

## Decision Making

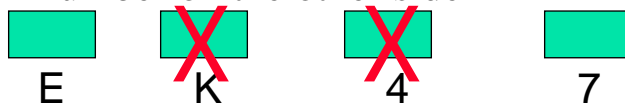


- Confirmation Bias
- Heuristics
  - Availability
  - Representativeness
  - Anchoring
  - As if
- Symbolic Comparison

## Decision Making

- Which cards do you need to turn over to obtain conclusive evidence of the following rule:

A card with a vowel on it will have an even number on the other side





## Decision Making

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- Answer:
  - E -- search for positive evidence
  - 7 -- search for negative evidence
- 4% search for positive & negative evidence
- 33% say E only (missing negative evidence)
- 46% say E & 4



## Confirmation Bias

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- Subjects focus on positive evidence
- Hypothesis-driven behavior
- Cognitive tunnel vision
- Tend to ignore negative evidence (even though equally diagnostic)



## Algorithms & Heuristics

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- Algorithm - A specific rule or solution, often detailed and complex, that is guaranteed to furnish the correct answer if followed correctly.
- Heuristic - A strategy or approach that works under some circumstances, for some of the time, but is not guaranteed to yield the correct answer.



## Heuristics

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- Humans use decision making heuristics
  - Simplifying rules of thumb
  - Simplify cognitive complexity
  - Speed decision making
  - Reduces burden on working memory
  - Can lead to errors -- special circumstances
  - Induces systematic biases



## Heuristics

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- Kahneman & Tversky's heuristics:
- Availability heuristic
- Representativeness heuristic
- Anchoring heuristic
- "As if" heuristic



## Availability Heuristic

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- In the English language, are there more words beginning with the letter K or more words with K in the third position?
- People often report 2 x as many words beginning with K
- In fact, there are many more words with K in the third position than in the first.

## Availability Heuristic

- The ease of bringing an example to mind is a means of estimating the probability of occurrence (likelihood)
- Frequent events will be easy to recall
- Rare events will be difficult to recall
- Bias -- tendency to overestimate rare events
  - Lightning strikes, JAWS, Gambling, School shootings

## Representativeness Heuristic

- Judgments strategy in which we make estimates on how similar (or representative) an event is to its population.
- Coin toss: Which is more representative?
  - HHHHHTTTTT
  - HTHHTHTHHT



## Gamblers Fallacy



- Suppose you are at a roulette wheel and the last 8 spins have come up red.
- Do you bet on red or on black for the next spin?
- Red and black equally likely -- no statistical reason to select red over black (or visa versa).

## Representativeness Heuristic

- *Frank is a meek and quiet person whose only hobby is playing chess. He was near the top of his college class and majored in philosophy.*
- Is Frank a librarian or a businessman?
- Consistent with librarian stereotype, but there are many more businessmen, so base rates make it much more likely that Frank is a businessman.

## Anchoring Heuristic



- If you are given a series of pieces of information, you give more weight to early evidence in the sequence
- Tendency to give undue weight to evidence which occurs early or most recently
- U shaped function

## Car for Sale



- |                  |                  |
|------------------|------------------|
| ○ High mileage   | ○ Clean          |
| ○ Slight rust    | ○ Fuel efficient |
| ○ Dependable     | ○ Dependable     |
| ○ Fuel efficient | ○ Slight rust    |
| ○ Clean          | ○ High mileage   |



## Anchoring Bias

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- Judicial system -- prosecution goes first
- Three mile island -- pressure relieve valve indicated what it was told to do, not what it actually did -- decisions made early biased other sources of information
- Confirmation bias -- tendency to seek (and find) information that confirms initial hypothesis (Science/Research)



## “As If” Heuristic

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- When several sources of evidence with different reliability are presented, people tend to treat all cues “as if” they had the same reliability
- Jurors, Nurses, Military
- Manifestation of cognitive simplification

# Improving Decision Making



- Paired Comparison Analysis
- Grid Analysis
- Decision Tree
- Cost/Benefit Analysis

## Paired Comparison

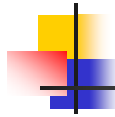
		Stanford (A)	Harvard (B)	Illinois (C)	Michigan (D)	Utah (E)	Total point for each option	Percentage for each option
A	Stanford		A,2	A,2	A,3	A,3	10	50%
B	Harvard			C,1	B,1	B,2	3	15%
C	Illinois				C,2	C,3	6	30%
D	Michigan					D,1	1	5%
E	Utah						0	0%
							20	100%
The Paired Comparison tool is useful for ranking a list of options.								
Directions: List each option across the columns and down the rows. Give each option a single letter designation. Grey out all cells below the diagonal (they will represent duplicate information). For each cell, compare the two options and select the one that is more important. Rank its greater importance from 1 to 3, 3 being the highest.								
Total the points for each option, A through E. Add up all points and give each option a percentage by dividing by the total. In this example, option A, Stanford, ranks the highest with 50% of the total points.								



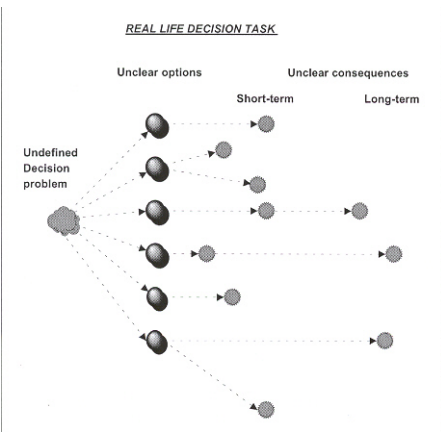
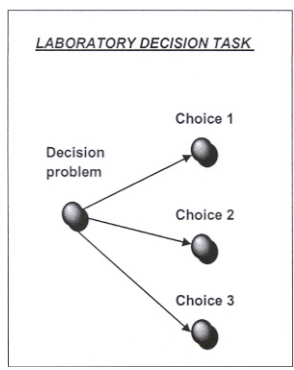
# Grid Analysis

(Normative Decision Making)

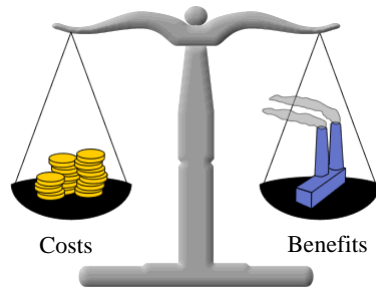
Factors:	Cost	Skis	Storage	Comfort	Fun	Look	Total
Weights:	4	5	1	2	3	4	
Sports Car	1	0	0	1	3	3	27
SUV/4x4	0	3	2	2	1	1	28
Family Car	2	2	1	3	0	0	25
Station Wagon	2	3	3	3	0	1	36



# Decision Tree



## Cost/Benefit Analysis

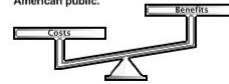


### Universal Healthcare

Healthcare costs redistributed from poor to rich through increased taxes on upper income levels.

Government expands further and exerts more control over American public.

Healthcare costs redistributed across income classes providing poor with more affordable access.



## Mental Representations and Decision Making

- How are our decisions affected by mental representations?
- How does the type of question affect the decision making process?
- How does the size of the comparison affect the decision?



## Symbolic Comparison

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- Which is bigger:
  - An elephant or a whale?
  - An ant or a termite?
  - A bee or a goat?
  - A whale or a goat?
  - A rabbit or a cat?



## Symbolic Distance Effect

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- 1 vs 2?
- 1 vs 5?
- 1 vs 9?
  
- As the difference increases, time to make decision decreases



## Congruity Effect

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- Which is smaller: 1 vs 2? (faster)
- Which is larger: 1 vs 2? (slower)
  
- Which is smaller: 8 vs 9? (slower)
- Which is larger: 8 vs 9? (faster)
  
- When there is a congruity between the instructions and the symbols, decisions are faster and more accurate



## Mental Representations

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- Mental representations are not linear
  - large differences are compressed so that 1 vs 2 is a “bigger difference” than 8 vs 9
- Car \$5,000 vs \$7,000
- House \$255,000 vs \$257,000
  
- Which deal are you most likely to accept?