



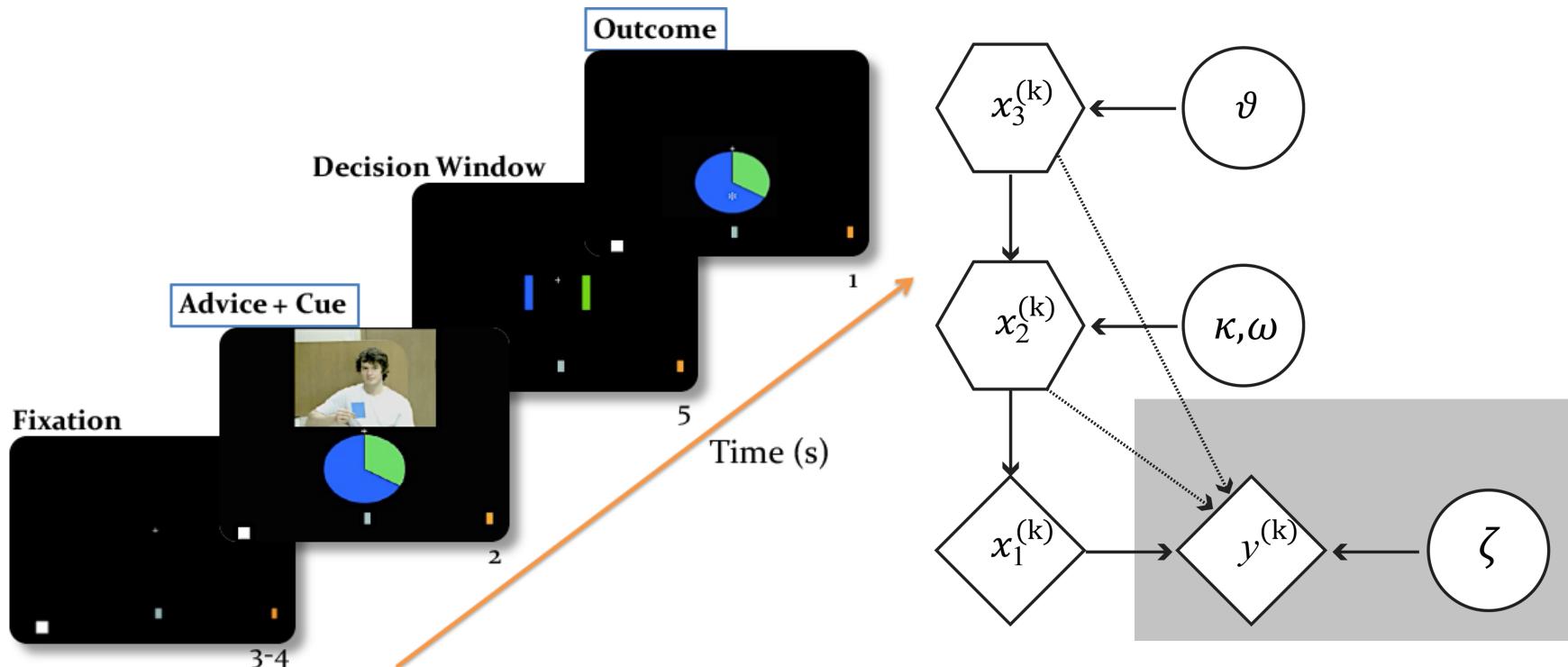
# DCM for fMRI –

Dynamic causal modeling for functional magnetic resonance imaging



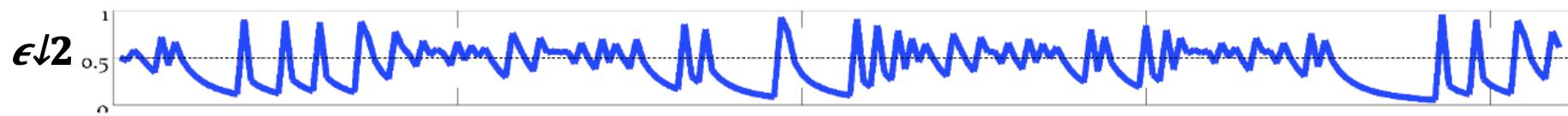
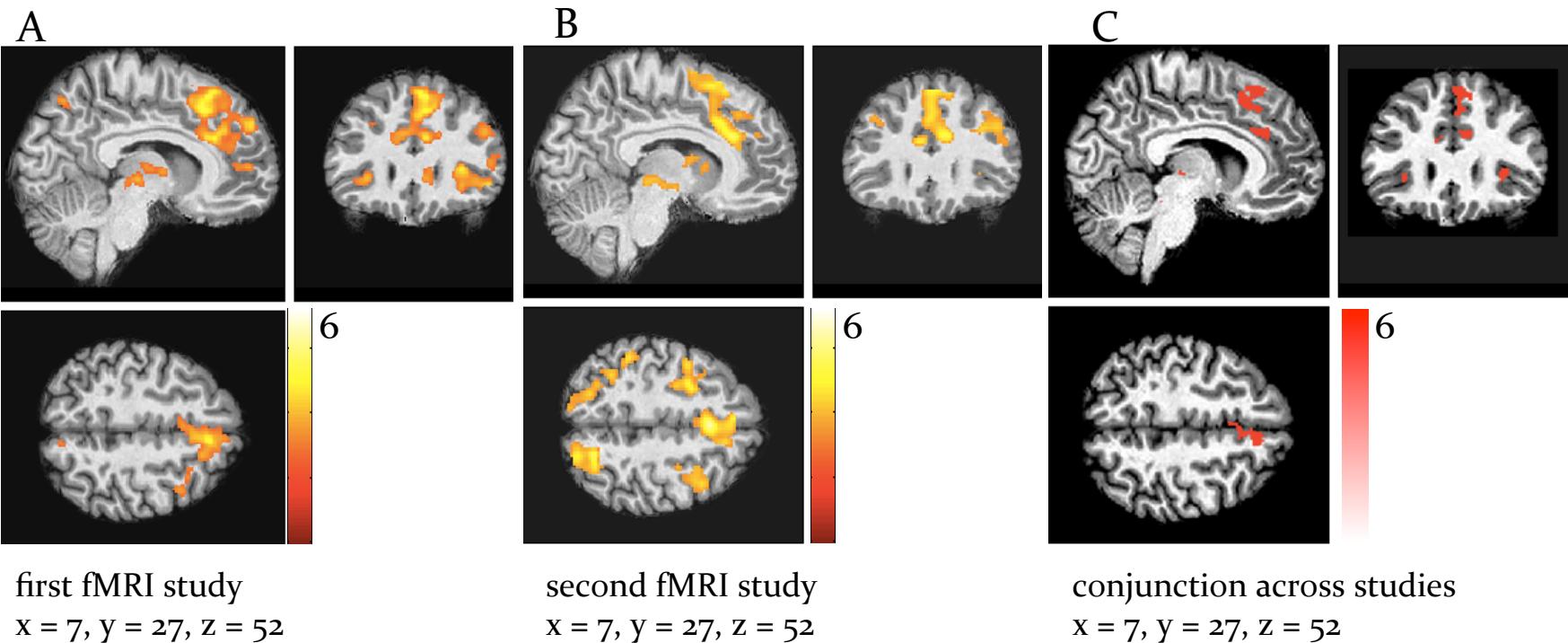
Andreea Diaconescu and Jakob Heinze  
Translational Neuromodeling Unit  
University and ETH Zürich

# Experimental Paradigm



Diaconescu et al., PLoS CB 2014

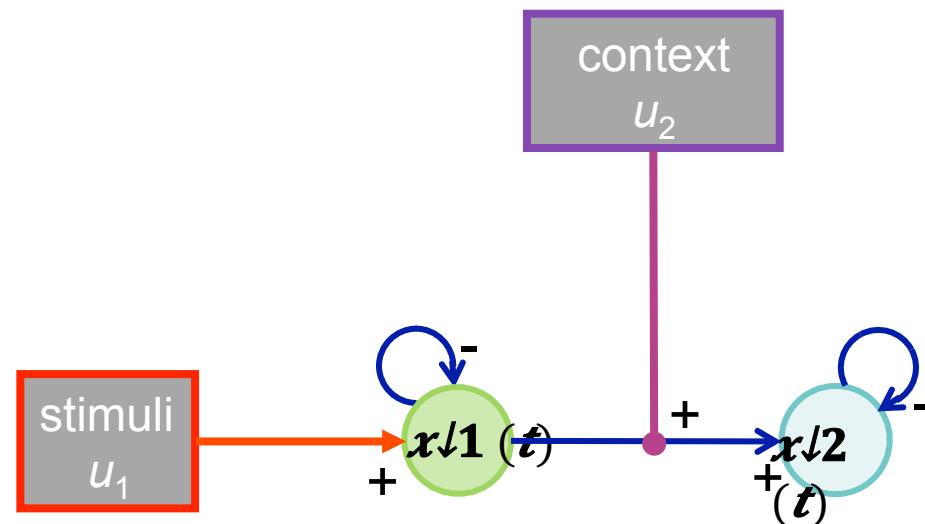
# Advice Prediction Error



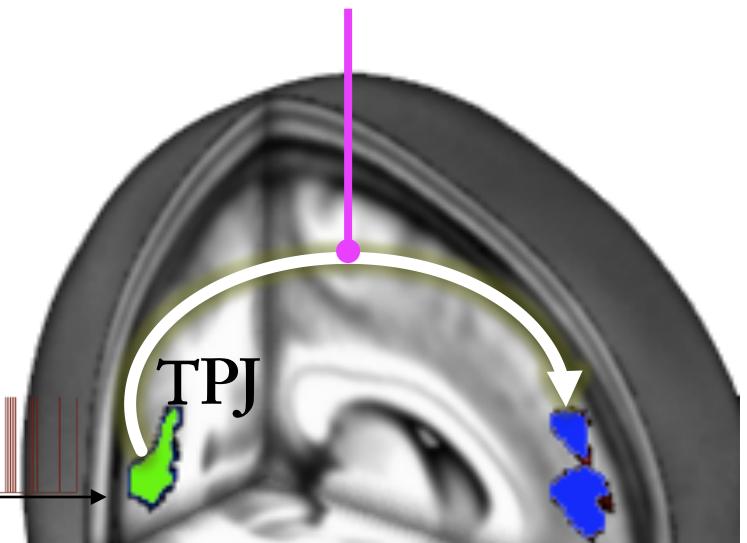
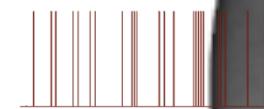
Diaconescu et al., Submitted

# Dynamic Causal Modelling for fMRI

Prediction error  $u_2(t)$



Advice  
 $u_1(t)$

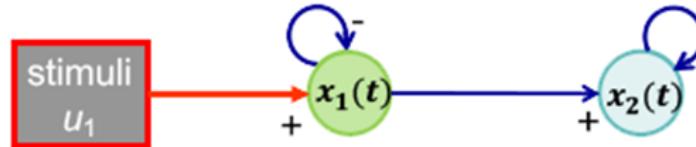


$$x = Ax + u \downarrow 2 B \uparrow(2) x + Cu \downarrow 1$$

$$[x \downarrow 1 \ x \downarrow 2] = [\sigma @ a \downarrow 2 \ \& \ \sigma] \cdot [x \downarrow 1 \ x \downarrow 2] + u \downarrow 2 [0 \& 0 @ b \downarrow 12 \uparrow(2) \ \& \ 0] \cdot [x \downarrow 1 \ x \downarrow 2]$$

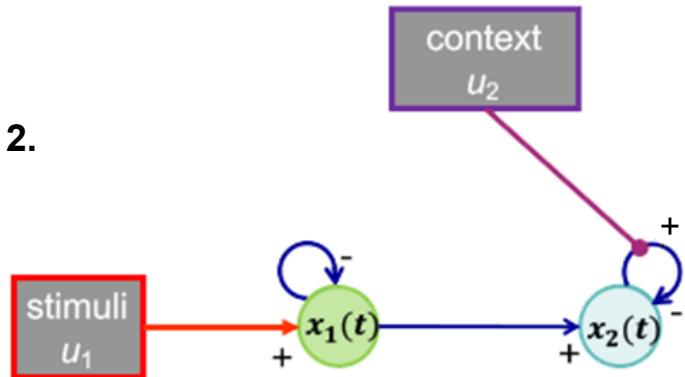
# Model Space

1.



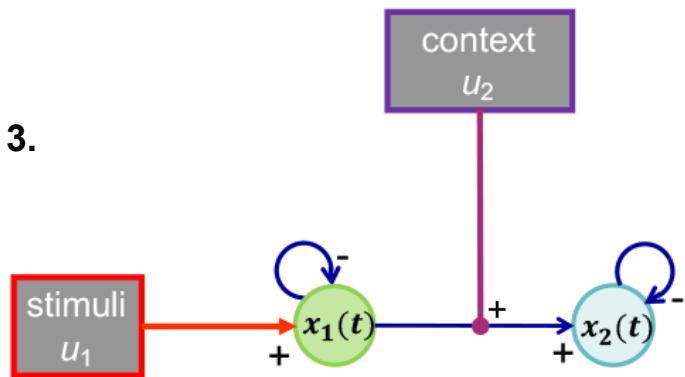
$$[x \downarrow 1 \ x \downarrow 2] = [\sigma @ a \downarrow 12 \ \& \sigma] \cdot [x \downarrow 1 \ x \downarrow 2] + u \downarrow 2$$

2.



$$[x \downarrow 1 \ x \downarrow 2] = [\sigma @ a \downarrow 12 \ \& \sigma] \cdot [x \downarrow 1 \ x \downarrow 2] + u \downarrow 2$$

3.



$$[x \downarrow 1 \ x \downarrow 2] = [\sigma @ a \downarrow 12 \ \& \sigma] \cdot [x \downarrow 1 \ x \downarrow 2] + u \downarrow 2$$



# Take-Home Message

## 1) Face Validity:

- Model Specification
- Simulation
- Inversion
- Diagnostics

## 2) Construct Validity:

- VOI Extraction
- Model Specification
- Inversion
- Diagnostics
- Model Selection

## 3) Predictive Validity