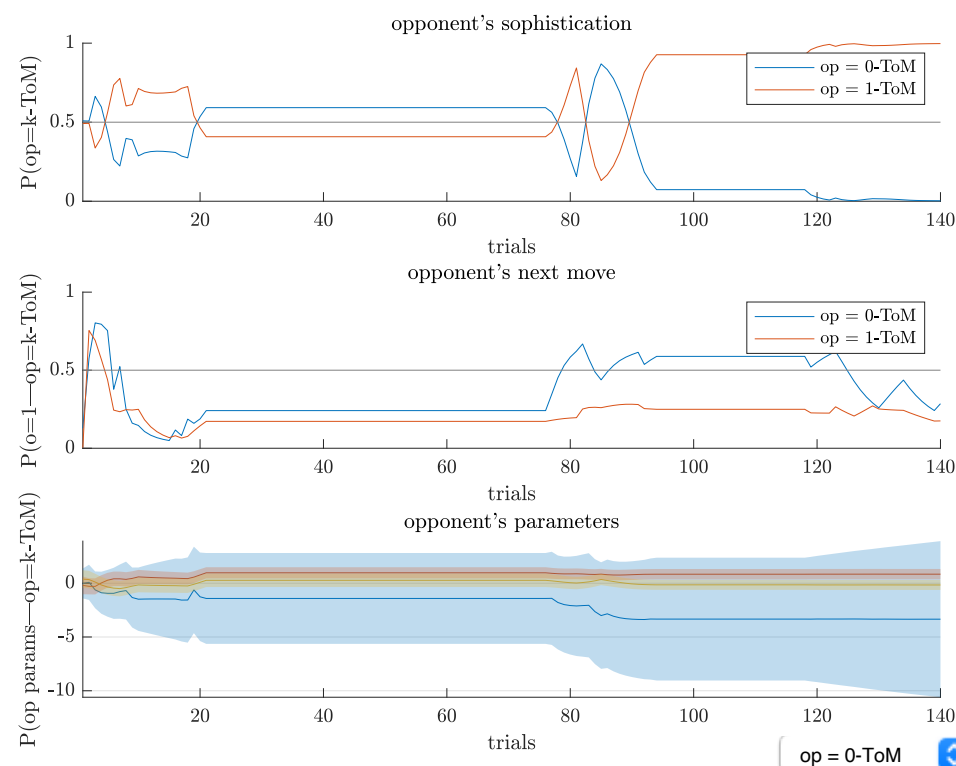
- full model:  $\log p(y|m) > -9.687e+01$
- null hypothesis:  $\log p(y|H_0) = -9.704e+01$

Classical goodness-of-fit metrics:

- determin. coeff. (R2): 5.3%
- balanced classif. acc.: 56.4%
- log-likelihood:  $-8.880e+01$
- AIC:  $-1.268e+02$
- BIC:  $-1.827e+02$

Estimation efficiency (minus posterior entropies):

- hidden states:  $0.000e+00$
- initial conditions:  $-4.596e+01$
- evolution parameters:  $-1.393e+00$
- observation parameters:  $-6.875e-01$



# K=3

Date: 12-Nov-2025 03:20:42

VB converged in 1 iterations (took ~6 min)

Dimensions of the model:

- data:  $p=1$
- time samples:  $t=140$
- hidden states:  $n=81$
- evolution parameters:  $n_{\theta}=1$
- observation parameters:  $n_{\phi}=2$
- inputs:  $n_u=2$

This was a deterministic dynamical system

- observation function:  $g_{kToM}$  (binomial data)
- evolution function:  $f_{kToM}$

Bayesian log model evidences:

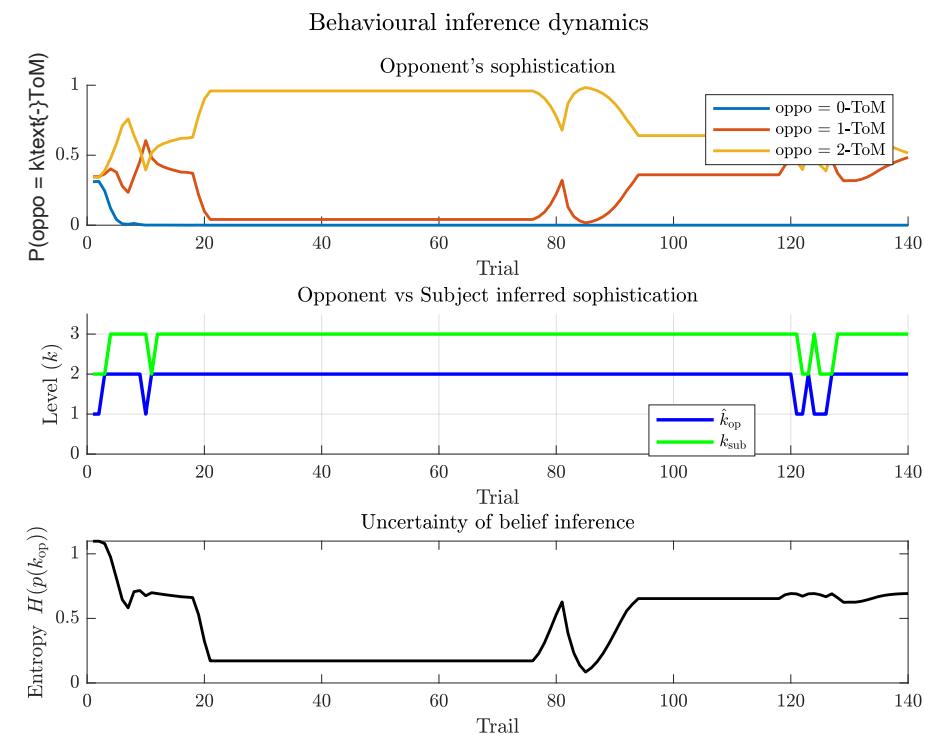
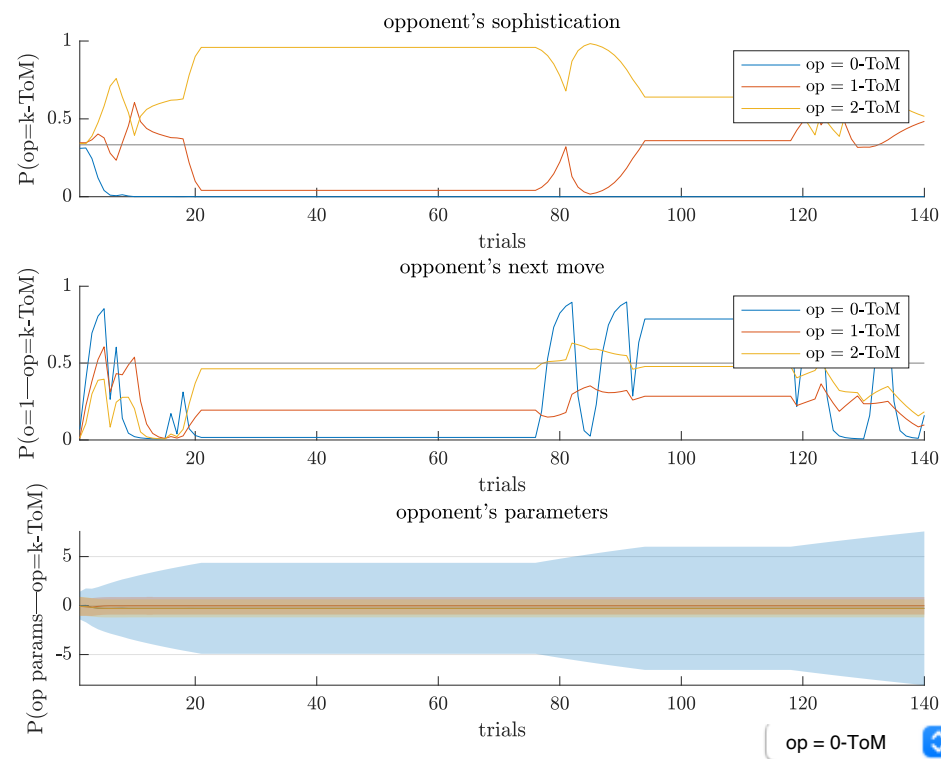
- full model:  $\log p(y|m) > -1.278e+02$
- null hypothesis:  $\log p(y|H_0) = -9.704e+01$

Classical goodness-of-fit metrics:

- determin. coeff. (R2): 0.0%
- balanced classif. acc.: 50.0%
- log-likelihood:  $-1.278e+02$
- AIC:  $-2.118e+02$
- BIC:  $-3.354e+02$

Estimation efficiency (minus posterior entropies):

- hidden states:  $0.000e+00$
- initial conditions:  $-1.149e+02$
- evolution parameters:  $-1.419e+00$
- observation parameters:  $-2.838e+00$



# K=4

Date: 12-Nov-2025 16:07:40

VB converged in 1 iterations (took ~38 min)

Dimensions of the model:

- data:  $p=1$
- time samples:  $t=140$
- hidden states:  $n=173$
- evolution parameters:  $n_{\theta}=1$
- observation parameters:  $n_{\phi}=2$
- inputs:  $n_u=2$

This was a deterministic dynamical system

- observation function:  $g_{kToM}$  (binomial data)
- evolution function:  $f_{kToM}$

Bayesian log model evidences:

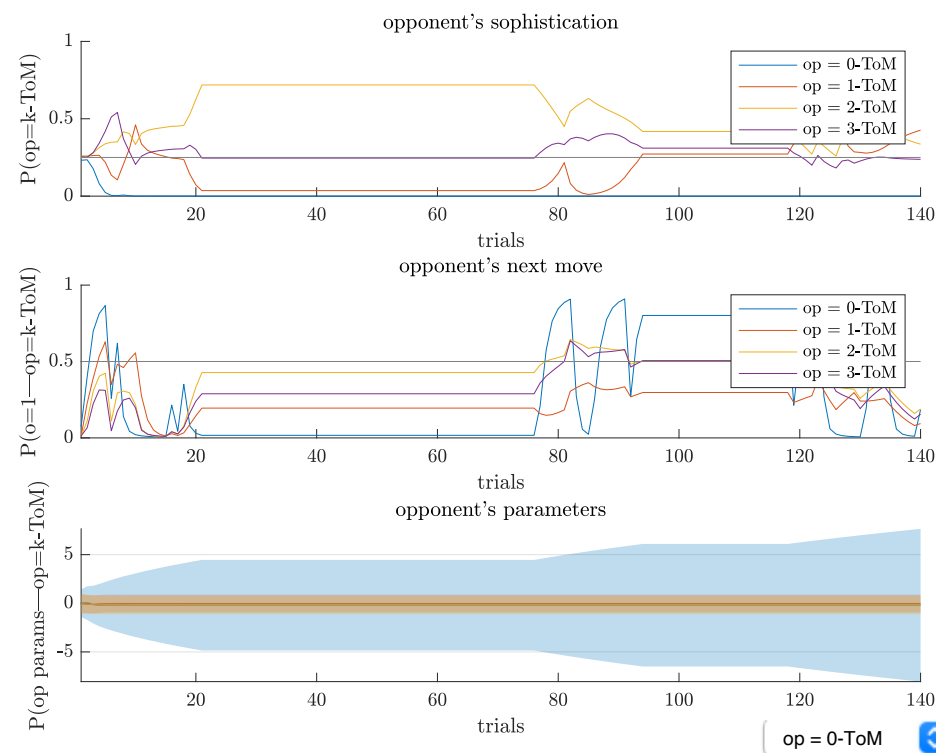
- full model:  $\log p(y|m) > -1.300e+02$
- null hypothesis:  $\log p(y|H_0) = -9.704e+01$

Classical goodness-of-fit metrics:

- determin. coeff. (R2): 0.0%
- balanced classif. acc.: 48.9%
- log-likelihood:  $-1.300e+02$
- AIC:  $-3.060e+02$
- BIC:  $-5.649e+02$

Estimation efficiency (minus posterior entropies):

- hidden states:  $0.000e+00$
- initial conditions:  $-2.455e+02$
- evolution parameters:  $-1.419e+00$
- observation parameters:  $-2.838e+00$



op = 0-ToM

