Decisions, decisions...
The psychology of judgment and choice

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Lecture 1 of 6
Welcome!

And thank you for deciding to attend
(No abulia here!)
Way back when...

• Humans have for millennia been seeking ways to solve their problems by making good decisions
  • Seeking help or advice from elders who have previously encountered similar problems or decisions
  • Seeking and interpreting signs or signals in nature (stars, plants, bird migrations, etc.)
  • Consulting with moral authorities (religious texts, clergy, laws, traditions)
  • Waiting for divine inspiration, often during contemplation and prayer
  • Succumbing to superstitions (e.g., gambler’s fallacy; dancing pigeons)
  • Etc.

• The rise of science and mathematics in Age of Enlightenment (1600s) led to the hope that problems could be solved by applying mathematics and other scientific methods of logical thinking to improve our decisions.
Wanted: A Rational Calculus for decision making

• The prescriptive approach
  • Attempts by mathematicians and economists to develop a set of rules— a rational calculus -- prescribing how we should make decisions for solving problems.
    • Reflected in management lexicon: prediction, optimization, evaluation, control, etc.
    • Revealed in insatiable appetite for statistical information: Big Data and all that

• The descriptive approach
  • Attempts by psychologists and cognitive scientists to develop another set of rules describing how we really do make decisions, why we do, what the consequences might be, and how we can reduce bad consequences
    • Reflected in work on motivation, memory, problem solving, satisficing, heuristics, group processes, nudging, attitude change, behavioural economics, and more
    • Leading us to rethink some very old questions about decisions and what to do with bad ones.
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
Let’s make a decision!

1. In a moment I will show you a list of dinner menu items
2. Please select the one you most prefer
   1. Write down the number of your choice
3. Time how long it takes you make your decision
   1. Write down the first number you hear me call after you decide
4. Are you ready?
Which of the following would you prefer for dinner tonight?

1. Sweet Corn & Peruvian Pepper Polenta Stack
2. Braised Lamb with Brown Buttered Tagliatelle
3. Braised Beef Short-Rib with Leek Cream
4. House Curried Chicken Breast with Israeli Couscous
5. Seared Atlantic Sea Scallops with Coconut Basmati Rice
6. Pan Seared Beef Striploin with Roasted Tomato Romesco
7. Burger Royale with Cheese
8. Fish and chips
Let’s do that again!

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Discussion

• Which did you choose and why?
• Who chose the same menu item on both occasions?
  • Why the same?
• Who chose different items on the two occasions?
  • Why different?
• Who took less time to choose on the second occasion?
  • Why do you think it took less time?
• Who took more time to choose on the second occasion?
  • Why do you think it took more time?

• What do the time differences imply for how we make decisions?
Most of us make hundreds of decisions each day

- We make them in ordinary situations with small, predictable consequences and second chances
  - Get up or press the snooze button?
  - Exercise or not?
  - What to wear?
  - What to have for breakfast?
  - Order of the day’s activities
  - Attend or skip decision making course?
  - Which route to walk the dogs
  - Red or white? Small or large?
  - Microwave or scratch?
  - Run the dishwasher or skip?
  - Watch TV? If yes, what shows?
  - Bed?
But some decisions must be made in unordinary situations with large, unpredictable consequences and few second chances

• Radiation, chemo or nothing?
• Accept marriage proposal or not?
• Have children or not?
• Stay in marriage or leave?
• Accept the job offer or wait for a better one?
• Invest life savings in Google shares or elsewhere?
• Drive or don’t drive while intoxicated?
• Major in business or in music?
• Stay put or move?
Leading research psychologists to ask four interesting questions

1. How do we make decisions in familiar, predictable situations with modest consequences?
2. How do we make decisions in unfamiliar, unpredictable situations with profound consequences?
3. Why do we make bad decisions?
4. What can be done to reduce the number of bad decisions we make?
Break now or never?
What is a decision?

• Dictionary: “The act or process of deciding.” “A conclusion or resolution reached after consideration.”

• More useful: “A decision is a choice among two or more solutions to a problem.”
  • A problem is a perceived difference between what a person wants and has.
    • Problems of inclusion: Wanting something but not having it
    • Problems of exclusion: having something but not wanting it
  • A solution is anything that reduces a want-have difference.
    • External solutions: changing what a person has
    • Internal solutions: changing what a person wants
  • How do we chose between external and internal solutions?

• The Principle of Last Resort
  • We change what we want to suit what we have only when we cannot change what we have to suit what we want.

“If first you don’t succeed, try, try again.”
“If all else fails, lower you standards.”
Making decisions: head versus heart

• **Enter Daniel Kahneman, Nobel Prize in Economics, 2002**

• **Wrote *Thinking, fast and slow* 2011**
  • *Summarizes 50 years of research on human judgment and decision making*

• **Two ways of making decisions: “head” versus “heart”**
  • **System 1 thinking**: fast, low level, instinctive, intuitive, habitual, midbrain (heart)
  • **System 2 thinking**: slow, deliberative, logical, frontal lobes (head)

• **System 2 employed when System 1 insufficient**
  • John Dewey (1922), “Thought is secreted in the interstices of habit”
System 1

- Relies heavily on perception, recognition, recall, habit, low level thought
- Wonderfully adapted to familiar repeated, predictable situations
  - Consider learning to drive as a shift from cognition to re-cognition
  - Consider learning a new language and the shift from rules to instances
  - Consider what we know about what makes a a good chess player
- Studied in great detail by behavioural psychologists interested in learning
  - Pavlov, Watson, Skinner and others
  - Association, generalization, discrimination, reinforcement schedules, etc.
- Also studies by advertisers, propagandists, consumer psychologists
System 2

- Relies heavily on reasoning, logic, inference, higher level cognition
- Invoked in unfamiliar, unpredictable situations
  - Is now the time to buy an electric car?
  - Have the surgery now or wait?
  - Will a border wall be cost effective?
- Studied by mathematicians, economists = prescriptive approach
  - Pascal, Fermat, Bernoulli family, Halley, Gauss, von Neumann
- Studied extensively by cognitive psychologists = descriptive approach
  - Bruner, Neisser, Simon, Newell, Abelson and many others
  - Reinforcement schedules, including random, partial reinforcement
- System 2 useful when trying to develop possible solutions to new, unfamiliar, well-defined problems
  - Can System 2 improved? If so, how? Adapt people or adapt the situations people face?
Systems of the brain: Phrenology and neurology

- **Frontal lobe**: Executive functions, thinking, planning, organising and problem solving, emotions and behavioural control, personality
- **Motor cortex**: Movement
- **Sensory cortex**: Sensations
- **Parietal lobe**: Perception, making sense of the world, arithmetic, spelling
- **Temporal lobe**: Memory, understanding, language
- **Occipital lobe**: Vision
Simplified model of decision making

Detect problem

Similar to previous problems?

Previous solution(s) satisfactory?

Think, ask, watch, read, learn

Seek, invent, try 1+ alternative solutions

If 2+ alternatives, choose one & implement

Repeat solution

Monitor results

System 1

Decision made here

System 2

Decision made here
System 2 and a history of the *Rational Calculus*

- Some history
  - Rise of popularity of games of chance, casinos in 17th century
  - Rich people hire mystics called mathematicians to advise them about where to place their bets.
    - Blaise Pascal (1623-1662), Pierre de Fermat (1607-1665), René Descartes (1596-1650) and others develop concepts of randomness, probability.
    - The ideas formed an alternative to divine inspiration, appeal to authority, convention, etc. for making decisions.
    -Utilized in Lloyd’s Coffee House (established 1686) as a means for setting maritime shipping insurance rates with mathematical assistance of Edmond Halley (1656-1742) and the beginning of actuarial science.

- Result: the development of probability and statistics
- And a definition of rational decisions
  - Choices that maximize a person’s own expected value *in the long run*
Probability, statistics and measurement

• **Measurement** = assignment of numbers to observations
  • Example (nominal): 1 = left-handed, 0 = right-handed
  • Example (ordinal): 1 = tallest, 2 = second tallest, etc
  • Example (interval): temperature in Celsius degrees
  • Example (ratio): distance in metres

• **Statistics** = numbers representing some aspect of two or more other numbers
  • Total, average, maximum, minimum, median, mode, range, 3rd smallest, etc.

• **Probability** = the chances that something will happen.
  • Often estimated by **relative frequencies** =
    • \# times it has happened / \# times it could have happened
  • Example:
    • How many left-handed people in this room?
    • How many people in this room?
    • Probability of correctly guessing you are a lefty = \#Left / (\#Left + \#Right)
Probability, statistics and decisions 1

• Suppose I asked you to play a simple game of chance.
  • You must pay me $3 to play the game
  • I will flip a coin
  • If a head comes up, I will pay you $5
  • If a tail comes up, I will pay you $0

• Is it rational for you play?
  • probability of a head (pH)= ½
  • Amount won if head ($H) = $5
  • probability of a tail (pT)=
  • Amount won if tail ($T)= $0

• Expected Value (EV) of game
  • = (pH x $H) + (pT x $T)
  • = (0.5 x $5) + (0.5 x $0) = $2.50 + $0 - $3 = -$0.50

• Therefore, in the long run you would expect to lose, on average, 50 cents each time you paid $3 and played. Thus, if you do not want to lose money, do not play the game.
  • Consider also; lottery tickets, insurance, loans
Suppose I bet you that it will snow on 14 February
  - If snow (S), you will pay me $40
  - If no snow (NS), I will pay you $20
  - Will you bet?

Reasoning: What is the probability of snow that makes your Expected Value of the bet > 0?
  - When \( p_{\text{Snow}} < 0.333 \)

How do you estimate \( p_{\text{Snow}} \) for 14 February?
  - Look at previous 14 February snow measures
  - Consult Farmer’s Almanac
  - Adjust for global warming and other climate changes

Your decision is only as rational as your statistical estimates
The Rational Calculus
General prescriptions for making decisions

• List as many alternative choices as you can
  • Examples: 6 candidates for mayor; 14 possible holidays; 10 places to live, 12 cars for sale
• For each alternative, list as many possible outcomes as you can if you chose it.
• List how much you value each possible outcome for each alternative
• Estimate as best you can the probabilities of each possible outcome for each alternative
• For each alternative, multiply each value by its probability, then add-up the result = its Expected Value
• choose the alternative with the highest Expected Value

• ------------
• These prescriptions became the foundation of much economic theory.
• Sometimes called “economic rationality” (von Neumann & Morgenstern 1944)
• Adopted by Consumer Reports in its rows+columns approach to evaluating consumer products
Example: Choosing a partner (multiple criteria)

<table>
<thead>
<tr>
<th>Marriage candidate</th>
<th>Remain pleasant +10</th>
<th>Continue working +4</th>
<th>Keep healthy +7</th>
<th>Seek divorce -8</th>
<th>Inlaw meddling -6</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Probability .6</td>
<td>.3</td>
<td>.2</td>
<td>.7</td>
<td>.4</td>
<td>+0.6</td>
</tr>
<tr>
<td>B</td>
<td>.1</td>
<td>.7</td>
<td>.5</td>
<td>.2</td>
<td>.9</td>
<td>+0.3</td>
</tr>
<tr>
<td>C</td>
<td>.4</td>
<td>.5</td>
<td>.7</td>
<td>.2</td>
<td>.2</td>
<td>+8.1</td>
</tr>
<tr>
<td>D</td>
<td>.8</td>
<td>.0</td>
<td>.3</td>
<td>.4</td>
<td>.1</td>
<td>+6.3</td>
</tr>
</tbody>
</table>
What is wrong with the Rational Calculus?

• Often very good for making repeated financial decisions
• But ...
  • Foreseeing many alternatives and possible outcomes impossible
    • “It came as a complete surprise!” “I never considered that” ”I forgot to look at…”
  • Quality of decisions influenced by accuracy of
    • Value estimates
    • Probabilities
  • Values and probabilities often difficult or impossible to obtain
  • Calculations often exceed cognitive ability
  • Economic rationality (”in the long run”) often not rational in the short run
    • Thought experiment: Bingo
• Moreover
  • Rational Calculus is prescriptive = how people should make decisions
  • Is it also descriptive? Does it account for how people actually make decisions?
The prescriptive/descriptive debate
Economics versus psychology (as of about 1960)

• Economists: Improve measurements of probabilities and values
• Psychologists: Improve understanding of ways people make decisions
  • What we know about values
  • What we know about probabilities (AKA beliefs)
  • Early attempts
    • Adriaan DeGroot (1914-2006)
      • chess
    • Herbert Simon (1916-2001; Nobel prize in Economics 1978) and Allen Newell (1927-1992)
      • Bounded rationality and satisficing
    • Ward Edwards
      • Conservative Bayesians
    • Tversky, Kahneman and others
      • links to cognitive theory
    • McClintock, Messick, Asch, Milgram, Sharif, Tajfel and others
      • Social influence and social motives
Have a safe drive home