Heuristics

"Close enough for government work"

Heuristics

- Shortcut recipes for solving problems, making decisions, estimating quantities
- Product of evolution; generally work well
- But are also a source of bias
- Analogous to schemas

Heuristics	:	Schemas
Decisions	:	Perception

Why we “know” what ain’t so

- Connect the dots ...
  - Don’t believe in randomness
- Non-representative data
  - biased or incomplete samples
- Heuristics for probabilities
  - Representativeness heuristic
  - Availability heuristic
  - Anchoring & adjustment heuristic
- Escalation of committment
  - don’t change horses in midstream; gone this far ..

Spurious Correlation

Tuesday, October 23, 2001 10:28 AM

Hi Prof. Borgatti,

How's the semester treating you??? I remember you saying that you were going to try to teach extra classes so you could have next semester off. Is that working out? I heard something funny this morning on the radio and I thought I'd share it with you. The VJ said that the **stock market has been doing well and is predicted to go up. They said that the reason behind this was because the Yankees have been doing well too.** I thought there was a funny relationship between the two.

Have a good day. Don't work too hard!!!

Victoria Roger

Stock Market & the Super Bowl

When an old *NFL* team wins, the stock market goes up

Year	Winner	League	DJIA	S&P
1967	Green Bay	nfl	8.38	17.18
1968	Green Bay	nfl	4.98	11.73
1969	New York Jets	afl	-13.52	-14.43
1970	Kansas City	afl	5.11	-1.16
1971	Baltimore	nfl	5.26	10.13
1972	Dallas	nfl	12.5	18.48
1973	Miami	afl	-18.14	-19.34
1974	Miami	afl	-26.77	-29.24
1975	Pittsburgh	nfl	29.39	32.25
1976	Pittsburgh	nfl	8.07	17.99
1977	Oakland	afl	-15.46	-10.36
1978	Dallas	nfl	3.77	2.44
1979	Pittsburgh	nfl	0.15	12.14
1980	Pittsburgh	nfl	11.17	23.84
1981	Oakland	afl	-6.93	-7.26
1982	San Francisco	nfl	23.85	12.59
1983	Washington	nfl	18.21	17.93

Year	Winner	League	DJIA	S&P
1983	Washington	nfl	18.21	17.93
1984	L.A. Raiders	afl	-3.78	0.07
1985	San Francisco	nfl	26.02	26.01
1986	Chicago	nfl	23.92	19.95
1987	New York Giants	nfl	-7.74	-3.08
1988	Washington	nfl	10.74	14.75
1989	San Francisco	nfl	23.17	26.06
1990	San Francisco	nfl	2.91	-5.69
1991	New York Giants	nfl	19.16	18.18
1992	Washington	nfl	2.11	12.13
1993	Dallas	nfl	13.42	6.96
1994	Dallas	nfl	-2.81	-2.31
1995	San Francisco	nfl	32.64	35.02
1996	Dallas	nfl	22.32	20.94
1997	Green Bay	nfl	18.1	30.73
1998	Denver	afl	20.61	
1999	Denver	afl	22.85	

- Other theories: the miniskirt predictor

Determinism vs Stochasticism

- Einstein: "God does not play dice with the universe"
- Man in the moon, canals on Mars
- Jesus in the wood grain of the hospital floor
- Hot hand

Regression to the Mean

- Children of exceptionally tall parents are not as exceptionally tall (relative to others of same generation)
  - parent in top 1% has child in top 5%
- Second time you take SAT, the exceptional score becomes more normal
- Due to chance processes

Effectiveness of Intervention

- Computer simulation for teachers.
  - When kid is super late, is punished. Next time typically arrives earlier
  - Teacher believes punishment is effective.
  - But the pattern of lateness was randomly pre-programmed by computer -- completely unrelated to punishment.
  - Not knowing this, we interpret pattern as effectiveness of intervention

Punishment Better than Reward?

- We reward exceptionally good performance, punish exceptionally bad
  - but after exceptionally good performance, more ordinary performance will usually follow, so rewards will appear ineffective
  - after exceptionally bad performance, somewhat better performance will usually follow, so punishment seems effective
- Flight instructor myth: don't praise after good landing -- it causes overconfidence

Funerals in Israel

- Flurry of deaths due to natural causes in northern part of Israel
  - speculation of some new unknown threat
- Rabbis attributed it to the sacrilege of allowing women to attend funerals, which was previously forbidden.
  - decreed that women could not attend funerals
- Soon, rash of deaths subsided
  - Seen as confirming effectiveness of remedy

Non-Representative Samples

- N_of_one thinking
  - Drawing conclusions from a single poignant instance
- Focus groups in marketing
- Lack of appreciation for randomness, coincidence, and therefore need for replication

Bias Toward Confirmation

- Successful managers have X & Y traits
  - go look at successful managers and see that they do have these traits.
  - But need to also look at unsuccessful managers and see that they don't have these traits
  - And ... check people who don't have X & Y. Now check their success: they better be unsuccessful.
- Carter racing …

Representativeness Heuristic

- Judge probabilities based on similarity of instance to a class
- Ignore base rates in favor of useless secondary information

Representativeness

- A coin is to be tossed 6 times. Which sequence is more likely?
  - H T H T T H
  - H H H T T T
- First “looks more random” because image of randomness is “mixed-upness”.
  - But they are equally likely

Representativeness Example

- "Susan is very shy and withdrawn, invariably helpful, but with little interest in people, or in the world of reality. A meek and tidy soul, she has a need for order and structure, and a passion for detail."
- Is Susan a librarian, lawyer or teacher?
  - Most say librarian, even though lawyers and teachers are far more common & therefore higher probability

Representativeness Example

- Linda is 31, single, outspoken and very bright. She majored in philosophy in college. As a student, she was very concerned with discrimination and other social issues and participated in antinuclear demonstrations. Which of the following statements is more likely?
  - Linda is a bank teller
  - Linda is a bank teller and active in the feminist movement
- Most answer #2, but correct answer is #1
- Representativeness/conjunction fallacy. Combination can't be more probable than one.

Anchoring & Adjustment Heuristic

- To estimate a quantity or predict an outcome, people begin with some value that is at hand, then adjust it in the more probable direction
- What is BC's endowment?
  - Harvard's is $19 billion, so ...
  - BC's is maybe a quarter of that or $5 billion?

Anchoring/Adjustment Heuristic

- A friend of mine (who thinks he knows a lot about politics) estimates that President Bush's new Anti-Terrorism bill has at most a 5% chance of passing in Congress as is (without major changes). What is your estimate?
- A friend of mine (who thinks he knows a lot about politics) estimates that President Bush's new Anti-Terrorism bill has at least a 95% chance of passing in Congress as is (without major changes). What is your estimate?
- People start with one estimate then adjust upwards or downwards as needed. **But never adjust enough**.
  - Power of first impressions; need for occupational mobility; pay inequities due to raises based on % of salary

Anchoring & Adjustment Heuristic

- Estimate the value of
  - 8 x 7 x 6 x 5 x 4 x 3 x 2 x 1
- Estimate the value of
  - 1 x 2 x 3 x 4 x 5 x 6 x 7 x 8
- Subjects give higher estimates for the first one, because they anchor on big numbers and then insufficiently adjust downward (opposite for the second one)

Availability Heuristic

- Judge probabilities of event by how easy it is to recall an incidence of it
- Basically works because
  - typically instances of large classes are recalled better and faster than instances of small groups,
  - likely events are often easier to imagine,
  - causal connections are repeatable and therefore more likely to be remembered.
- But ...
  - Horrific events recalled more easily than mundane
  - Media coverage affects recall

Availability Heuristic

- Which of the following causes more deaths in the United States each year?
  - Stomach cancer
  - Motor vehicle accidents
- Stomach cancer is far more common cause of death
- Ease of recall based on vividness and recency. Over one year, two newspapers had 137 stories about car accidents and only 1 story about stomach cancers. Systematically overestimate the probability of unlikely events (e.g., plane crashes).

Semantic Association

- People judge the probability of events co-occurring by judging how semantically related they are.
- So if you give them the clinical diagnoses of 100 mental patients (e.g., "paranoid schizophrenic" or "personality disorder"), together with drawings of a person made by those patients, and then ask them about the association between diagnoses and aspects of the drawing (e.g., "big heads", "weird eyes", "religious symbols"), they will overestimate how often "peculiar eyes" are found in the pictures drawn by "paranoid schizophrenic", because these seem logically related.

The End

(but a few more slides follow)

Overdrawn Mental Accounts

- You have reserved a seat for a Broadway play for which the ticket price is $40. As you enter the theater to buy your ticket, you realize that you have somehow lost $40 from your pocket. You look in your wallet and find there is enough to buy the ticket. Would you still buy the ticket?
- You have decided to see a Broadway play and have bought a $40 ticket. As you enter the theater, you realize you have lost your ticket. You cannot remember your seat number and have no way of proving to management that you bought a ticket. You look in your wallet and find enough money to buy a new ticket. Would you spend $40 for a new ticket?
- Most buy ticket after losing cash, but not after losing ticket. People set up a mental account for going to theater which has already been charged in one scenario leading to a cost of $80 for the theater.
  - "throwing good money after bad"

Risk Taking

- In choosing between unpleasant (or negatively framed) outcomes people are risk-seeking
  - go for broke
- In choosing between pleasant (or positively framed) outcomes, people are risk-averse
  - go for the sure thing

Positive Frame

- The US is preparing for an outbreak of an unusual Asian disease, which is expected to kill 600 people if nothing is done. Two alternative programs to combat the disease have been proposed.
  - **Program A:** If Program A is adopted, 200 people will be saved [72%].
  - **Program B:** If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved [28%].
- *Which of the two programs would you favor?*

Negative Frame

- **Program A:** If Program A is adopted 400 people will die [22%].
- **Program B:** If Program B is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die [78%].
- *Which of the two programs would you favor?*

- The two frames are identical mathematically
  - People given the positive frame choose program A (risk averse)
  - People given the negative frame choose program B (risk seeking)

Evidence for "Hot-Hand"

Philadelphia 76ers, 1980-81 Season

Player	P(x|ooo)	P(x|oo)	P(x|o)	P(x)	P(x|x)	P(x|xx)	P(x|xxx)
Richardson	0.5	0.47	0.56	0.5	0.49	0.5	0.48
Erving	0.52	0.51	0.51	0.52	0.53	0.52	0.48
Hollins	0.5	0.49	0.46	0.46	0.46	0.46	0.32
Cheeks	0.77	0.6	0.6	0.56	0.55	0.54	0.59
C. Jones	0.5	0.48	0.47	0.47	0.45	0.43	0.27
Toney	0.52	0.53	0.51	0.46	0.43	0.4	0.34
B. Jones	0.61	0.58	0.58	0.54	0.53	0.47	0.53
Mix	0.7	0.56	0.52	0.52	0.51	0.48	0.36
Dawkins	0.88	0.73	0.71	0.62	0.57	0.58	0.51
Average:	0.611111	0.55	0.546667	0.516667	0.502222	0.486667	0.431111

- *If anything, these players became **less** accurate after hitting, not more*