Myside Bias and Group Discussion

The model simulates a group discussions over a binary issue between myside biased agents, i.e. agents that undervalue arguments that attack their prior belief, and overvalue arguments that confirm their prior belief.

The **objective** of our model is to assess the extent to which the myside bias, i.e. the tendency to overvalue/undervalue arguments depending on their fit with one's own prior belief, affect the ability of the group to find the correct answer to the binary issue under discussion.

Description of the model

The model consists of a given number of **arguers** (fixed by the variable "n-agents")**,** which represents the discussants, and a unique propositional variable, representing the issue under discussion. The propositional variable can assume value *true* or *false*. We fix the value *true* as the correct answer to the binary issue the propositional variable represent.

Arguers have a *prior,* representing their degree of belief in the correct answer to the binary issue at the start of the discussion; a *degree of belief*, encoding their degree of belief in the correct alternative after some argument has been presented in the discussion; a radicality parameter *self-gamma*, representing how strongly they undervalue or overvalue the arguments presented by other discussants.

Each arguer is assigned a *prior* degree of belief that is in the open interval (0,1), drawn from a beta-distribution set up at the. We require that, at the start of the discussion, the average *prior* of the group in the correct answer to the issue is strictly bigger "min-group-competence. In particular, we use this assumption to fix the correct answer to the binary issue (as done in variants of some Jury Theorems see https://plato.stanford.edu/entries/jury-theorems/).

We then say that an agent is initially correct when its *prior* is strictly higher than 0.5. We say that it is initially incorrect otherwise.

The variable *Majority* allows to decide the type of majority that the model output at the setup:

- By selecting "correct", the setup command outputs a group of agents such that strictly more than half of the agents are initially correct;
- By selecting "incorrect", the setup command outputs a group of agents such that strictly more than half of the agents are initially incorrect;
- By selecting any, the setup command outputs a group of agents with either a majority of initially correct agents or not.

Depending on their prior, agents are also assigned a color (if prior > 0.5, they are red, if prior < 0.5 they are blue, if prior = 0.5 they are white)

The parameter *self-gamma* can be distributed in three different ways, by selecting different values for the variable "distribute-gamma":

- by selecting "uniform", each agent is assigned the same value of gamma that is set in the slider "gamma";

- by selecting "across", for each agent, its parameter gamma is drawn from a beta-distribution with alpha=alpha-across and beta=beta-across (where alpha-across and beta-across can be fixed in the corresponding sliders);
- by selecting "within", for each agent with b>=0.5, the parameter gamma is drawn from the beta distribution with parameters alpha-correct, beta-correct (sliders), and for each agent with b<0.5, the parameter gamma is drawn from the beta distribution with parameters alpha-incorrect beta-incorrect (sliders).

However one decides to set up the parameter *self-gamma*, we require that *self-gamma*<1 for all agents.

The model can be initiated by pressing the button “Setup”.

Dynamics of the model

The dynamics of the model simulate a group discussion, where, at each time step (tick) a randomly drawn agents presents an argument, i.e. a Bayesian likelihood ratio; after the argument has been presented, all the other agents update their degree of belief in the correct answer in the light of the argument presented.

Here are some more details. At each step, a random agent with degree of belief different from 0.5 is chosen and draws a random argument “arg”, which is a number between 0 and 1, and strictly bigger than 0.001 (to avoid approximation error in the computations that are described below).

After “arg” is drawn:

- if the agent’s degree-of-belief > 0.5, then each of the other agents first calculates its own *perceived-likelihood ratio* “perc-arg” using the value of “arg” (informally, it is the argument that the interlocutors perceive, as opposed to strength of the original argument presented by the selected agent), using the function “perceived-likelihood-update”, and then update its new degree of using the function Bayes-update and perc-arg;

- if the agent’s degree-of-belief < 0.5, then each of the other agents first calculates its own *perceived-likelihood ratio* “perc-arg”, using the inverse of “arg”, i.e. 1/ “arg”, using the function “perceived-likelihood-update”, and then update its new degree of using the function Bayes-update and perc-arg.

These two type of updates correspond respectively to the following two situations:

- a correct agents presents an argument in favour of the correct alternative (in our Bayesian setting a likelihood ratio <1) and all agents update on depending on their degree-of-belief and self-gamma;
- an incorrect agents presents an argument in favour of the incorrect alternative (in our Bayesian setting a likelihood ratio > 1) and all agents update on it depending on their degree-of-belief and self-gamma.

After the argument is presented, and everyone has updated, the agents change color according to their new degree of belief. The argumentation step is then over.

A full discussion can be run by pressing the button “start”. In this case, the discussion automatically goes on until no agent has degree of belief = 0.5, and all agents supporting the correct side of the issue have degree-of-belief > 0.99999, and simultaneously all the agents supporting the incorrect side have degree-of-belief <0.00001

If on, the switch *probabilistic-majority-vote* calculates the probability that a strict majority of agents (for groups of odd size) will vote correct, under the assumption that an agent’s likelihood of casting a correct vote is its own degree-of-belief. The change of the probability of a correct majority vote can be visualized in the plot “Condorcet-Majority” throughout a discussion.

Plots

This revised version of the model includes new plots to visualize more clearly the dynamic changes in the opinion of the agents:

- the plot “number-of-correct-agents” plots the number of correct agents at each tick;
- the plot “Evolution of the Agents’ Degrees of Belief” plots in a single graph the degrees of beliefs of all agents at each time step;
- the plot “Distribution of Degrees of Belief” reports the distribution of the degrees of belief of the agents’;
- the plot “histogram-presented-arguments” reports the histogram of the likelihood ratios which have been used as arguments by the agents;
- the plot “Condorcet-Majority” plots, for each time step, the probability that a strict majority of the agents (for groups of odd size) will vote correct, under the assumption that an agent’s likelihood of casting a correct vote is its own degree-of-belief.

Notes

To avoid approximation errors to 1 and 0 for the update of degree-of-belief, we replace 0 by 0.00001 and 1 by 0.99999.

We approximate numbers to 5 decimals.

For a live link to the journal publication associated to the model check the website:
https://edoardobaccini.wordpress.com/research/

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