Sources of Decision Difficulty

- Conflict: Decision makes must make tradeoffs across different dimensions
- Uncertainty: outcome of decision often depends on uncertain variables or events (e.g. future price of stock)
- Many decisions involve uncertain events with unknown probabilities

Heuristics in Decision Making

- availability
  - use the ease with which examples come to mind as a measure of their probability
  - the easier come to mind, the more likely, probable or prevalent
- representativeness
  - people mistakenly believe that each roll of a dice or each flip of a coin is dependent on the other
  - most people general expect the random process and second one is more looking like random however the probabilities of them are the same
  - randomness
  - gamblers fallacy
  - people assume that things they know occur randomly will always look random
- anchoring
  - the first equation has larger estimation (8!) $\rightarrow$ the first part of problem serve with an anchor
  - **Tversky and Kahnemen**
    - people tend to perform the first few steps of multiplication and then extrapolate
- illusory correlation
  - seeing a relationship one expects to see even when no such relationship occurs

  - hair twister

- confirmation bias
  - the tendency to search only for information that will confirm one's initial hunch or hypothesis and to overlook or ignore other information

- overconfidence
  - people's impressions of their own accuracy on a task are typically inflated

Utility Models of Decision Making

- Expected Utility Theory (normative model)
  - defines ideal performance under ideal circumstances
    - often compared to a gamble
    - in most gambles you win or lose depending on certain outcomes
      - probability theory tells us what the odds are of any outcome
      - dollar amount won or lost tells us the expected value of that outcome
  - pick the highest expected utility

- image theory
  - people typically whittle down choices to a small few before they do any active consideration
  - people can only handle a certain, small amount of information at any given time
  - proponents argue that most of the decision making work is done during pre-choice screen of options
    - pre-screening allows to make more deliberate and conscious decisions on a small number of alternatives rather than trying to weigh the utilities of all options.
  - ask them if it is a new goal, plan or alternative
    - value image: contain the decision maker's values, morals and principles

        * trajectory image: contains the decision maker's goals and aspirations for the future
        * strategic image: the way in which the decision maker plans to attain ones goal
    - options are judged incompatible with any three of images are automatically dropped from further consideration
    - the reasoner is left with only one or two options to give careful consideration

- Recognition-Primed Decision Making
    - Experts are more likely to reply on intuition, mental simulation, making metaphors or analogies and recalling or creating stories
    - As decision makers take stock of a new situation, they compare it to other situations they have previously encountered

Decision Making, Emotion and the Brain

- Neuroeconomics
    - New field that examines how the brain interacts with the environment to enable us to make complex decisions
    - interplay between cognition and emotion
    - frontal lobes play a large role in decision making

- Ultimatum Game
    - split $10; one get certain dollars the other one get rest
    - Sanfey, Rilling, Aronson, Nystrom and Cohen:
        * unfair offers were followed by activations in the insular, and the dorsolateral prefrontal cortexes
        * this insula has been predominately implicated in response to negative emotional states such as anger and disgust
        * this insula, in some ways, this emotional response trumps the cognitive response and determines how the decision will be made

  - a region of the brain found to be involved in error detection and conflict monitoring, as well as the amygdala (processing emotion)

Reading

- psychologists argue that goodness of decision making cannot be measured by the success of individual decisions
- the success is taken to be the rationality of the decision.
  - consider all your relevant goals and principles
- cognitive overload – when the information available overwhelms the cognitive processing available

Phase of decision making

- setting goals: decision maker takes stock of ones plan for the future, one's principles and values and one's priorities
  - need to develop answer to the question: "what am I trying to accomplish"
- gathering information: needs to know what the various options are
  - need or want to gather information about possible criteria to use in making their choice
- structuring the decision
  - need a way of organizing all their information
  - decision structuring: decision maker need to determine or invent a way of managing different information
- Making final choice
  - needs to select from among the final set of options
- evaluating:
  - aim to reflect on the process and identify aspects that could be improved as well as those that ought to be used again for similar decisions in the future

Basic concepts of probabilities

- probability can be thought of as a measurement of a degree of uncertainty
- probability theory treats differences in intermediate values of probability as corresponding to different gambles or lotteries
- subjective probabilities: influenced by characteristics of the probability estimator
- 17: for Baron 1988 examples

Cognitive illusions in decision making

- cognitive illusion: the biases are understandable and often justifiable ways of thinking under most conditions but lead to error when misapplied
  - invoke the analogy to perceptual illusions: errors of cognition that come about for understandable reasons and that provide information relevant to understanding normal functioning
  - give up information on when unaided human decision making is likely to be optimal and when it is not
  - help to design and implement educational programs or interventions to improve the quality of decisions and plans people make
  - a cognitive illusion if there is a correct way to answering a questioning or making a decision, there is also an intuitive estimate or decision and there is a discrepancy(矛盾) between the two that always goes in the same direction
- Availability
  - Tversky and Kahneman(1973)
    - people's intuitions were systematically wrong
    - when faced with the task of estimating probabilities, frequency or numerosity, people rely on shortcuts or rules of thumb known as heuristics to help make judgment easier
    - two-person committees are more distinct
    - two-person committees are more available and hence deemed more numerous

  - availability heuristic – instances that are more easily thought of, remembered, or computed stand out more in one's mind
  - Ross and Sicoly: husband and wife household shares
    * our own efforts and behaviours are more apparent and available to us than are the efforts and behaviours of others
    * what we do, think, say or intend is more accessible to us than to anyone else and also more accessible than anyone else's deeds, thoughts words or intentions.
    * always report sharing more works than others
  - with all other heuristics, the idea is to suggest you think carefully first about if the range of examples you are drawing from is equally accessible

- representativeness
  - people generally expect that a random process will always produce results that are random looking
  - Kahneman and Tversky(1973)
    * base rate conditions
    * similarity conditions
    * prediction conditions
  - the failure to include base rate information in the estimates of probability can lead to answers that are in error
  - related error in judgement: gambler's fallacy
    * the gambler's fallacy can be thought of as an instance of belief in the law of small numbers
    * long run should be equal
    * a random process will not always produce results that look random especially in the short run
  - Kahneman and Tversky(1971)
    * peoples' mistaken belief in the law of small numbers

        - people expect samll samples to resemble in everyrespect the populations from which they are drawn
    - only very large samples can be expected to be representative of the population which they come
    - Sedlmeier and Gigerenzer
        * the issue of people's intuitions about sample size in greater depth
        * arguing that people something do have correct intuitions about sample size, but often does not
    - man who – misuse of the representativeness heuristic
    - Nisbett and Ross (1980)
        * man who argument is usually advanced by someone who has just confronted

- Framing effects: (gas price)
    - people evaluate outcomes as changes from a reference point, their current state
    - depending on how their current state is described, they perceive certain outcomes as gains or losses
    - we treat losses more seriously than we treat gains of an equivalent amount
        * we care more about losing a dollar than we do about gaining a dollar.

- Anchoring
    - the initial starting point will have a huge effect on their final estimates
    - people tend to perform the first few steps of multiplication then extrapolate

- Sunk Cost Effects(沉默成本效应)
    - greater tendency to continue an endeavor once an investment in money, effort, or time has been made

- Illusory Correlation
    - the phenomenon of seeing nonexistent relationship

  - variables that tend to be falsely associated typically seem to have some prior association in people's minds
  - the associations we bring it to a situation often colour our judgement to such an extent that we see them even if they are not there

- Hindsight Bias (后见之明)
  - a tendency to consistently exaggerate what could have been anticipated in foresight when looking back on an event
  - once you know how a decision has turned out, you look back on the events leading up to the outcome as being more inevitable than they really were
  - the economic effects of the introduction of the euro (Hoelzl, Kirchler)
  - the outcome of the O.J.Simpson trial (Demakis,2002)
  - the 9/11 attacks

- Confirmation Bias
  - tendency to search only for information that will confirm one's initial hunch or hypothesis and to overlook or ignore other information
  - the rational decision, would be made by talking to a randomly selected set of parents or to parents who have transferred out of a particular option, as well as to parents with children still in that option

- overconfidence
  - calibration curve: plotting confidence against accuracy
  - the closer the curve is to the 45-degree line, the better the calibration between confidence and accuracy
  - deviation from the curve below this line are said to indicate overconfidence, where confidence ratings are higher than actual accuracy
  - derivation above the line called underconfidence which rarely occurs
  - the general idea is that for all questions to which participants give a 0.8 confidence rating, they are correct only about 0.6 of the time. 100% $\rightarrow$ 75% to 80%

  - people's impressions of their own accuracy are typically inflated
  - impediment to good decision making
    * fail to see the need so do not ask for help
    * can be thought of as arrogance in decision making
  - Friffin and Koehler (2005):
    * found that people's confidence by accuracy confidence calibration depends on the diagnosticity of the evidence available
    * people's judgement rely primarily on evidence regarding the particular case at hand and tend to neglect relevant aggregate properties associated with the class of instances to which the case belongs

Utility Models of decision making

- normative models: define ideal performance under ideal circumstances
- prescriptive models: tell us how we ought to make decisions
- descriptive models: simply detail what people actually do when they make decision
- expected utility theory
  - as a normative model of decision making
  - EU theory provides an account only of making the final selection from a set of alternatives, not of making decisions in which one faces a "status quo" vs "make a change" option
  - does not describe the process by which people structure a decision – that is gather information and lay out the possibilities and parameters
- image theory
  - assumption: in making real-life decisions, people rarely go through a formal structuring process in which they lay out all their options and criteria and then weigh and integrate various pieces of information
    * trajectory image: contains decision maker's goal and aspirations for the future
    * value image: contain the decision maker's values, morals and principles

        * strategic image: the way in which the decision maker plans to attain his or her goals
    - options judged incompatible with on or more of these three images are dropped from further consideration
    - prechoice screening process is noncompensatory: violations of any image are enough to rule out that option, and no tradeoffs are made
    - screening may result in a single option remaining active
- Recognition-Primed Decision Making
    - rely on intuition, mental simulation, making metaphors or analogies and recalling or creating stories
    - Klein: they take stock of a new situation, they compare it to other situations they have previously encountered, calling to mind narrative stores about what happened in those situations and why

Decision Making emotions and the brain

- neuroeconomics: examines how the brain interacts with the environment to enable us to make complex decisions
- the frontal lobe plays a large role in decision making
- decision making can be highly emotional
- ultimatum game:
    - a complex interplay between cognition and emotion
    - the degree to which the negative emotional reaction caused the offer rejection or was a byproduct of the decision is open for debate
- Knutson and colleagues:
    - activity in the nucleuas accumbens and medial prefrontal cortex was associated with a preference for a product and predicted that the participant would buy the item

  - the insula: was activated in accordance with high prices and negatively associated with purchasing behaviours
  - emotional processes contribute to and may help determine the type of decision a person might make

Improving decision making

- one of major obstacles: people gather and integrate information is overconfidence
  - real improvement in reducing bias seems to require extensive practice with task, individual feedback about one's performance
- second obstacles is: people's feelings and expectations about how decisions ought to be made
  - cultural expectations lead to trust our intuitions
  - Meehl: relative effectiveness of holistic, clinical impressions with judgments made by statistical models of data
    - use nonhuman model(Dawes, 1982)
  - Dawes argued that people are quite proficient at figuring out which variables are good predictors
  - people try to integrate all the information relevant to a decision
  - linear models are good at integrating information that human judges have selected as relevant
  - Decision analysis: is an emerging technology that helps people gather and integrate information by using human judges' feelings beliefs, and judgments of relevance but helps ensure that integration of information is carried out in an unbiased way
- expert decision making may be associated with less rather than more decision making time
- expert clinicians cannot easily predict the errors of other experts
- ambiguous features can easily be misinterpreted

- current training offered to clinicians underestimates the importance of clinical experience which specific case examples in developing expertise