NETWORKS

444 Lecture 26

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REVISION

PLAN FOR DAY

A little bit of revision, then onto last bit of new material

Q1 - GROUP BELIF

1. Briefly describe the difference between what Lackey calls "inflationary" and "deflationary" accounts of group belief, and give an example of each.

Deflationary accounts say that group beliefs are just a function of what individuals in the group believe. E.g., the group believes p just in case a majority of the members believe it.

Inflationary accounts say that other things than the beliefs of the group can matter to belief. E.g., the group believes p just in case someone in the group has evidence e, and everyone in the group thinks e is excellent evidence for p.

Q2 - GROUPTHINK

2. Explain the Conditionalisation constraint in Russell, Hawthorne and Buchak's paper *Groupthink*.

The constraint says that the following two operations should have the same result.

- a. Combine two opinions into a group opinion, then update on some evidence.
- b. Have each member of the group update on that evidence, then combine the two updated individual opinions into an updated group opinion.

Here's a case where this doesn't happen. A and B each think that P and Q are independent.

- A thinks that each has probability 0.8.
- B thinks that each has probability 0.2.
- The group probability for each proposition is a 50/50 mix of each.

At this stage, A thinks p&q has probability 0.64, and B thinks it has probability 0.04, so the mix is 0.34.

And the 50/50 mix of their probabilities for q is 0.5.

So the mixed probability for q given p is 0.68.

So if they merge the probabilities (by taking a 50/50 mix) and then learn q, they'll end with probability 0.68 for q.

But what if they do things the other way around - first learn q then update?

Well, they both think p and q are independent, so they will both have unchanged probability in p, so it's still 0.8 and 0.2, and the mix is 0.5.

So that's the challenge: do these procedures lead to the same outcome.

- 1. Merge then update.
- 2. Update then merge.

Q3 - VOTING

In a local election, with 100 voters, the voters have the following preferences. 45 people rank the candidates ADBC (i.e., A first, D second, B third, C fourth); 25 rank them BCDA; 20 rank them DABC; 10 rank them CDBA. Who would win if the voters vote sincerely, and the city uses first-past-the-post voting? Who would win if the voters vote sincerely, and the city uses ranked choice (i.e., alternate vote) voting? Very briefly (in a couple of sentences), which verdict do you think better reflects the will of the voters?

In first-past-the-post, A gets 45, B gets 25, D gets 20, and C gets 10, so A wins because 45 is largest.

In ranked choice, no one has a majority (i.e., 51 votes), so we eliminate the person with the fewest votes. That's C, and all 10 of their voters had D as second preference, so those 10 votes get added to D. Now it's A on 45, B on 25, and D on 30 (the 20 original, and 10 new). Still no one has a majority, so B gets eliminated. Each vote for B gets moved to the remaining candidate who was most preferred, and in all 25 cases that's D. So now D has 55 votes and is the winner.

Either answer for the last question seems fine, since neither system here is great. D does not have wide support - only 30% of voters even have them in the top 2. On the other hand, a majority of the voters have A outright last, and it is odd to have the worst possible option for 55% win the election.

Q4 - ARROW

State Arrow's **Independence of Irrelevant Alternatives** condition.

A social choice function takes the preferences of the voters as input, and returns a social preference ordering as output.

IIA says that if you change the voters' preferences, but do not change how any voter thinks about the relative position of A and B, then the social preference ordering of A and B should not change. That is, if originally A was ranked above B in the output, then the only way that can change is if some voter changes their mind about the relative ordering of A and B. It isn't enough if, for instance, some voters who always had B above A change their mind about whether B or C is outright best.

MORE REVISIONS

We'll do much more of this next Tuesday!

NETWORKS

NETWORK MODELS

Imagine a network with the following features.

- All but one of the people are arranged in a circle.
- Everyone can talk to their neighbor, and the other person, who is intuitively in the *middle* of the circle.
- The person in the middle can talk to anyone, but makes choices about what they are going to say.

STUDIES

There are two methods for trying to solve some problem, A and B. (For realism, the problem could be a disease and the methods could be drugs, but in general anything.)

- A works with probability 0.5.
- B works with probability a little above 0.5, say 0.53.

Crucially, no one in the group knows these numbers - in fact they are very interested in finding them out.

STUDIES

Each person around the periphery runs the following test.

- 1. Find 40 things with the problem.
- 2. Apply method A to 20, and method B to 20, and announce the results

Let's assume for now there are a lot of people around the edge, maybe 1000.

SUMMARISER

Here is one thing the person in the center could do.

- Add up all the numbers from all the studies and announce the results.
- If that happens, then almost certainly everyone will find out the truth.

PROPAGANDIST

What if the person in the middle has the following rule.

- Broadcast all results where A does better than B.
- Soak up other results.

Then almost certainly everyone will think B is no better.

PROPAGANDIST

Note that the following things all happen in this case.

- 1. Everyone does a perfectly fair experiment.
- 2. Everyone only tells people true things.
- 3. The result is that everyone ends up with a false belief.

JOURNALIST

Here's a slightly different model.

The person in the middle is a journalist who is committed to presenting both sides of every story.

So they'll listen to all the scientists, and pick at random one of the reports where A does better, and one of the reports when B does better.

JOURNALIST

Now this will end up with on average people having slightly more pro-B attitudes.

That's because the studies that favor B will, on average, have slightly larger margins than the studies favoring A.

But it will be very marginal, and it will be much much worse than if the journalist picked two studies at random.

SOLUTIONS

- 1. More communication between scientists; none of these results would happen if all the scientists communicated. Of course, this would require reading a *lot* of incoming mail.
- 2. Larger studies. This is the really interesting one.

LARGER STUDIES

Instead of 1000 studies with 20 tests per treatment, imagine that we have 20 studies with 1000 tests per treatment.

Then none of the results go through.

PROPAGANDIST

Even with B just at 53%, it isn't likely you'll have that many studies where A does better.

And the ones that are, will have only a small benefit.

Just looking at one's own studies and one's neighbor's studies will be enough to over-ride the propagandist.

REALISM?

Is this what propagandists really do?

- In some cases they just lie.
- In other cases they find approaches that tend to lead to better results.
- In yet other cases the focus is saying true things about a third option that could explain (away) bad public information.

But this does seem to have been part of the story, and it's interesting that it can in theory work.