## A Mathematical Model of Privacy Decisions: **A Behavioral Economic Perspective**

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## **Problem Statement**

- Much of the research of computer science community on privacy has been focused on protecting confidentiality
- The existing mathematical models of privacy assume humans are rational economic agents, have stable preferences, and always choose the option with the highest expected utility
- People express concerns about privacy, but often act contrary to their stated intentions
- Need mathematical models that "realistically" describe privacy decisions

## Approach

- Investigate how two systems of thinking in human mind, affective (system 1) and cognitive (system 2) operate during privacy decisions
- Develop affective-cognitive algorithms to mathematically describe the operation of systems 1 and 2 in privacy decisions
- Test and evaluate the accuracy of these algorithms



## **Progress So Far**

Illustrated how "experienced utility" (vs. decision utility) can be applied in developing affective-cognitive theories and algorithms, focusing on two groups of theories:

Algebraic models such as prospect theory that are explicit value multipliers with functional forms fit to empirical data 2) Theoretical tools for dynamic decision making such as diffusion models applied to risky decisions such as decision field theory

**Example:** A diffusion model to process attention weighting in privacy decisions



- Applied prospect theory value function and weighting function to describe privacy decisions
- Progressed in designing experiments, using techniques from behavioral economics and behavioral game theory

The probability  $Z_i$  of first considering each outcome  $x_i$  is input to the model, along with the objective (stated) probabilities  $\pi_{i*} = p_i =$  $P_{r[xi]}$ .

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