Consideration of Strategy-Specific Adaptive Decision Support

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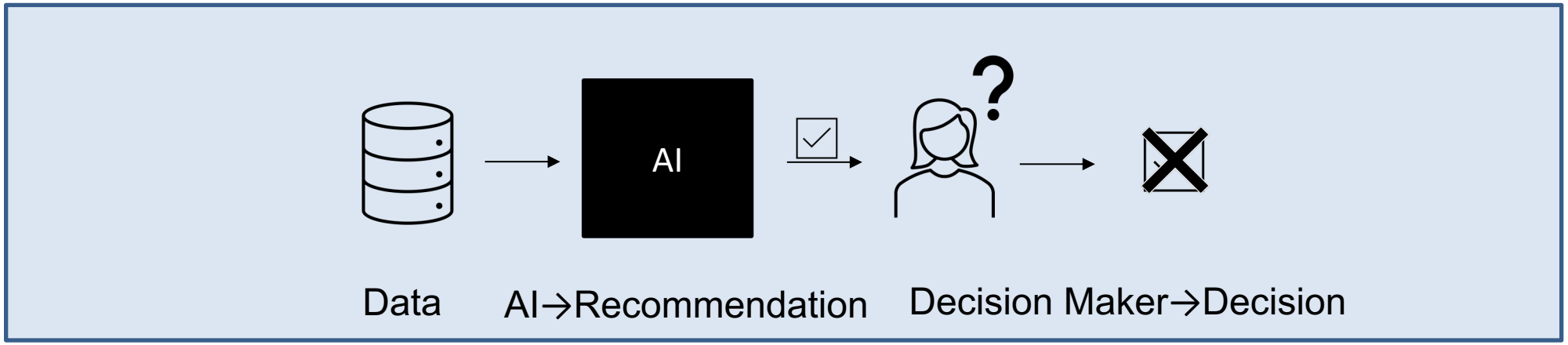
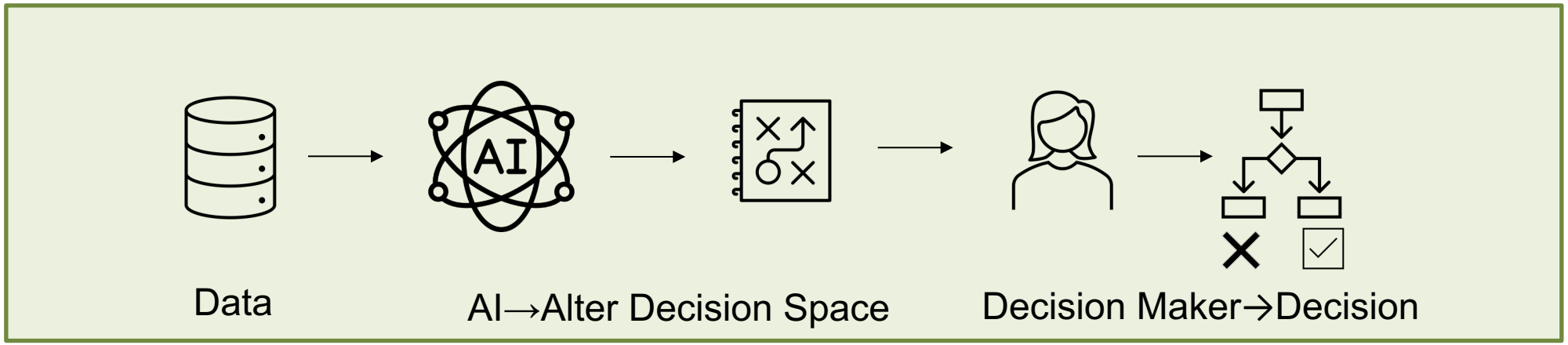
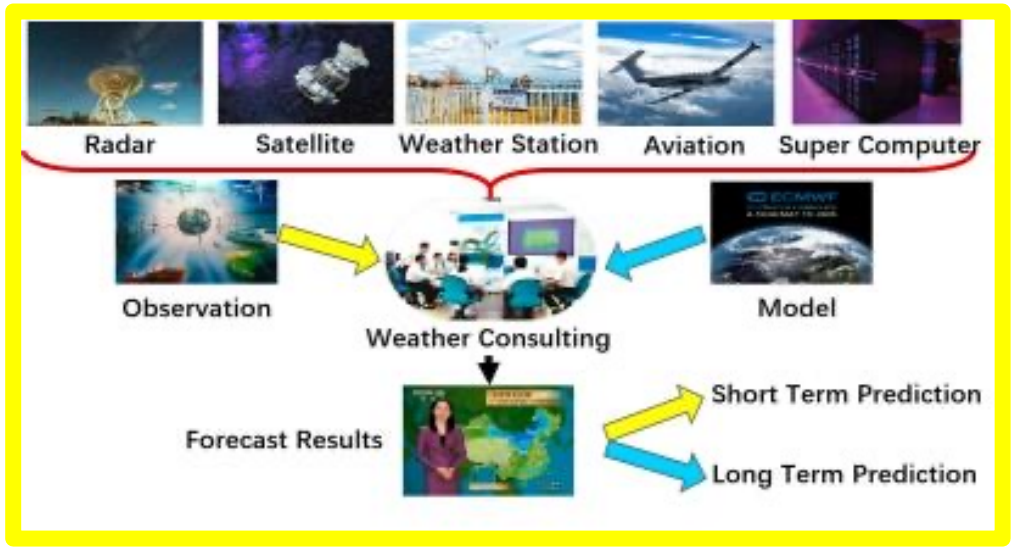
Improving AI-Advised Decision Support





Decision Making Strategies



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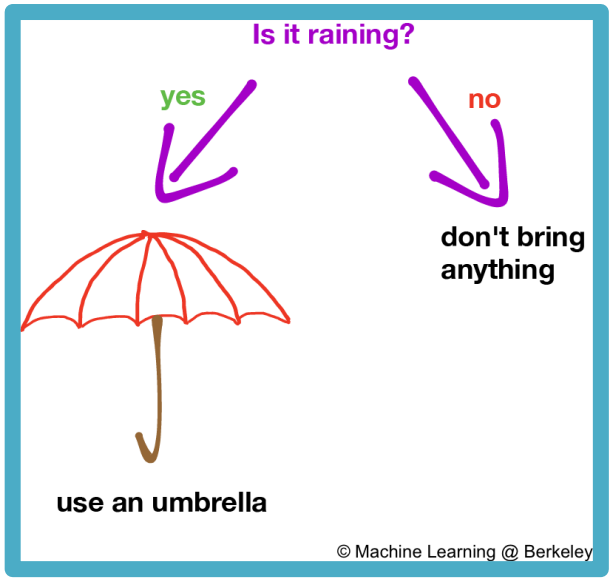


Analytic: seeks to weigh all the available information to identify an optimal solution

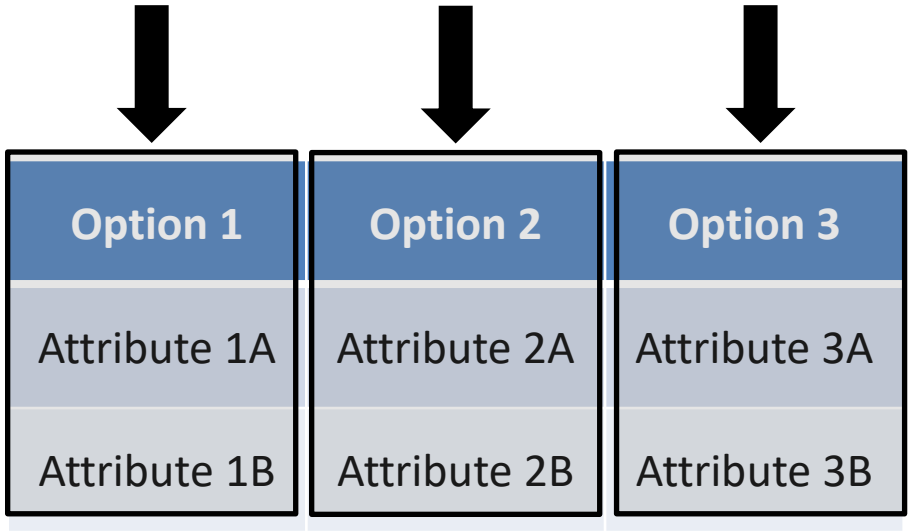
Analytic and heuristic styles are treated as opposites on the continuum of decision making strategies

Heuristic: Uses only a subset of "necessary" information to make "good enough" solutions that may not be optimal

Option-wise v. Attribute-wise Decisions

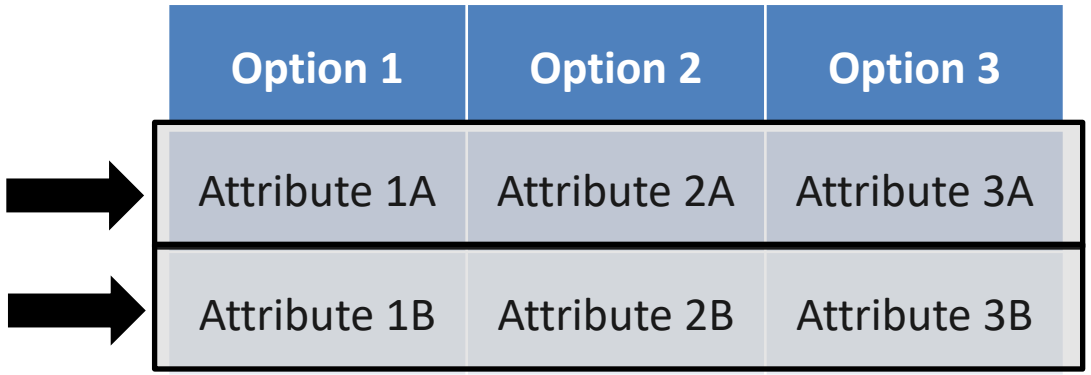
Analytic: Option-wise

- Analytic strategies are generally slower, more complex, and are highly dependent on working memory capacity



Heuristic: Attribute-wise

- Heuristic strategies ignore parts of the information, with the goal of making decisions more quickly, frugally, and/or accurately than more complex methods



Both types of decision strategies have been shown to be accurate and effective

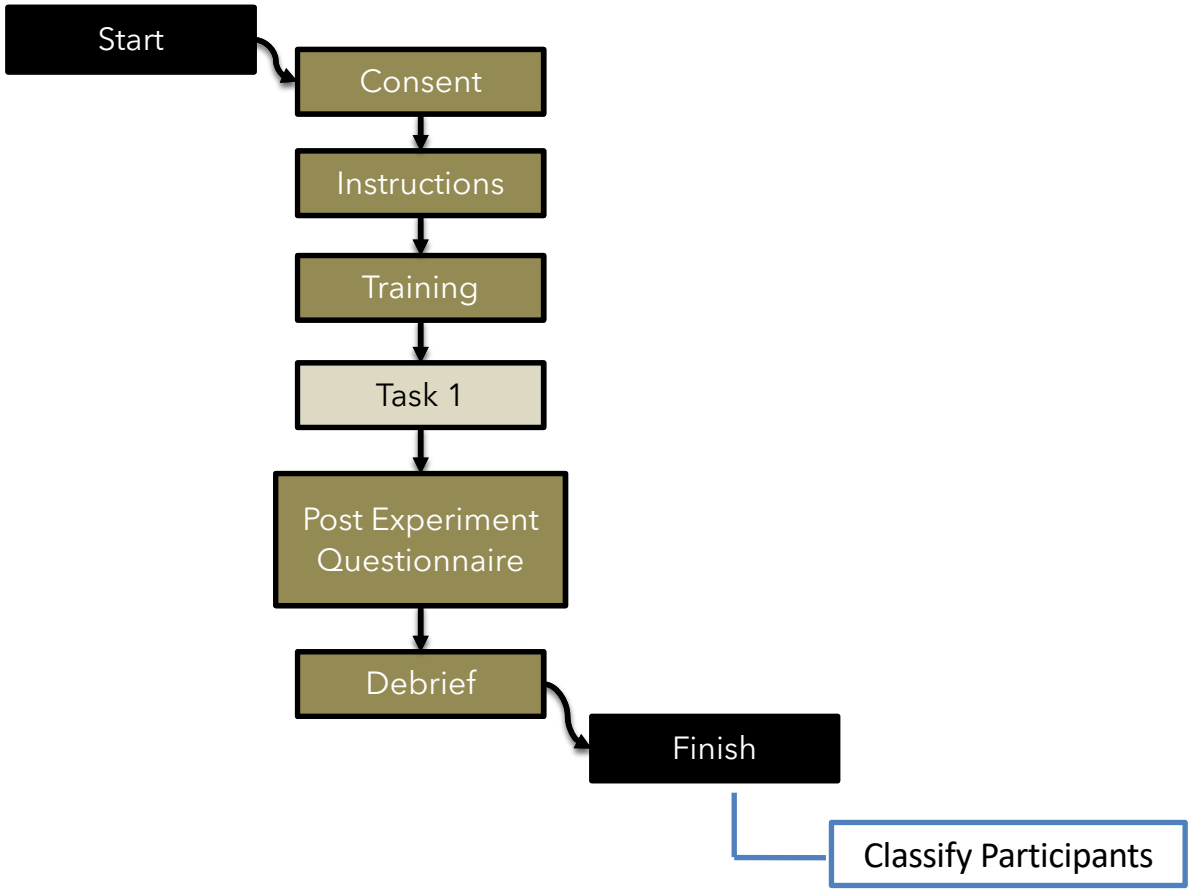
EXPERIMENT: PROVIDING A STRATEGY-BASED DECISION AID

- RQ1: What form of decision aid (heuristic or analytic) improves performance (accuracy, effort, time to complete)?
- RQ2: Does decision support that aligns with natural decision strategy improve performance over strategy-aid mismatch?

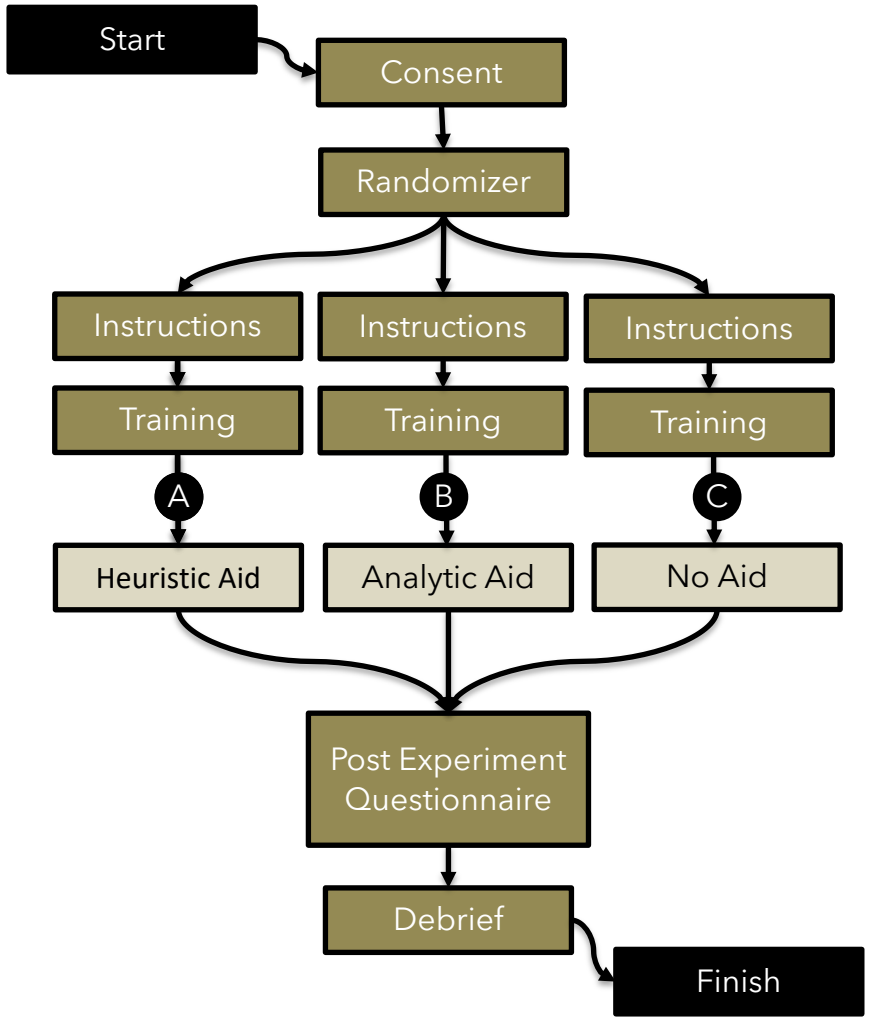
Experiment Design

Assess benefits of altering aid based through performance and workload

Part 1: Open to all



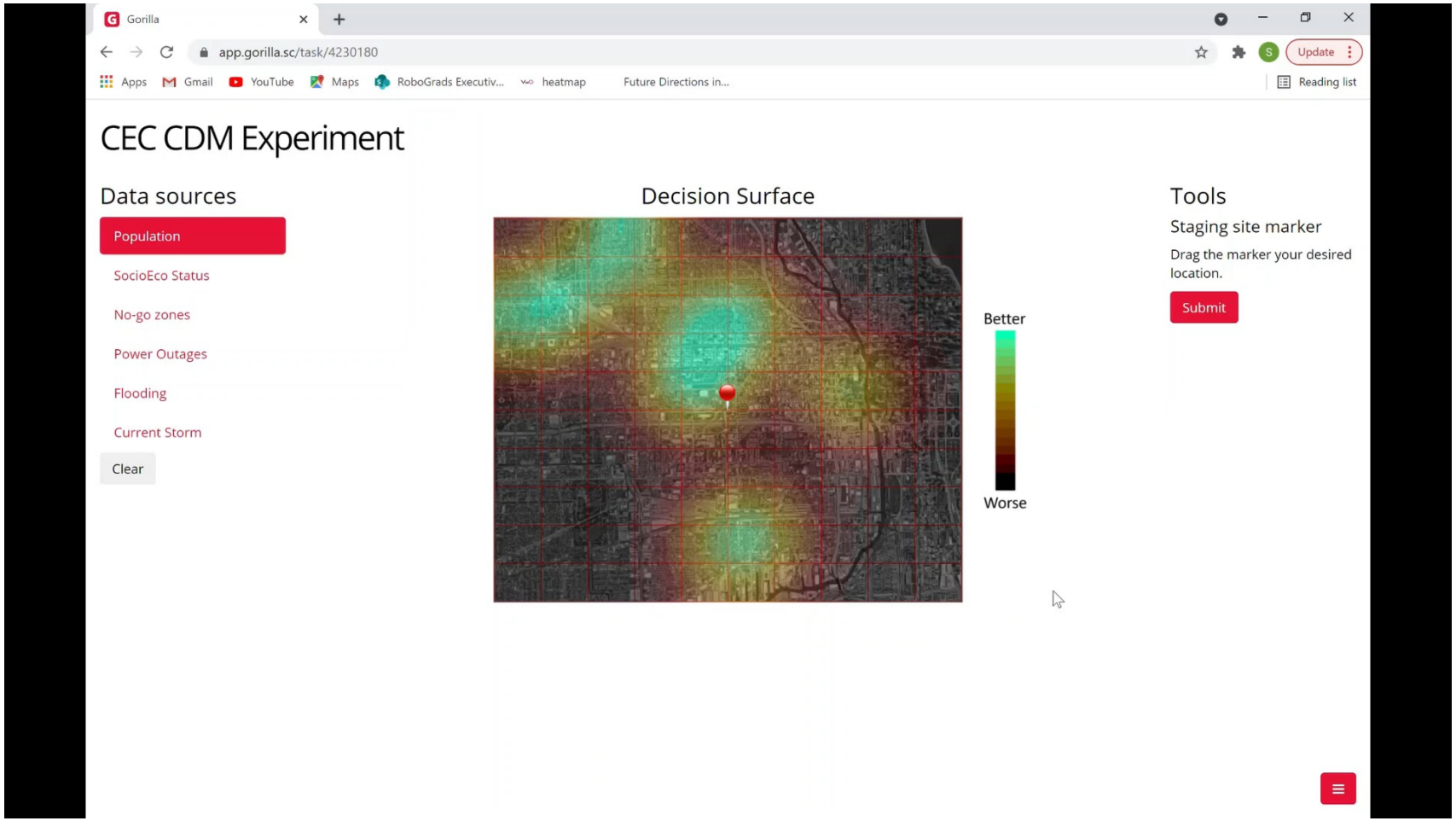
Part 2: Invite only



Participants

- Number of participants
  - Part 1: 178 participants
  - Part 2: 90 participants
- 40% male and 60% female
- Ages of participants ranged from 19-76 years old with a median age of 31.
- All participants spoke English, resided in the U.S., and reported no color blindness.

Disaster Relief Experimental Environment

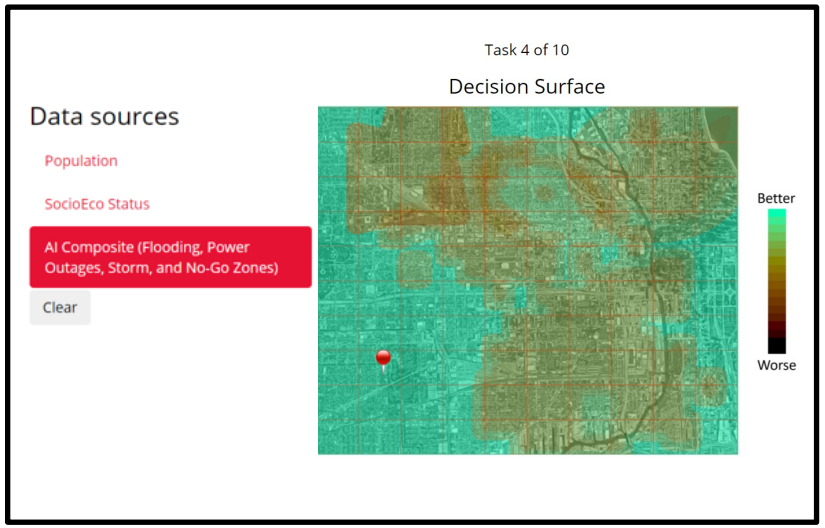


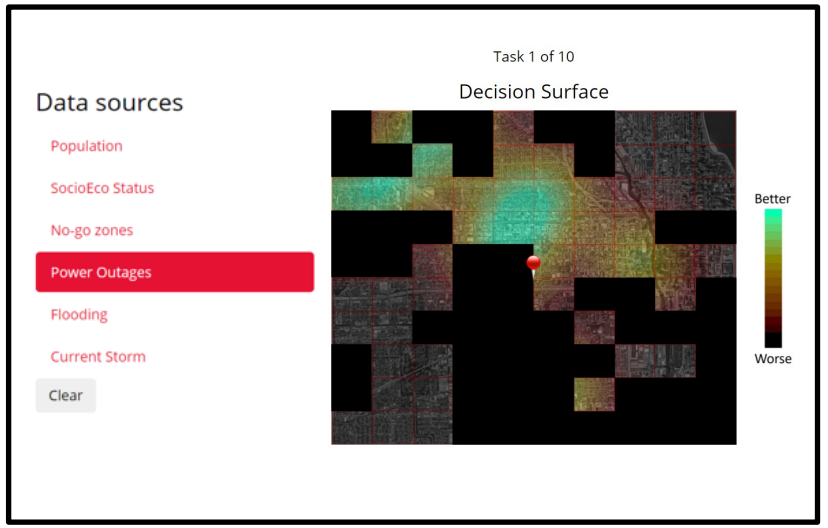
Decision Aid Breakdown

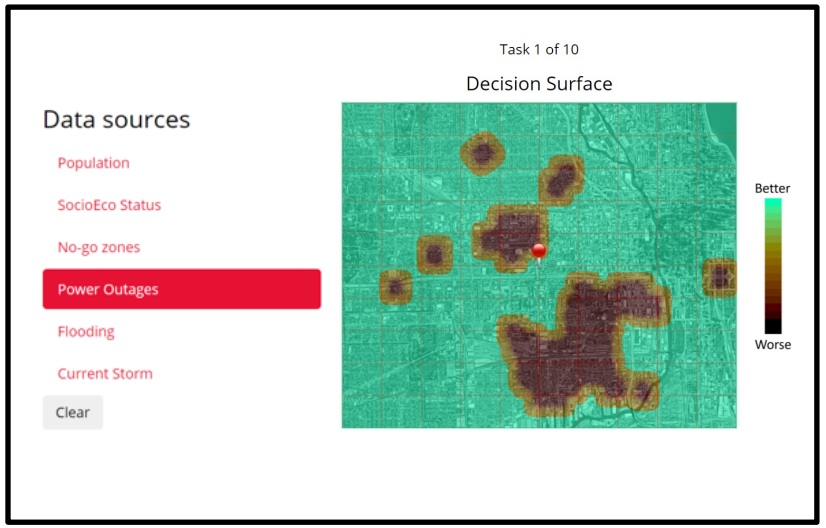
Heuristic Decision Aid
- Attribute space reduction from 6 to 3
- Decision Space = 300

Analytic Decision Aid
- Option space reduction from 100 to 50
- Decision Space = 300

No Decision Aid-Control
- Decision Space = 600

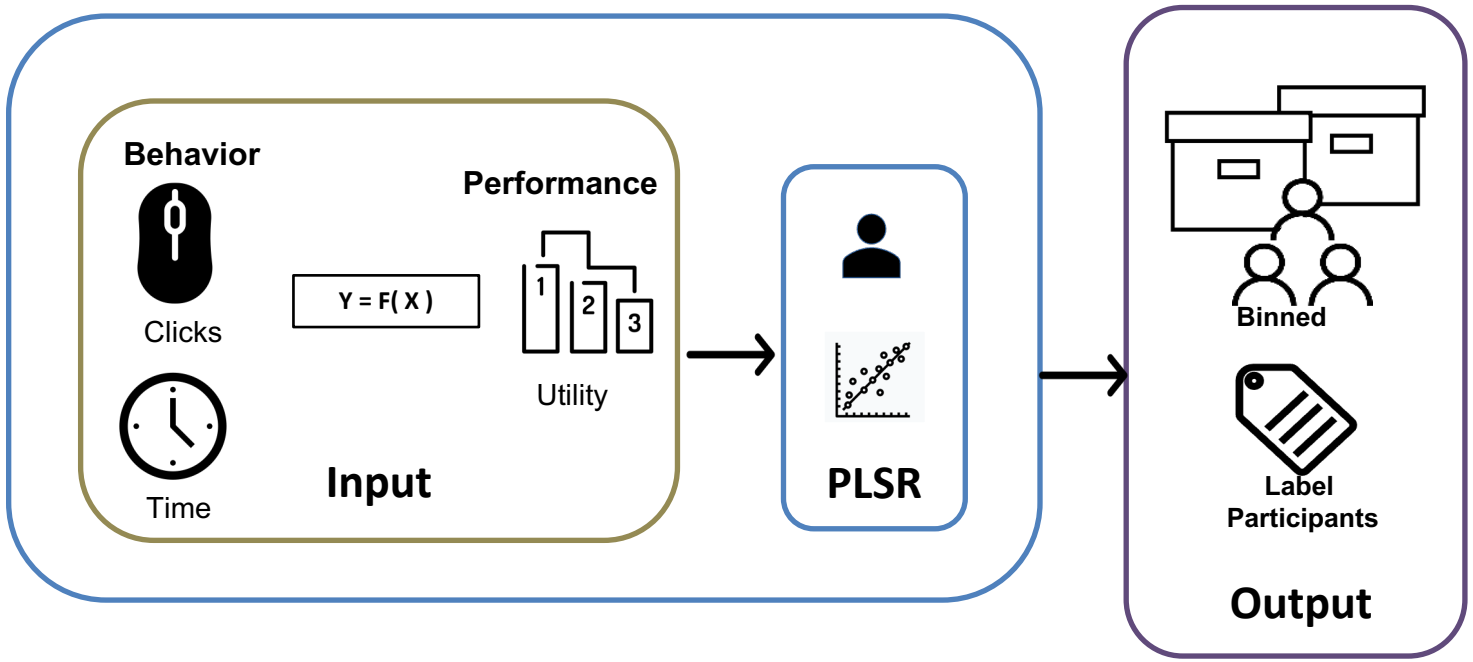






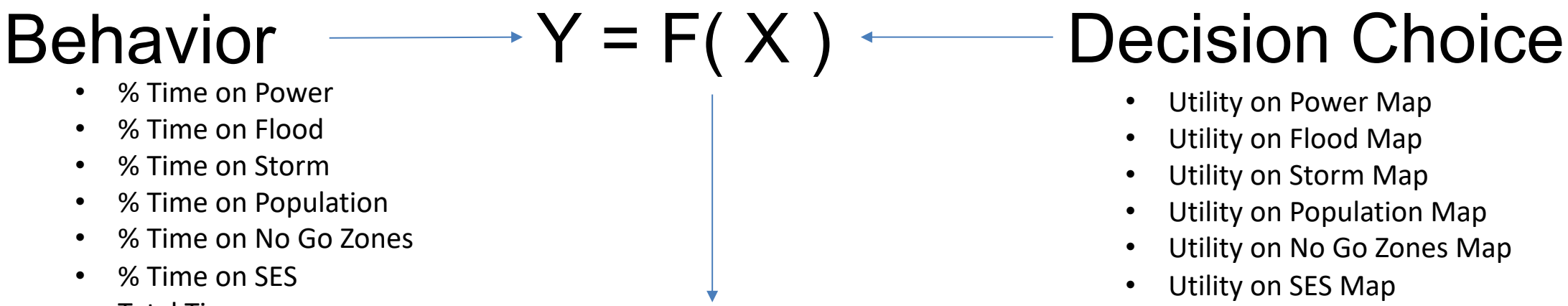
Approach to Identifying Decision Making Strategies

- Label data using Partial Least Square Regression: Relate performance data to behavior data
- Goal: Use behavior to classify decision strategies and predict decision strategies of participants



Partial Least Square Regression Setup

- Behavior is a function of your decision-making process



- % Time on Power
- % Time on Flood
- % Time on Storm
- % Time on Population
- % Time on No Go Zones
- % Time on SES
- Total Time
- # Clicks on Power
- # Clicks on Flood
- # Clicks on Storm
- # Clicks on Population
- # Clicks on No Go Zones
- # Clicks on SES
- Total Clicks

- Utility on Power Map
- Utility on Flood Map
- Utility on Storm Map
- Utility on Population Map
- Utility on No Go Zones Map
- Utility on SES Map

PLSR Output

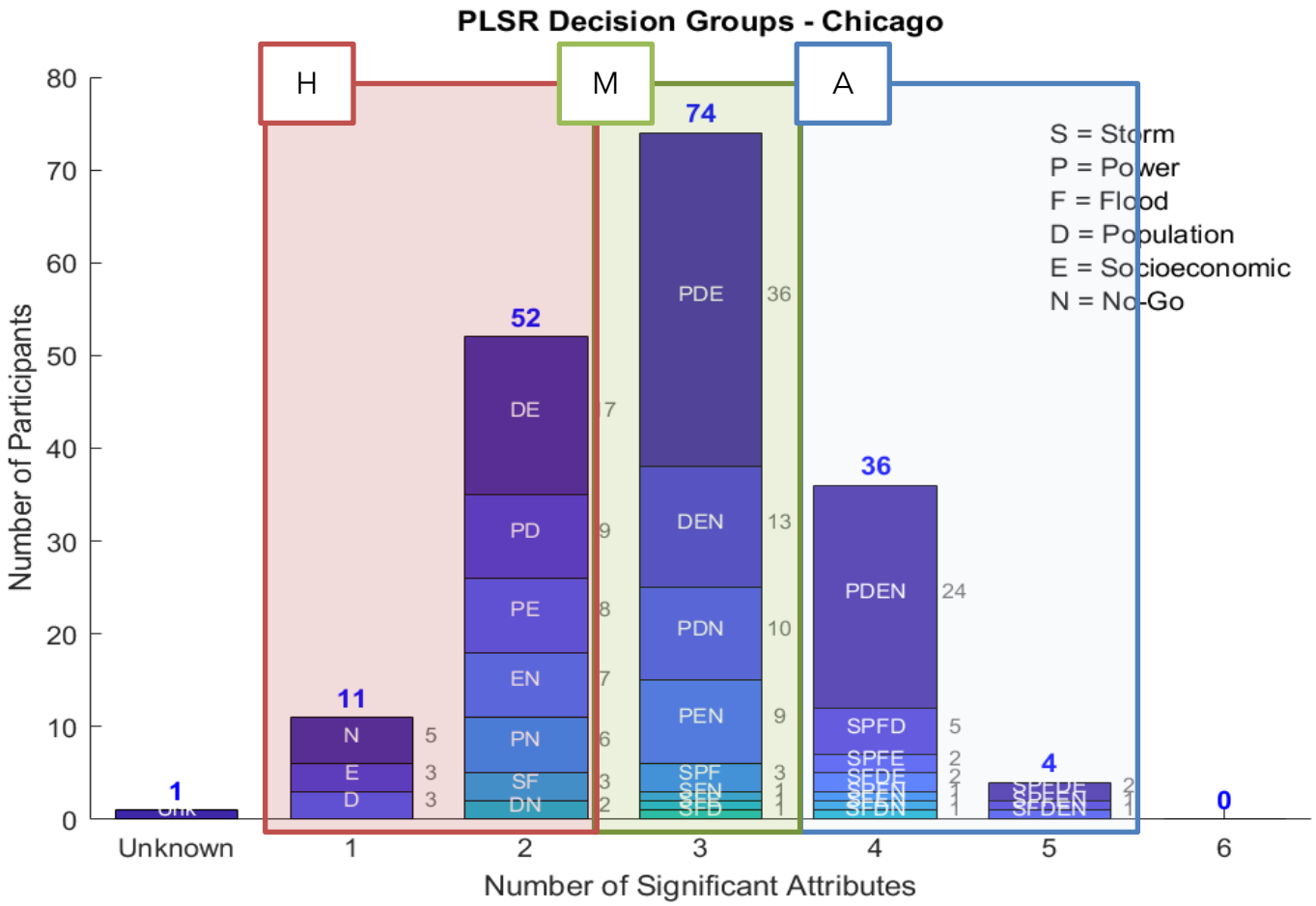
- Coefficients for each participant indicating which resources are most likely to correspond to their observed behavioral data

Part 1: Classifying Decision Strategies

Heuristic Strategy
- 1-2 Significant Attributes

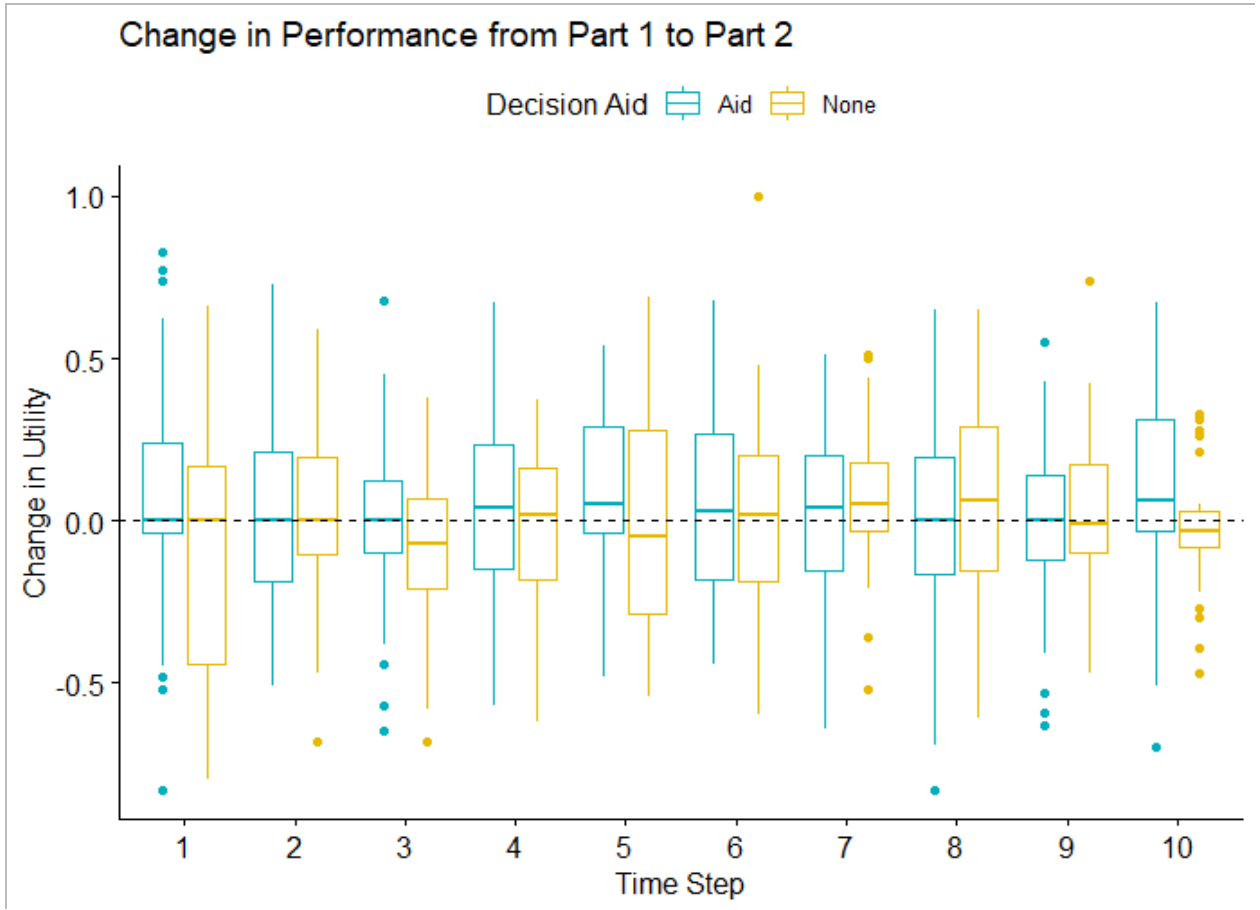
Mixed Strategy
- 3 Significant Attributes

Analytic Strategy
- 4-5 Significant Attributes



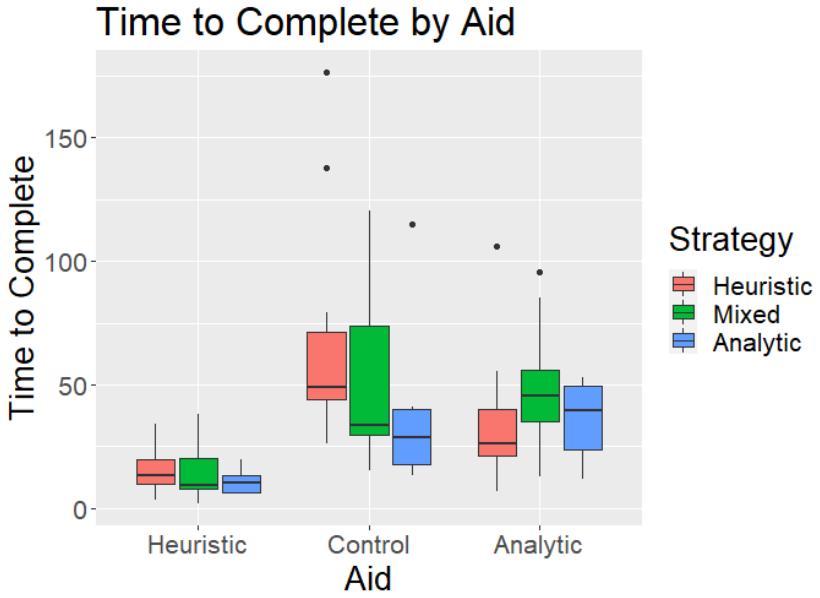
Change in Accuracy: Aid v. No Aid

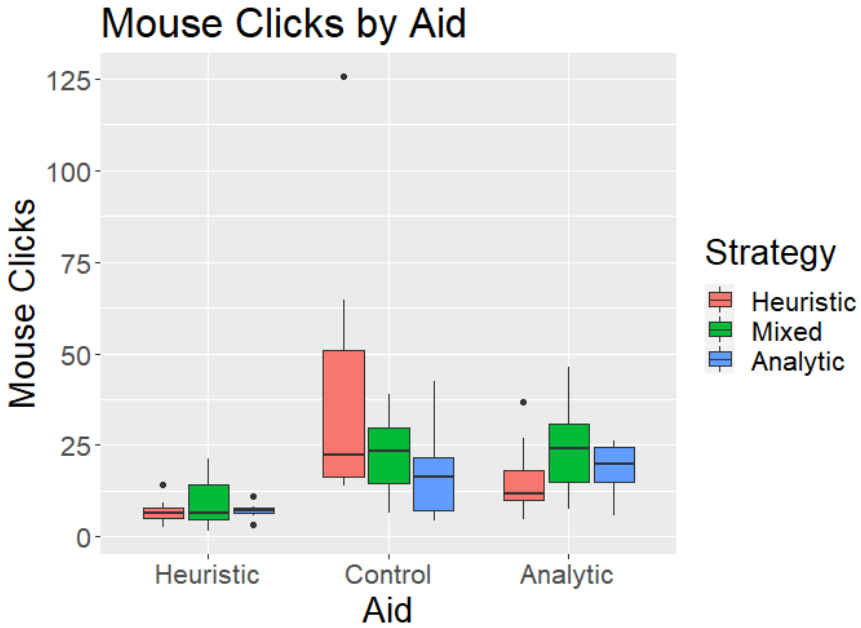
Change in Decision Making accuracy from Part 1 to Part 2



- There was no improvement (p=0.5) between Part 1 and Part 2 by participants that were not given an aid
- An ANOVA showed that there was significant improvement (p=0.0059) in decision making accuracy from those participants that were given a decision aid in Part 2

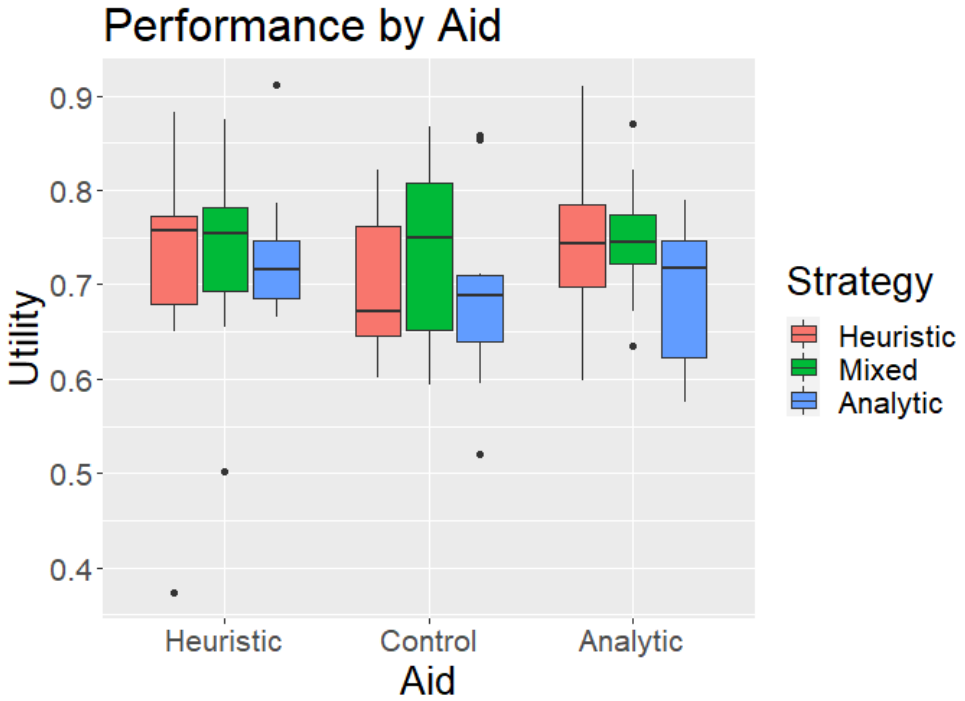
Effect on Effort (Time, Mouse Clicks)





- **Time to Complete:** An ANOVA showed decision aid does impact (p=1.7e-6) time to complete
- **Mouse Clicks:** An ANOVA showed decision aid does impact (p=3.99e-5) number of mouse clicks

Effect on Performance



- **Performance:** 'mixed' strategy participants performed significantly better by over 8% (p=0.0485) between trials compared to the 'analytic' strategy when no aid was given
- This indicates that the decision aid can boost performance of the lowest performers to bring them up to the performance standard of the other strategy groups

Key Take-aways: Implementing a Decision Aid

FASTER DECISIONS

IMPROVED ACCURACY OF LOWEST PERFORMERS

LESS EFFORT- FEWER MOUSE CLICKS

However, these findings were strategy independent

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