**Supplementary Materials**

# A Regularization Method for Linking Brain and Behavior

Inhan Kang, Woojong Yi, and Brandon M. Turner

The Ohio State University

## Simulation 2: Overlapping structure

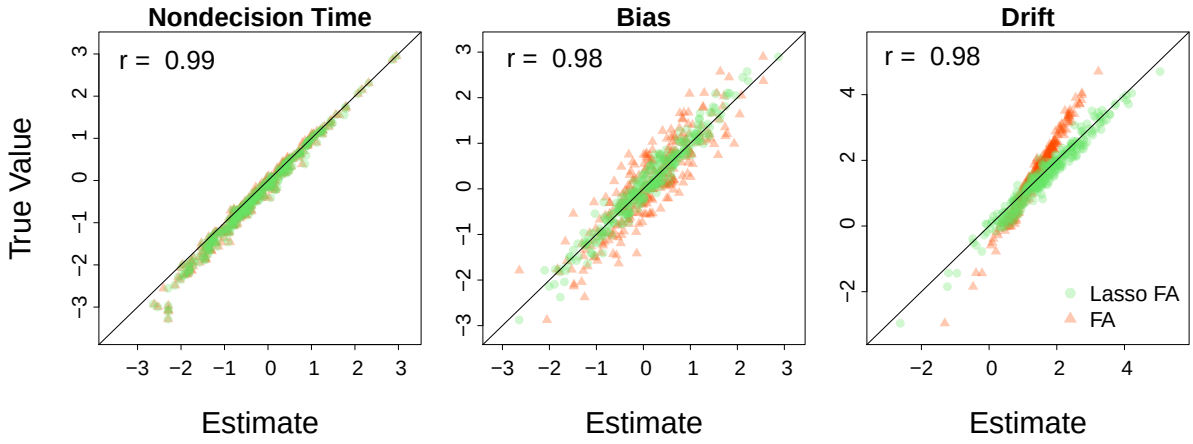


Figure 1: **Single-trial Parameter Estimates, Overlapping Structure.** Each panel shows the maximum a posteriori estimate of the single-trial parameters for the diffusion decision model component of the model: nondecision time (left), starting point bias (middle), and drift rate (right). In each panel, estimates are shown on the $x$-axis, whereas the true parameter value is shown on the $y$-axis, where Lasso FA NDDM results are shown in green and FA NDDM results are shown in red. Pearson correlations for the Lasso FA NDDM are shown in the top left region for each panel. FA NDDM = Factor Analysis Neural Drift Diffusion Model.

**Simulation 3: Complex structure**

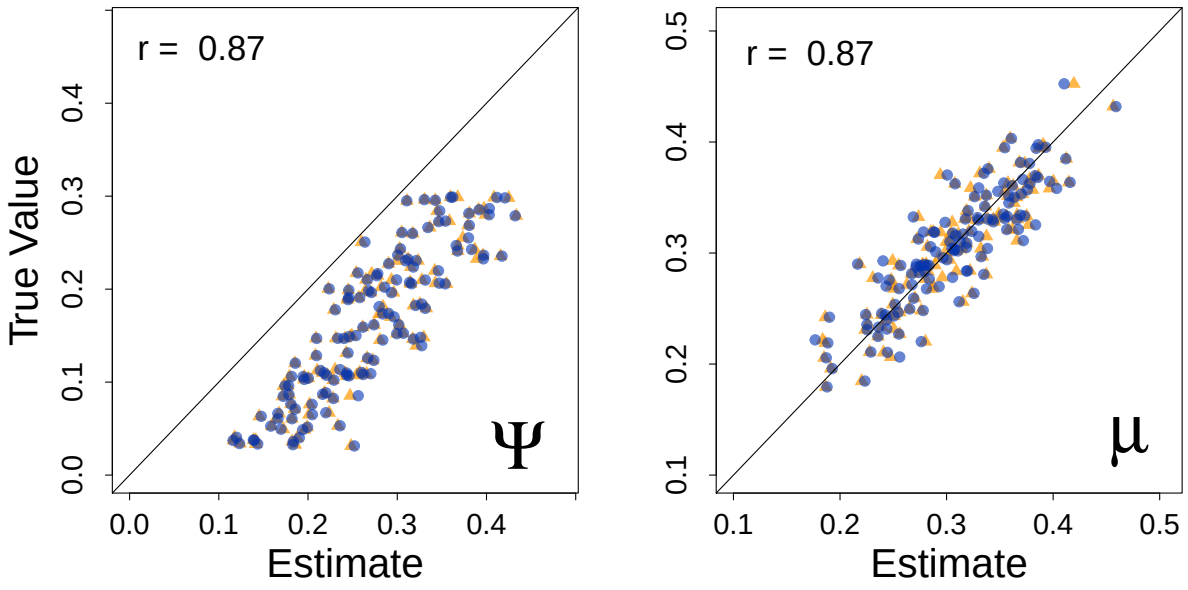


Figure 2: **Residual Variance and Intercept Estimates. Complex Structure.** In each panel, parameter estimates ($x$-axis) obtained by the Lasso FA NDDM (blue) and the FA NDDM (orange) are shown against the true parameter values ($y$-axis). Where appropriate, Pearson correlations are reported for the Lasso FA NDDM results within panels. FA NDDM = Factor Analysis Neural Drift Diffusion Model.

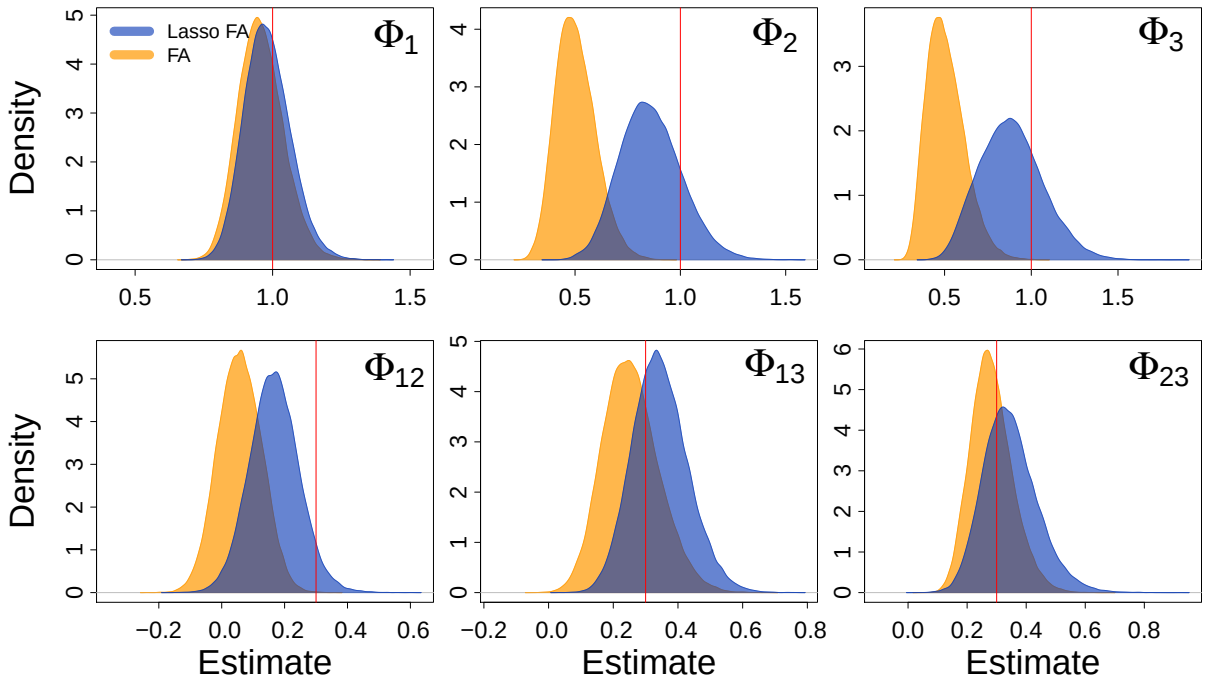


Figure 3: **Factor Variance Estimates, Complex Structure.** Each panel shows the estimated posterior distributions for each element of the factor variance matrix obtained by either the Lasso FA NDDM (blue) or the plain FA NDDM (orange). The red vertical lines indicate the true values. FA NDDM = Factor Analysis Neural Drift Diffusion Model.

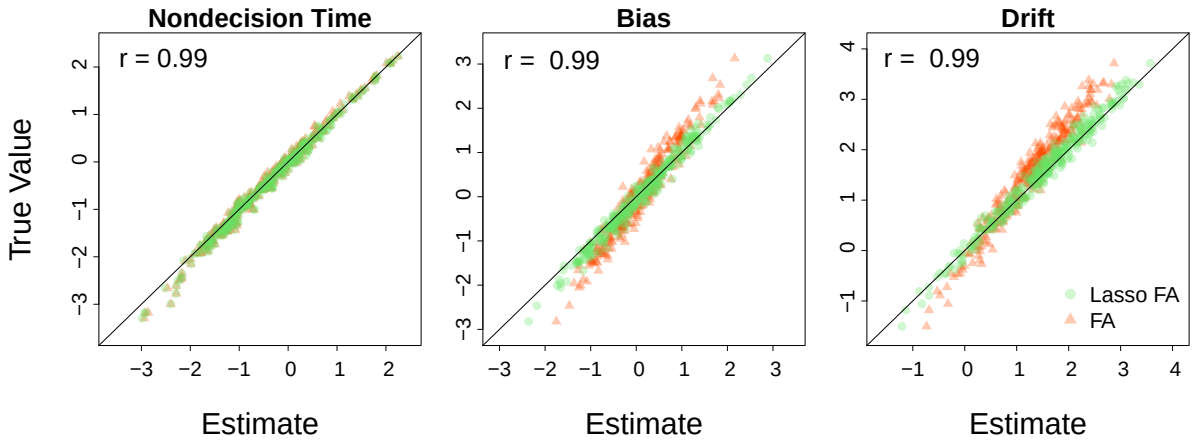


Figure 4: **Single-trial Parameter Estimates, Complex Structure.** Each panel shows the maximum a posteriori estimate of the single-trial parameters for the diffusion decision model component of the model: nondecision time (left), starting point bias (middle), and drift rate (right). In each panel, estimates are shown on the $x$-axis, whereas the true parameter value is shown on the $y$-axis, where Lasso FA NDDM results are shown in green and FA NDDM results are shown in red. Pearson correlations for the Lasso FA NDDM are shown in the top left region for each panel. FA NDDM = Factor Analysis Neural Drift Diffusion Model.