Judgment and Prediction (Part 2)

Is anyone good at it?



The Wisdom of Crowds

- In October we looked at how good experts are, or are not, at judging and predicting and found that
  - In the *aggregate*, experts are not very good except on easy questions;
  - BUT *individually* some, the foxes, are (often much) better than others
  - BUT even they are not that proficient
- We did not examine using groups of experts instead of just a single expert
  - But, alas a ***like minded group*** of experts is no better, and is often **worse**, for reasons we will examine
  - So we will look at different kinds of groups



Effective Group Decisions - The World of Animals

- They can do it.
- https://www.youtube.com/watch?v=jANEA8xiujs&t=138s

But What About Us?



Crowd Wisdom is an Old Idea



In 1895, French social critic LeBon said about juries and the government that “groups are always intellectually subordinate compared to individuals”.



Nietzsche said that “madness is the exception in the individual and the rule in a group.”

What About Now?

General belief is that crowds are dumb, e.g., we assume that groups:

- are dumber than their smartest member,
- degrade to the level of the least able member, and even
- morph into utterly stupid or dangerous groups, e.g., mobs

True of certain crowds and persons but not all of them

And Groups Do Fail, Right?

- Yes, and sometimes spectacularly, for at least 2 different reasons:
  - "***Group Think***" – the group is made up of people, often experts, who are so like-minded that different ideas are not considered, simply because they fail to even appear (nobody thinks of it)
  - "***Conformity or the Drive for Consensus***" – different ideas may appear initially but if, and when, they are quashed in the name of agreement or consensus, different ideas are later actively withheld (nobody is brave enough to speak up)
- Note: the same result via different processes, which can operate in tandem

Even Groups of Experts Can Fail

- Notable examples:
- One of the most famous – The Bay of Pigs invasion (group think)
- The meetings before the Challenger disaster (drive for consensus)
- Iraq and the existence of WMD (some of both?)

- In fact, groups of experts can almost be expected to fail if they do not conduct group decision making properly – the method matters

But Groups Can Get it Very Right

Francis Galton's oxen weight observation (1906)

- 787 random fairgoers guessed the dressed weight of an oxen (in a contest)
- Average weight guessed – 1,197 pounds, actual weight 1,198 pounds

John Craven's use of the guesses of a knowledgeable crowd to locate the lost Scorpion submarine

- Reduced a 20-mile possible radius of possible locations to 220 yards from where it was – based on their individual best guesses

Who wants to be a Millionaire?

- 50/50 ("**random**") = 50% chance of success
- Phone a friend (the "quasi" **expert**) = 65% chance of success
- Ask the audience (the **crowd**) = 91% chance of success

Who was responsible for the Challenger disaster and stock prices 21 minutes after the explosion (long before anyone knew the answer)

- Lockheed down 5%, Martin Marietta down 3%, Rockwell down 6%
- **Morton Thiokol** trading was initially halted, when started, down 6%, eventually 12%

Examples of Effective Group Decision Making

Sports betting markets. Why? Bets made help to set the odds.	Prediction markets	Markets in general – picking out the winners and winnowing out the losers (akin to the bees' waggle dancing)	The multinational discovery of the source of SARS
• As an ironic result of the resultant accuracy, consistently beating the house is nearly impossible. • Even before considering the vigorish – the added house edge!	• E.g., Iowa Electronic Markets (IEM) predicting election results • These markets are ubiquitous now but many are disguised betting (gambling) venues		

Types of Questions / Problems Addressed by Crowds

- Generally, 3 types
  - Cognition problems
    - those with a definitive solution or answer, e.g.,
    - who will win the Super Bowl or how much will inflation be next year?
  - Coordination problems
    - individuals trying to coordinate their behavior with others, knowing the others are trying to do the same, e.g.,
    - driving on a busy expressway or buyers and sellers in a marketplace
  - Cooperation problems
    - getting self-interested, distrustful people to work together when narrow self interest would suggest otherwise, e.g.,
    - dealing with free riding

A Closer Look at Cognition Problems

These are perhaps the easiest to address by groups

Keys to *Effective* Group Decision Making (1)

- ***Diversity*** (each person brings their own personal knowledge and opinions)
- ***Independence*** or ***Anonymity*** (no person can influence the opinion of the others
- ***Decentralization*** (each person draws on their own knowledge in forming their ideas)
- ***Aggregation*** (an *effective* means of bringing together the disparate ideas of all persons)

Keys to *Effective* Group Decision Making (2)

Why are these elements necessary?

- The best decisions result from disagreement and contest, not consensus of compromise
- Mathematically, the errors tend to cancel each other out, leaving good information*

* Sufficient size is also needed but a group does need necessarily need to be large.

Why Does Diversity Matter?

Diversity is “built into” very large groups but

Must be fostered in small groups

Diversity matters at 2 levels:

- By creating a larger set of alternative outcomes and opportunities
- When deciding between the alternatives

How?

- Diversity adds perspective that might otherwise be absent AND
- It counteracts the destructive elements of group decision making
- Note: actively opposing homogeneity of thought through diversity helps explain why groups can excel over experts

More on Destructive Elements of Group Decision Making

Causes of *Group Think* and *Conformity or the Drive for Consensus*:

Rationalization of disagreement - one or a few experts rationalize disagreements away

Polarization - the decision process is dominated by one or more dominating people

Confirmation bias - the phenomenon that individuals support arguments that confirm their own opinion and ignore those which go against their biases

Why Does Independence Matter?

Independence is *not* isolation but relative freedom from being influenced by others. This in turns fosters decentralization:

- It prevents errors from being correlated
- It increases the likelihood of new information being added

So …

- You can personally be biased and irrational but you won't make the group dumber if you can stay independent
- Systematic bias readily occurs if person(s) knowledge is dependent on information from the other members

But … this is difficult to maintain because

- we are social being who are used to getting information from others

When Independence Goes Astray (1)

But, isn't our most important source of information *other* people?

Following the lead of others often makes sense,

- especially given the wisdom of crowds,
- and it works most of the time accordingly, it makes us smarter, not dumber

But not always

- Especially when following is based on a desire for safety rather than to be right

When Independence Goes Astray (2)

- So following the crowd makes sense, until it doesn't:
- What can go wrong:
  - ***Herding:*** following the crowd and risking small loss vs. going against the crowd and risking a loss of a big gain is risk aversive and can be unconscious
    - Example: mutual fund managers buy the same assets and similarly underperform the market
  - ***Information cascades***: following the crowd in sequence rather than all at once (down an ultimately erroneous path), not out of conformity or peer pressure but a belief that these others must know something that I don't,
    - Examples: plank road fever, the bowling frenzy, 1990's tech bubble

Why Decentralization Matters (1)

It fosters and encourages independence and specialization

It permits people to coordinate and solve problems jointly

But can easily becomes disorganization

The problem is getting information that is uncovered in one place shared with others while maintaining local knowledge

It is difficult to establish and maintain

Why Aggregation of Decentralized Action is Important and Difficult

Aggregation is essential to bringing decentralized knowledge together

It is (ironically) a form of centralization but it is a crucial aspect of coordinating the efforts of decentralized groups and persons

And must be done in way that both effectively captures the information (for use by others) and maintains decentralization

Decentralization and Aggregation: What Can Go Wrong, What Would Work

When it goes wrong:

- The CIA and other alphabet agencies after WW2 were highly specialized within their spere but did not share information with anyone, so effective decentralization + ineffective aggregation = disorganization and failure

But this can be fixed:

- Simple sharing of databases between organizations = aggregation
- Internal (and external) prediction markets; were tried and abandoned
  - (considered too creepy for people to profit from predicting catastrophes – despite the fact that this is exactly what these agencies are supposed to be doing)
  - what should they do with the resultant information or conclusion

A Closer Look at Coordination Problems (1)

- These are everywhere but independent decision making is irrelevant
- The problem is to pick the best solution **and** the solution that other persons think is the best within the context of every choice affecting everyone else.
- But, everyone is still working in their own self-interst

A Closer Look at Coordination Problems (2)

- Top-down decisions could be a solution but
- Groups also reach conclusions, and create norms & conventions
  - The customary movements of pedestrians on a crowed sidewalk
  - The fear of disruption – you can often cut in line w/o an issue
  - In hard times, businesses lay some people off rather than cut all wages

Conventions Can Make No Sense But Live On

- Conventions may work but are often not optimal
- Consumer pricing outside of the demand / supply dynamic
  - Demand increases do not necessarily → price increase
  - Price of movie tickets not based on the quality of the film

A Closer Look at Cooperation Problems (1)

- Unlike coordination problems,
  - these require more than myopic self interest to be solved and
  - There must be an element of trust for people to participate
- Human nature is not rational
  - Zero sum thinking (e.g. the ultimatum game – nothing better than small)
- Cultural considerations
  - Americans most likely to be concerned with inequality – the rich
  - Why – they think their riches were earned whereas Europeans are more like to attribute wealth to luck

A Closer Look at Cooperation Problems (2)

- But we cooperate anyway – even with strangers
  - Prosocial behavior - willingness to punish bad behavior even when we get no benefit from it
  - Mutual trust, I'll do it if you do it as e.g., paying taxes or tipping
  - Honesty (required for trust) as e.g., business dealings
  - These are more systemic than the other problems and take time to develop
- The main problem is obvious; trust can lead to exploitation of that trust
  - Corruption of the system thus bothers us a lot; be it financial, governmental, etc.
  - And any system can be gamed or conned

So How Can Crowds Get it Right

- Here we refocus on conscious acts of decision making
  - Not ad hoc conventions or
  - the creation and maintenance of systems
- How can crowds get it right
- Revisit the keys to group decision making



Keys to Effective Group Decision Making

- ***Diversity*** (each person brings their own personal knowledge and opinions)
- ***Independence*** or ***Anonymity*** (no person can influence the opinion of the others, except in a controlled manner)
- ***Decentralization*** (each person draws on their own knowledge in forming their ideas)
- ***Aggregation*** (an *effective* means of bringing together the disparate ideas of all persons)



More Sophisticated Uses of Crowds

- A simple use of crowds involves using a crowd to predict a discreet and ultimately known result, e.g.,
  - Elections
  - Sporting events
- The “keys” are crucial to getting optimal results
- But sometimes, the predictions sought are of far more vague and sometimes potentially random results
- Can crowds be successful here,
- Can the “keys” be tweaked

The Delphi Method – Definition

- A **structured** communication process used for decision making and forecasting with the goal of reaching a consensus through questionnaires to experts.

The Delphi Method – How it is “Structured”

- Several rounds of questionnaires are sent out to the group of experts (who do not know who the other members are)
- The responses include the rationale for that opinion expressed.
- The anonymous responses are aggregated and shared with the group after each round with a new questionnaire
- The experts are allowed to adjust their answers in subsequent rounds, based on how they interpret the group response.
- Multiple rounds of questions and responses tell the members what the group thinks as a whole and how that has changed.
- The Delphi method seeks to reach the correct response through consensus.

The Delphi Method – Does it Break the “Rules”?



The Delphi Method – Does it Break the “Rules”?

- Note: deviations from the “keys” to group wisdom
  - Communication between the members of the group
  - Explanation (and argument) regarding the rationale for that opinion
  - Experts as members of the group
  - Consensus as a goal
- Why doesn’t this break the rules and wreck the game



The Delphi Method Improves on the “Rules”

Why doesn’t the Delphi Method break the rules and wreck the game?

- Diversity – so long as each member is still bringing their own knowledge, using experts in the group permits access to more relevant knowledge
- Independence or Anonymity – anonymity is a sufficient barrier to any person(s) dominating the group
- Decentralization - members remain free to express their views
- Aggregation – consensus need not be rigid (i.e. 100%)

Is it even better than strict adherence to the keys?

- By making more information available, **diversity is increased**
- By permitting the use of additional knowledge, **Bayesian updating** is prompted and encouraged (using new data to update your opinion)

The Delphi Method - Problems?

- Big commitment required of participants
- The moderator selects the experts deemed relevant
- The process is cumbersome and time consuming
  - Best used for forecasting long term or more uncertain outcomes
- The value (if any) to a non-anonymous discussion is lost

Hmm, Could You Do This Yourself?

- There are products to use for group decision making and predicting
  - Thinkscape®
  - Farseer®

Conclusions

- We are not very good at decision making or predicting
- Individual experts are not much better, although some are better than others while others are utterly useless
- But crowds can sometimes do this much better, as seen in other animals as well as in groups of humans
- In fact, crowds are solving problems all the time
  - whether we notice this or not and producing
  - solutions that “work” well enough but are not necessarily optimal
- Group decision making and forecasting is ongoing as well but
  - is usually done ineffectively, or worse (group think, drive for consensus)
  - but could be done better by following the keys

How Did Our Group Do Making Predictions

- Federal elections
  - House of Representatives
  - Senate
- State elections
  - Governor
  - House
  - Senate

Other Considerations

- Despite the ability of crowds to make accurate judgments and predictions
  - Businesses and government fail to use these methods
  - They also fail to entertain the value of probabilities of outcomes, rather than looking for absolutes that do not exist
- Another way to keep a group from lapsing into bad habits?
  - The lonely and uncomfortable world of the “devil’s advocate”
  - A person willing to suggest alternatives or to challenge consensus in the face of a sometimes hostile group

Questions or Comments?