

Neurobiological Basis of Decision Making in Online Environments



PI: Fariborz Farahmand, Georgia Institute of Technology, fariborz@ece.gatech.edu

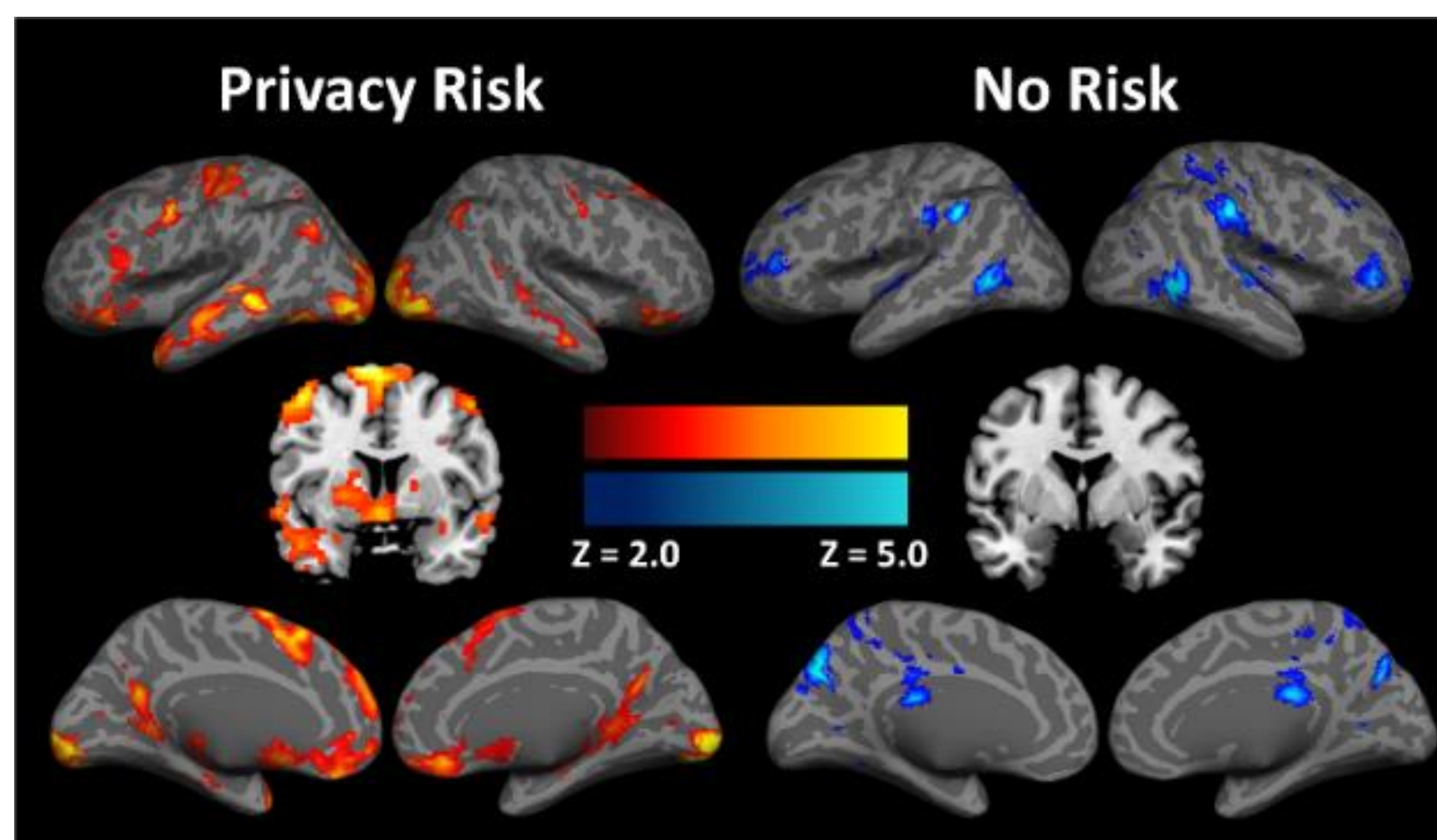
Limitations and Challenges:

- *Affect* (emotion) plays little or no role in the existing mathematical models of privacy decision processes
- Validated by paper-and-pencil, and web-based surveys/interviews
- Questionable assumptions about user intent and behavior
- Need mathematical models that “realistically” describe privacy behaviors and rigorous test and evaluation

Approach:

- Use fMRI to track changes in the cortical and subcortical activity of humans as they make decisions
- Ask privacy-related and non-privacy related questions, record and compare brain reactions, compare the predictions of various decision theories

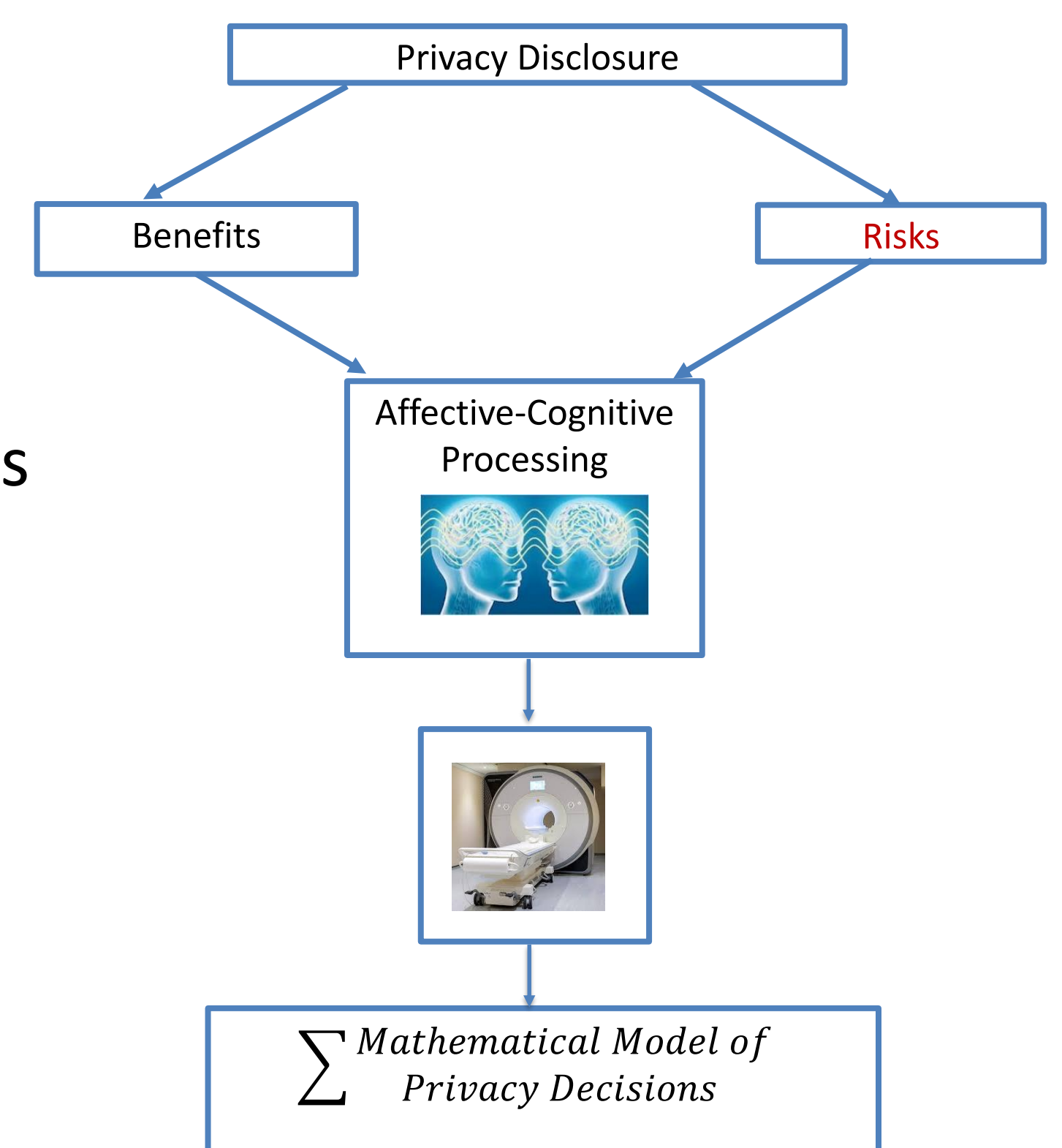
Results:



- Whole-brain correlation analysis of parametric responses to privacy risk and no-risk activities--higher z score means more likely activation
- Presenting the first neurobiological (hard) evidence of privacy in human brain, and starting the new discipline of *neuroprivacy*

Broader Impact:

- *Cyber privacy and security:* Address the gap between security and privacy mental models and the existing tools
- *Software and hardware design:* Build intelligent systems by utilizing the synergy of brain-inspired algorithms and neuromorphic hardware
- *Artificial intelligence:* Integration of affect and cognition in neurophysiological models of human behavior
- *Education and outreach:* How to nudge for “experienced” utility (likability) in policy development and risk communication
- *Translational research:* Translating the findings of neuroscience (e.g., brain function) and social science (e.g., emotional memory) in privacy into mathematical models of choice and decision making



Farahmand and Farahmand, Privacy Decision Making: The Brain Approach, *IEEE Computer*, pp. 50 – 58, 2019

- Identifying the role of *emotional memory* and “experienced” utility (likability) in privacy decision making
- Developing a formal dual-processes in privacy decision making; System 1 (affective) and System 2 (cognitive)