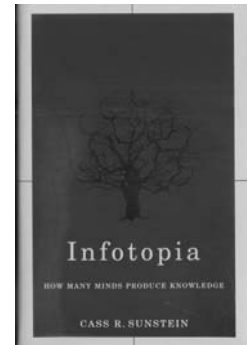


How to get the best cognitive performance out of groups



How should we aggregate knowledge in a group to get the right answer to a question?

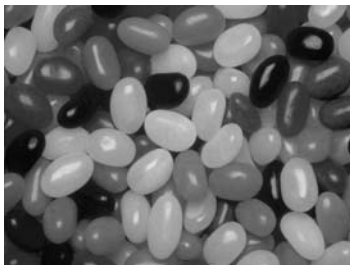
- Vote/poll/
- Deliberation
- Market
- Blog/wiki

Just ask a lot of people and take the average of their answers

- Galton and the weight of the bull.



How many jelly beans are in this picture?



Majority Rule

- If we have a yes/no question, rather than averaging, we can take the majority opinion.

## The Condorcet Jury Theorem

- Assumptions:
  - Independence of information: people are not affected by the votes of others
  - Each person is more likely than not to be correct.
  - Majority rule.
- The probability of a correct answer by the majority of the group increases toward 100% as the size of the group increases.
  - Groups are more accurate than individuals.
  - Big groups are more accurate than little groups.

## A justification for democracy?

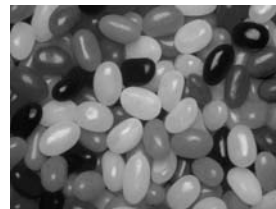
- If all of the voters are more likely to be right than wrong, then majority rule will work.
- Even if only most of the voters are more likely to be right than wrong, it will still work.
  - E.g. if 55% of the people are 65% likely to be right and the other 45% of the people are only 40% likely to be right.
  - Who wants to be a millionaire? Ask the audience or your expert?
- And if those who don't know respond randomly, then the outcome will be determined by those who do know.

## The dark side

- If each member of a group is more likely to be wrong than right, then the likelihood that the majority's decision will be right falls to **zero** as the size of the group increases!
- So voters or jurors must be enlightened. They must not be misled.
  - According to Pew Research, 93% of Americans believe that Arab terrorists destroyed the World Trade Center. Only 11% of Kuwaitis believe this.
  - If polled, these two groups will produce different answers. One of these groups is wrong.

What can affect the likelihood that a person will make the right choice?

- Anchors. I am asking 500 people how many jelly beans there are in this picture. How many do you think there are?



## Framing

- Of the people who have this procedure, 90% will be alive 5 years from now.
- Of the people who have this procedure, 10% will be dead 5 years from now.

## Think of our congress

- “A very numerous assembly cannot be composed of very enlightened men. It is even probable that those comprising this assembly will on many matters combine great ignorance with many prejudices. Thus there will be a great number of questions on which the probability of the truth of each voter will be below  $\frac{1}{2}$ . It follows that the more numerous the assembly, the more it will be exposed to the risk of making false decisions.”

### When should we expect aggregation to work?

- When most people asked are more likely than not to be right.
  - Company pres asks advisors about a business decision
  - University dean asks faculty about hiring a certain job candidate
  - Govt agency consults a group of scientists about a pollution problem

### When will it not work?

- When most people are not more likely than not to be right.
  - Ask the entire world
    - If the US should sign the Kyoto Protocol
    - Whether genetic engineering poses serious risks
    - Whether an increase in the minimum wage would increase unemployment.

### Deliberation

- Rather than aggregating initial opinions, what if we allow people to talk it over?
- Deliberation can help under some conditions

### General effects of deliberation

Views will be more extreme after deliberation than they were before deliberation  
Consensus will be higher after deliberation = less diversity of opinion  
People will have more confidence in their opinions after deliberation  
Are they more likely to be right? If the question has an answer that is difficult to find, but is obviously correct once found, then yes.  
In general NO!

### Why deliberation sometimes fails to integrate the available information

- Eagerness to conform and be accepted may lead to holding back dissenting opinions
- Fear of punishment may lead to holding back dissent

### The internal morality of deliberation

- Rational discourse is supposed to be public and inclusive, to grant equal communication rights for participants, to require sincerity and to diffuse any kind of force other than **the forceless force of the better argument**. This communicative structure is expected to create a deliberative space for the mobilization of the best available contributions for the most relevant topics. (Habermas)
- Explore/exploit and the fundamental tradeoff in cognitive ecology

### Different institutions capture different aspects of this ideal

- Religious cults
  - Courtroom trials
  - Airline cockpits
  - Government agencies
  - Democratic society
  - Science
- 
- This means that the character of the institutions we have, determines the effectiveness of our use of “many minds to produce knowledge”