

# Cognitive Biases

Critical Thinking

# Reasons for why Human Reasoning isn't Perfect

- Perfect Reasoning isn't always 'perfect' from the perspective of evolution
  - Persuasive reasoning is often more beneficial than perfect reasoning
  - Perfect reasoning requires a lot of resources
  - Survival requires quick and dirty reasoning

# The 'Perfect Cognizer' and the Real World

- Consider the “Perfect Cognizer”, which is a hypothetical organism with ‘perfect’ perception, ‘perfect’ memory, ‘perfect’ reasoning (as in: truth seeking, not persuasion), etc.
- How well does the Perfect Cognizer in the real world?
- Well, the Perfect Cognizer takes in all factors relevant to a certain situation, and tries to figure out exactly which course of action is the most advantageous, so one would think that the Perfect Cognizer would do really well.
- But: Organisms must often make *quick* decisions in order to survive. The Perfect Cognizer takes too long!

# Heuristics

- A heuristic is a strategy that often works, though not always.
- Human cognition is likely to be full of heuristics:
  - We need to make many decisions in a short period of time.
  - But we don't have the time or other resources to think all things through.
  - So, we rely on heuristics.
- This often works just fine, but sometimes it fails.

# Question

- Are there more words that start with the letter 'r' than there are words that have 'r' as their third letter?

# Availability Heuristic

- We often make our judgments based on whatever information is readily available to us (rather than make a concerted effort to go out and do some research).
- In fact, usually we just use what we believe and remember.
- Again, usually this works just fine:
  - Are there more Fords than Jaguars?
    - We remember seeing more Fords, so we say Ford, and we would be right.
- But, sometimes it fails (see previous slide)

# What factors effect the availability of things?

- The environment we grow up in
  - E.g. people from different socio-economic strata will have different judgments as to the chances of getting robbed
- The media
  - Most people overestimate the chances of airplane crashes, acts of terrorism, or shark attacks, because these are all on the news. But, you are thousands of times more likely to die in a car crash than of any of these.
- The ‘salience’ (psychological ‘importance’ or ‘weirdness’) of the events
  - Again, ‘hits’ and ‘misses’ of the psychics

# Question

- Steve is very shy and withdrawn, invariably helpful, but with little interest in people, or in the world of reality. A meek and tidy soul, he has a need for order and a passion for detail
- Which is more likely?
  - Steve is a librarian
  - Steve is a salesman



# Representativeness Heuristic

- ‘like goes with like’. Makes sense, but can fail:
  - Graphology (studying people’s handwriting to make claims about their personality)
  - Food/health (eating brains makes you smart; eating testicles increases sexual drive; etc)
  - Astrology (Bull is stubborn, Virgin is tentative, Scales is calculated, etc)
  - Cause reflects effect
    - 1 effect -> 1 cause
      - Sports Team Performance
      - Traffic Jams
      - Accidents
    - big effect -> big cause
    - Cause is like effect
      - water
      - phlogiston
      - caloric

# What is the Rule?

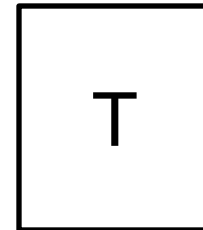
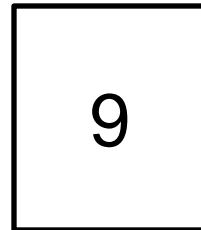
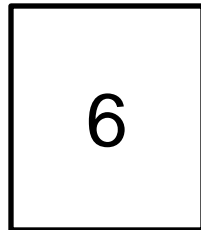
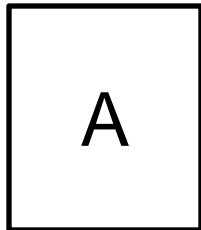
- 2, 4, 6 is a sequence that follows a certain rule
- Try to figure out what the rule is by asking about other sequences of 3 numbers: I will tell you whether or not it follows the rule

# Confirmation Bias

- Once we hold a certain belief, we tend to notice more things that confirm that belief, and we will seek out things that are likely to confirm that belief.
- At the same time, we tend to not notice, or explain away (often with ad hoc explanations) disconfirming evidence, and not seek it out.
  - Examples:
    - We tend to read what we agree with
    - Selective Perception
    - Constructive Perception
    - Constructive Interpretation (e.g. horoscope)

# Wason Selection Task

- A deck of cards has a letter on one side, and a number on the other side.
- You are told that the cards obey the following rule:
  - *If a card has a vowel on one side, then it must have an even number on the other side*
- Which of the following cards do you need to turn over to make sure that this rule has not been violated by any of these cards?



# Tossing a Coin

- One half of the class: Toss a coin and write down the sequence of heads and tails you get: HTTHH...
- Other half: *Imagine* you toss a coin and write down the sequence of heads and tails you get: HTTHH...
- Do this now for 20 coin tosses!

# Counting Sequences

- Now count the number of times that you had 2 of the same in a row.
- Same for 3 in a row, 4, 5, etc.
- E.g. HTTHHHHTTHTHHTTTTHTT
  - 2: 10
  - 3: 4
  - 4: 2
  - 5: 0

# 'Pattern' Bias

- Since it is useful for our brain to recognize certain regularities in the world, it tends to see patterns even when there are none:
  - The 'hot hand' in basketball
  - Bombs in London

# Spooky Presidential Coincidences

- Abraham Lincoln was elected to Congress in 1846.  
John F. Kennedy was elected to Congress in 1946.
- Abraham Lincoln was elected President in 1860.  
John F. Kennedy was elected President in 1960.
- Lincoln's secretary was named Kennedy.  
Kennedy's Secretary was named Lincoln.
- Andrew Johnson, who succeeded Lincoln, was born in 1808.  
Lyndon Johnson, who succeeded Kennedy, was born in 1908.
- John Wilkes Booth, who assassinated Lincoln, was born in 1839.  
Lee Harvey Oswald, who assassinated Kennedy, was born in 1939.
- Lincoln was shot at the theater named 'Ford.'  
Kennedy was shot in a car called 'Lincoln' made by 'Ford.'
- A week before Lincoln was shot, he was in Monroe, Maryland  
A week before Kennedy was shot, he was ...



# Coincidences

- If you look hard enough, you can find such ‘spooky coincidences’ for many things.
  - In other words, most likely this *is* just a coincidence.
- Also, sometimes strange juxtapositions of events just happen
  - Aristotle: “Unlikely things are likely to happen”

# The Sports Illustrated Curse

- Sports Illustrated Curse: After appearing on the front cover of Sports Illustrated, athletes seem to get into a 'slump': is there some kind of curse going on?!?
- Possibly there is some subjective validation going on: what exactly counts as a 'slump'? With such a vague term, the performance of any athlete can be seen as being in a slump.
- Or selective perception: maybe we just notice the cases where this happens, but don't notice the ones where it does not (i.e. we know of a few striking cases where this happened, but these really weren't representative of a general trend). So maybe this is all in our head?
- Actually, most likely there *is* a correlation between the two events ... not due to some curse, but because there is most likely a common cause for being on the cover as well as for getting into a slump: peak performance!

# Natural Regression to the Mean

- The Sports Illustrated Curse is an example of 'natural regression to the mean': things such as an athlete's performance naturally vary over time, so right after peak performance, most likely the athlete is going to do worse, simply because it is hard to sustain that level of performance (especially if factors are involved that are not under control of the athlete, including just plain luck).
- You can see how similarly, parents might think that punishing their kids for bad behavior works (since the behavior soon after gets better), whereas reward at times of good behavior seems to have the opposite effect (as soon after, behavior gets worse). But again, this might be due to natural 'peaks' and 'valleys' in the 'behavior curve'.