

Modifications to the Paper: Ideologically Motivated Biases in a Multiple Issues Opinion Model

We would like to thank the referees for their comments. The modifications we introduced in the paper in order to make it clearer as described bellow.

- Reviewer 2 wrote: *“Are opinions in the range $[0,1]$? They should state that.”*
 - Its stated at the beginning, second paragraph, of section 2.
- Reviewer 2 said:
 - *“They should explain the Bayesian rule in words, or more intuitively.”*
 - *“They should explain the concept of uncertainty and estimation. What does uncertainty mean? Why do agents have to estimate opinions? Don’t they know their own opinions? Or is there an observation error when looking at the opinion of the interacting partner? Are there empirical evidence of the Bayesian approach or statistical inference in opinion dynamics? What are the sociological fundamentals of mechanisms of the model?”*
 - We have added two paragraphs at the beginning of section 2 to state the framework we’re using. Details about the meaning and using of the Bayesian framework were also introduced. We also indicated previous works that go deeper into these details.
- Reviewer 2 wrote: *“What is the physical meaning of p^* ? Can they explain this interaction rule more intuitively?”*
 - We have included an explanation for the meaning of p^* soon after Equation 2.
- Reviewer 2 : *“(3) The physical meaning of sigma is quite confusing. In the conclusion they mention that sigma defines the trust of one agent on other agent. Why? Why do stubborn agents have $\sigma=1e-20$?”*
 - That is an implementation detail. We have modified the fourth paragraph of section 2 so that it should be clear that what we’re modeling is a sigma close to 0, that is agents that basically do not change their opinions (inflexibles).
- Reviewer 2: *“They also mention that sigma plays the role of the threshold in Bounded confidence models (BCM). However, in page 4 it is mentioned that Δ_{ij} also plays the role of the threshold in BCM. However, sigma and Δ_{ij} seem to be independent variables. They should clarify that.”*
 - We have modified the first paragraph of the last section and the description of Δ_{ij} in section 2 to fix that. There was indeed a mistake in that, while the distance Δ_{ij} is related to trust, it is indeed sigma that plays the role of the threshold parameter, while the trust between agents is a function of the ratio between Δ_{ij} and sigma. Modifications were introduced to correct for the actual meaning of each parameter.
- Reviewer 2:
 - *“It is not clear to me how simulations were done.”..one sampling of*

70,000 times.." means 70,000 independent realizations of the dynamics? Related to this point: was the distribution of Fig. 1 done over many different runs of the model? If that is the case, then it is hard to see whether there is consensus or not in individual realizations. The should add a plot (or perhaps an inset) showing the mean opinion of each agent in an single realization. What are the parameter values σ , n and p of Fig. 1?"

- We answered that by modifying the second paragraph of section 3. "Times" is equal to quasi-random "draws" following saltelli's sampling (one of the paper's bibliographic references). The fact that each of those draws correspond to a complete run of the model is now mentioned clearly. We have modified the paragraphs that explain Fig. 1 so that its clear we're investing the behavior of the model over many parameterizations. We've identified and pointed out the difference between initial and final state of the model both in the plot and in paragraphs explaining it. Plots of individual runs are already depicted throughout the paper, with the improved text, we feel there is not need add another one here.
- Reviewer 2: "5) Why do they take $\rho_2 = \sqrt{n} * \rho_1$ in page 13 instead of, for instance, $\rho_2 = n * \rho_1$?"
 - The explanation, that for independent processes it is the variance that is expected to add, making it a factor \sqrt{n} for the standard deviation was now added to the discussion.
- Reviewer 2: "6) It is mentioned in the conclusions". . . it makes sense to change how trust is calculated to a situation that is more compatible with experiments". They should cite related experiments."
 - We have added references on trust at the end of this sentence in the conclusion section. The new paragraph in the Introduction with results from cognitive science also provides the missing justification for the model assumptions.
- Reviewer 3:
 - "I would have expected the authors to incorporate some notion of 'relevance' or 'similarity' to represent that distances - between individuals - in their opinions regarding 'similar' issues, into their model. As it is now, the model presents a rather crude extension of previous work."
 - "I found the paper lacking in empirical grounding. In terms of the micro-underpinnings of the model, I was expecting to see much more references to empirical work justifying the notion that opinion- distance is a relevant factor in opinion updating processes; and the notion that opinion-distance on other (more or less related) opinions plays a role, too (see previous point). Without such empirical evidence, statements such as "how much each agent trusts another agent should be a function of the distance between their opinions on the subject they are debating" sound a bit unfounded."
 - "Likewise, I was expecting to see more reference to macro-level empirical work, which could either help justify the assumptions embedded

in the model proposed by the authors, or be used as a validation-benchmark for the aggregate levels outcomes generated by the model. Without such empirical reference, claims made e.g. in the first phrases in the conclusions section feel unwarranted or at least as lacking empirical grounding. And then ultimately, one has to resort to much weaker claims such as the ones made in the abstract (where the use of the word ‘might’ gives away that in fact, we really do not know for sure if this is how things play out in real life).”

- We have modified the first paragraph of section 1 to indicate the relevant literature about geometric models. We have also added a new second paragraph at Section 1 where a small review of the literature of Bounded Confidence opinion models is introduced as well as a very concise review of the cognitive aspects on why we trust better those who agree with us. The new second paragraph in the Introduction provides empirical justification for the assumptions. We’ve added a paragraph to the conclusion reinforcing what is the scope of the paper. Empirical calibration/validation and many other extensions were beyond the scope of the paper and left for a future study.