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Erratum: A Bounded-Confidence Model of Opinion Dynamics on Hypergraphs*

Abigail Hickok†, Yacoub Kureh†, Heather Zinn Brooks‡, Michelle Feng§, and Mason A. Porter¶

Abstract. This is a short erratum for the paper A. Hickok et al. [*SIAM J. Appl. Dyn. Syst.*, 21 (2022) pp. 1–32].

Key words. opinion models, hypergraphs, bounded-confidence models, polyadic interactions

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We are making important corrections to the continuum model in Appendix A of our paper [1]. Although we did not study that model in our paper, we did present it as interesting for future work, and we want interested readers to use the correct model. None of the computations or analysis in our paper are affected by this correction.

First, we need to correct the type of hypergraph that we assume for that continuum model. We consider hypergraphs with N nodes. Let $L \subseteq \{2, \dots, N\}$ and consider a hyperedge that (1) has every hyperedge of all sizes $\ell \in L$ and (2) has only those hyperedges. In the special case $L = \{2\}$, this hypergraph is the complete N-node graph.

Second, we need to correct the rate equation (A.1). Let $P(x, t)$ denote the probability density function, such that $P(x, t)\, dx$ indicates how many nodes have opinions in the interval $(x, x + dx)$ at time t. In this model, when updating opinions, we select a hyperedge uniformly at random to update. The distribution $P(x, t)$ evolves according to the rate equation

$$\begin{aligned}\frac{\partial}{\partial t} P(x,t) &= \sum_{\ell \in L} \Bigg(\mathbb{P}[\text{we pick a hyperedge of size } \ell] \\ &\qquad \times \ell \int_{\{\sum_{j=1}^{\ell} (y_j - \bar{y})^2 < c(\ell-1)\}} dy_1 \cdots dy_\ell P(y_1,t) \times \cdots \times P(y_\ell,t) [\delta(x-\bar{y}) - \delta(x-y_1)] \Bigg) \\ &= \sum_{\ell \in L} \Bigg(\frac{\binom{N}{\ell}}{\sum_{\varpi \in L} \binom{N}{\varpi}} \\ &\qquad \times \ell \int_{\{\sum_{j=1}^{\ell} (y_j - \bar{y})^2 < c(\ell-1)\}} dy_1 \cdots dy_\ell P(y_1,t) \times \cdots \times P(y_\ell,t) [\delta(x-\bar{y}) - \delta(x-y_1)] \Bigg),\end{aligned}$$

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†Department of Mathematics, University of California, Los Angeles, CA 90095 USA (ahickok@math.ucla.edu, jkureh@gmail.com).
‡Department of Mathematics, Harvey Mudd College, Claremont, CA 91711 USA (hzinnbrooks@g.hmc.edu).
§Department of Computing + Mathematical Sciences, California Institute of Technology, Pasadena, CA 91125 USA (mfeng@caltech.edu).
¶Department of Mathematics, University of California, Los Angeles, CA 90095 USA and Santa Fe Institute, Santa Fe, NM 87501 USA (mason@math.ucla.edu).

where $\bar{y} = \frac{y_1+\cdots+y_\ell}{\ell}$ is the mean opinion of the nodes in a selected hyperedge. By symmetry, we are allowed to write $\delta(x - y_1)$ in the integrand.

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REFERENCE

[1] A. Hickok, Y. Kureh, H. Z. Brooks, M. Feng, and M. A. Porter, *A bounded-confidence model of opinion dynamics on hypergraphs*, SIAM J. Appl. Dyn. Syst., 21 (2022), pp. 1–32.