Decisions, decisions…
The psychology of judgment and choice

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Lecture 3 of 6

Lecture topics

- Week 1. What are decisions and how should we study them?
- Week 2. Beliefs, values and decisions in an uncertain world
- Week 3. Decision heuristics and biases
- Week 4. Expert judgments and decisions
- Week 5. Group decision making
- Week 6. Social decisions and dilemmas

Review

- Last week we began a discussion about some psychological aspects of the Rational Calculus
  - Perceiving or conceiving possible alternative solutions to a problem and their possible outcomes
  - Assigning values (utilities) to each combination of possible solutions and outcomes
  - Assessing the probability of each outcome (expectation) for each alternative
  - Combining values and expectations to find the expected value of each alternative
  - Choosing the alternative with the highest expected value
- Today we focus on
  - Assessing probabilities, also called expectations and beliefs.
  - Combining our values and expectations
  - Implications for improving decision making

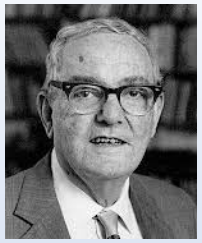
Assessing probabilities (expectations, beliefs) to outcomes

- Examples
  - If I eat more fresh veggies, what are the chances I will live a year longer?
  - If I go to Patrice's, what are the chances I will find fresh veggies?
  - If I go on holiday, what are the chances of a home emergency?
  - If I apologize for my mistake, what are the chances I will be forgiven?
  - If I redo my kitchen, what are the chances I can recover the cost when I sell the house?
  - If I visit my friends in Guelph, what are the chances I will
    - Be bored by the long drive?
    - Make my friends happy?
    - Eat too much?
    - Get in an argument?
    - Reduce my guilt? Increase my guilt?

Risk versus uncertainty

- Risk. chances of outcomes that can be estimated using simple counts and explicit statistical/logical rules
  - "Historical records indicate that when air masses are similar to the one passing by tomorrow, 60% of them produced snow."
  - "A poll of 1,000 seniors found that 38% of report feeling lonely at least once a week, accurate to within 4 percentage points 19 times put of 20."
  - What are my chances of winning the one $500 lottery ticket of 1,000 sold?
- Uncertainty. Chances of outcomes estimated by mental inferences, often implicit and intuitive
  - "This is the first wounded elephant I have encountered. What are the chances it will hurt me?"
  - "What are the chances Shakespeare himself wrote all them plays?"
  - "What are the chances of hurting myself if I shovel all this snow?"
- We will focus on the mental rules we use in situations of uncertainty

Bounded Rationality
(Herbert Simon 1916-2001)



- Humans are limited (bounded) in how rational they are at decision making by three factors
  - The difficulty or complexity of the decision to be made
    - Availability of relevant information about alternatives, outcomes, values, probabilities
  - Cognitive limitations
    - Limits if attention, short-term (working) memory, logical abilities, computational skills, etc.
  - Time constraints
    - How much time/attention is needed to make a rational decision vs how much is available
- When requirements for a rational decision exceed these limits, humans resort to satisficing rather than to optimizing
  - "If all else fails, lower your standards." = Principle of Last Resort
  - Creates opportunities for people to use mental shortcuts for approximating values and probabilities, called heuristics

From where do our beliefs about uncertain outcomes come?

- Personal experience, trial and error
  - Chances that a dog will bite you
  - Chances of falling after an ice storm
  - Chances of finding perfect mate before/after online dating experiences
  - Chances of Internet broken today
- Communications with others
  - Social influence/pressure, testimonials, observational learning
    - What parents tell children about trusting strangers
    - What doctors tell patients about diseases and prognoses
    - Tracks in snow
  - Expert opinion
    - “Scientific studies prove …” “The weather channel predicts …”
  - Gossip, advice from friends and strangers
  - News headlines, etc.

Biases of personal experience and communications

- Personal experience is often unrepresentative
  - Beliefs about bee stings different for bee keepers than others
  - Beliefs about danger different for police/first responders than for others
  - We tend to pay more attention to dangers than to opportunities, to novelty than to routine
  - personality differences in interpreting experiences: normal, depressive, paranoid, etc.
- Communication can be unrepresentative
  - News headlines make unusual events usual
    - Combs & Slovic, 1979. Newspapers overemphasize disasters, accidents, violence and underemphasize diseases
  - People dating, interviewing for jobs displaying their “best self”
  - Propaganda censoring bad, emphasizing good
  - Advertising emphasizing pros, silent on cons (or listed quickly in drug ads)

Biased samples can alter probability estimates and decisions

Town lot	True chance of selling lot for $5,000 profit	True expected value	Biased estimates of chances	Biased expected value
X	60%	$3,000	30%	$1,500
Y	40%	$2,000	80%	$4,000

Town	True chances of good job value = +10	True expected value	Biased estimates of chances	Biased expected value
Almonte	60%	+6.0	35%	+3.5
Arnprior	20%	+2.0	50%	+1
Perth	40%	+4.0	80%	+4

Person	True chances of good marriage = +10	True expected value	Biased estimates of chances	Biased expected value
A	25%	+2.5	35%	+3.5
B	75%	+7.0	75%	+7.5
C	10%	+1.0	80%	+8.0

Faulty cognition: Heuristics and biases

- Heuristic = a mental shortcut or "rule of thumb" for calculating, estimating, or answering questions
- Bias = systematic errors of estimates
- First studied by Tversky and Kahneman (1974)
- Now over 100 heuristics have been studied, hundreds more await study. Most have names such as:
  - Availability
  - Representativeness
  - Anchoring and adjustment
  - Affect
- No all heuristics produce biases, all the time, but many can

Example: Availability heuristic

- Estimates based on how easy it is to retrieve examples from memory
- Example
  - Average age of professional hockey players versus badminton players
- Demonstrations:
  - Are there more words in English that begin with a “K” or that have K as the third letter?
  - Imagine for a moment, that life was found on Mars under its ice cap – tiny bacteria with genetic traits similar to bacteria here. Imagine what a profound and exciting discovery this would be. What do you think are the chance that life will be found on Mars?
  - What do you think are the chances that a person living in the Middle east is:
    - A Moslem extremist?
    - A Christian?
  - Which is more common (a) death by suicide bombing or (b) by snake bites?

[planes = 305 per year
bites = 132,00 per year]

Representativeness heuristic

- The degree to which a sample seems to represent characteristics of a population
- Demonstrations
  - Suppose I toss a coin 12 times and record the outcomes. Which is most likely to occur? Which least likely?
    a. HTTHTHHHTHTT
    b. HHHHHHTTTTTT
    c. HHHHHHHHHHH
  - Are ulcers more likely to be caused by stress or bacteria?
  - Mary visited her doctor for an upset stomach. Her doctor prescribed two small glasses of warm apple vinegar. The next day, after drinking the vinegar, Mary felt much better. What are the chances her recovery was caused by the vinegar?

Anchoring and adjustment

- Repeated judgments made by starting with an estimate and adjusting up or down with new evidence
  - "Where people go depends on where people start."
- Example
  - Teachers given essays to grade from students whose previous grades had been randomly paired. Higher previous grades → higher essay grades
- Demonstrations
  - Johann Sebastian Bach had 20 children. How many children did Chopin have?
  - Ludwig van Beethoven had no children. How may children did Mozart have?
  - Estimate the answer to a multiplication problem (hand-out)

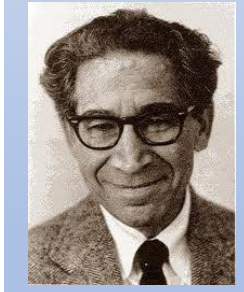
Social heuristics

- Examples
  - Observe what other people are doing and copy their “norm-al” decisions
    - Muzafer Sharif (1935) and autokinetic effect research on development of norms
  - Copy what selected others are doing
    - Scientists, medical doctors, family members, clergy
  - Seek advice from experts
    - Scientists, health professionals, financial experts
    - If experts unavailable, seek advice from rich, powerful, hi status, beautiful people
  - Look on internet for reviews
- But if beliefs are wrong, these heuristics multiply their bad consequences across many people

Chopin = 0; Mozart = 6
Solution = 362880

Affect

- Emotional reactions can influence outcome probability estimates
  - Hope can increase estimates of chances something good will occur
  - Despair can decrease estimates of chances something good will occur
- Cognitive dissonance can be reduced by biasing outcome probability estimates
  - Leon Festinger's theory of cognitive dissonance (1957)



    - Belief-behaviour relations can be consonant or dissonant
      - Consonant, "I believe I am honest and I told the truth."
        Dissonant, "I believe I am honest but I told a lie."
    - Dissonance creates psychological pressure to change belief-behaviour relations
    - If we believe that our behaviour is (a) public and (b) voluntary, we are more likely to change our belief to be consonant with our behaviour than vice versa
  - One classic demonstration: Knox and Inkster racetrack studies (1969)

Affect and sunk costs

- Sunk costs = losses from making a bad decision
  - Example: Mary and Fred spend $200 on tickets to a new musical. The first half is very disappointing, so they consider leaving at intermission They decide instead to sit through the second half because “we do not want to waste our money.”
- Variant = doubling down
  - Example: Bill brings $100 to a local casino, plays a $5 one-arm bandit with a $50 jackpot and by the end of the evening has only $10 left. Should Bill go home or spend his last $10 playing a $10 one-arm bandit for a chance at winning $100?
- Variant = University of Alberta’s education building construction
- Variant = building walls, investing in risky start-ups, staying in bad marriages, etc.

Affect: desire and fear

- Desire = increased feeling for a positive outcome
  - Attention focuses on gain
  - Leads to optimism = belief in a positive outcome
    - ”I hope I will win the lottery” → “I believe I will win the lottery”
- Fear = increased feeling of a negative outcome
  - Attention focusses on loss
  - Leads to pessimism = belief in a negative outcome
    - “I fear I will lose my job” → “I believe I will lose my job”
- Despair, depression, agency, and learned helplessness
  - Optimists tend to overlook chances of negative outcomes = bad luck
  - Pessimists tend to overlook chances of positive outcomes = good luck

Shall we decide to take a break?

Heuristics and biases: So what?

- When there is no ”scientific” means of estimating probabilities of outcomes, what alternatives are there to using heuristics?
- In situations where the Rational Calculus and Heuristics can be compared How often do they lead to the same decision?
  - If 50% of less, then worry
  - If 90% or more, then relax
- How can we know? Computer simulations

Efficient decision heuristics
(Thorngate, 1980)

- Step 1. Make two tables of alternatives (rows) and possible outcomes (columns)
  - Step 1a. Fill one table with random numbers for values
  - Step 1b. Fill other table with random numbers for probabilities
  - Step 1c. Calculate Expected Value (E.V.) for each alternative per Rational Calculus

Values

	Outcomes			
Alternatives	W	X	Y	Z
A	8	3	7	0
B	5	1	9	7
C	5	9	6	10
D	3	7	3	1
E	6	1	8	3

X

Probabilities

	Outcomes			
Alternatives	W	X	Y	Z
A	23%	23%	47%	7%
B	34%	12%	19%	35%
C	13%	28%	32%	17%
D	39%	16%	12%	33%
E	6%	21%	17%	56%

=

Expected Values

Alt	E.V.
A	5.82
B	5.98
C	6.79
D	2.98
E	3.61

Efficient decision heuristics
(Thorngate, 1980)

- Step 2. See what different heuristics would do. 3 of 10 heuristic examples:
  - Choose alternative with highest value
  - Choose alternative with highest total value
  - Choose alternative with highest value for most likely outcome

Values

	Outcomes			
Alternatives	W	X	Y	Z
A	8	3	7	0
B	5	1	9	7
C	5	9	6	10
D	3	7	3	1
E	6	1	8	3

Highest Value

Alt	Max
A	8
B	9
C	10
D	7
E	8

Highest Total

Alt	Total
A	18
B	22
C	30
D	14
E	18

Probabilities

Outcomes			
W	X	Y	Z
23%	23%	47%	7%
34%	12%	19%	35%
13%	28%	32%	17%
39%	16%	12%	33%
6%	21%	17%	56%

Most Likely

Alt	Likely
A	7
B	7
C	6
D	3
E	3

Efficient decision heuristics
(Thorngate, 1980)

- Step 3. Create 10,000 of these situations using randomly generated values and probabilities.
  - For each of these situations count the number if times each heuristic chose highest E.V., 2nd highest E.V., 3rd highest etc.
  - Repeat steps 1-3 with different numbers of alternatives and outcomes

Efficient decision heuristics
(Thorngate, 1980)

- Results
  - Highest Value and Highest Total heuristics did an excellent job of choosing highest Expected Value alternatives
    - 2 alternatives = 90% + of the time
    - 8 alternatives = 60% of the time + 30% 2nd best
  - Most Likely alternative did worse
  - Among the poorest at choosing alternatives with highest expected value were those using a rule called Elimination by Aspects
- Do people ever use an Elimination by Aspects heuristic?