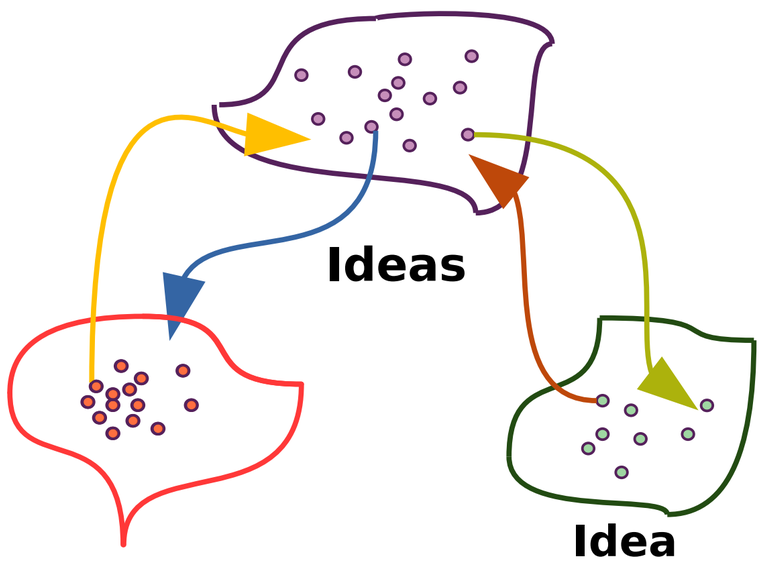
Modeling idea transfer between communities of members

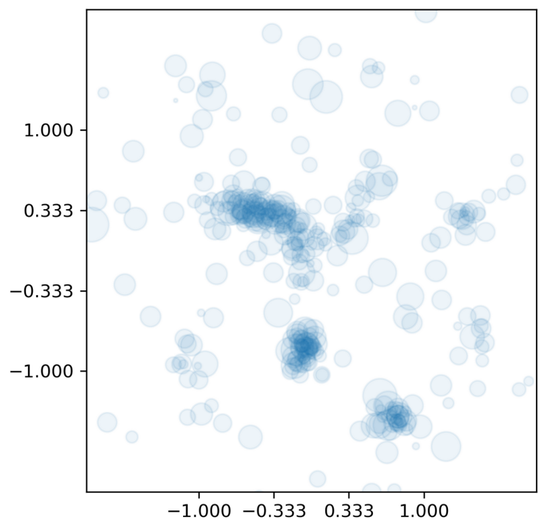
Clark Ikezu
Fall 2019, CS 221

Acknowledgements
Hancheng Cao, CS PhD candidate for his helpful comments and direction
The Professors and TA's for leading the course
RRE, ISL, ELS, VKT for their help and comments

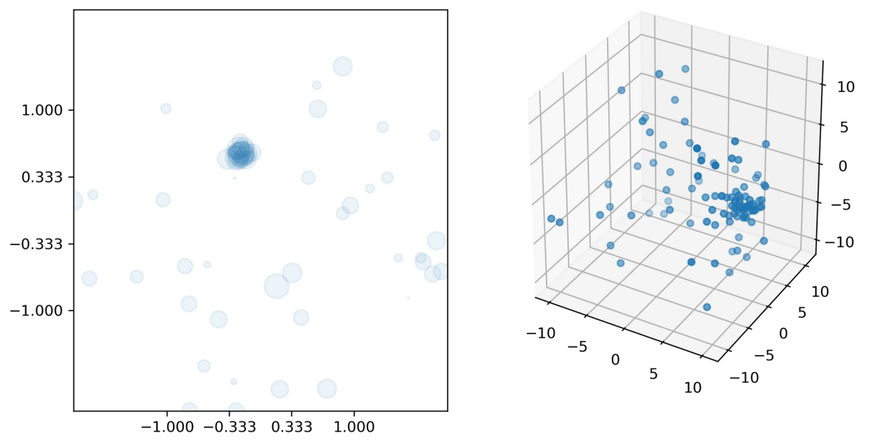
Model



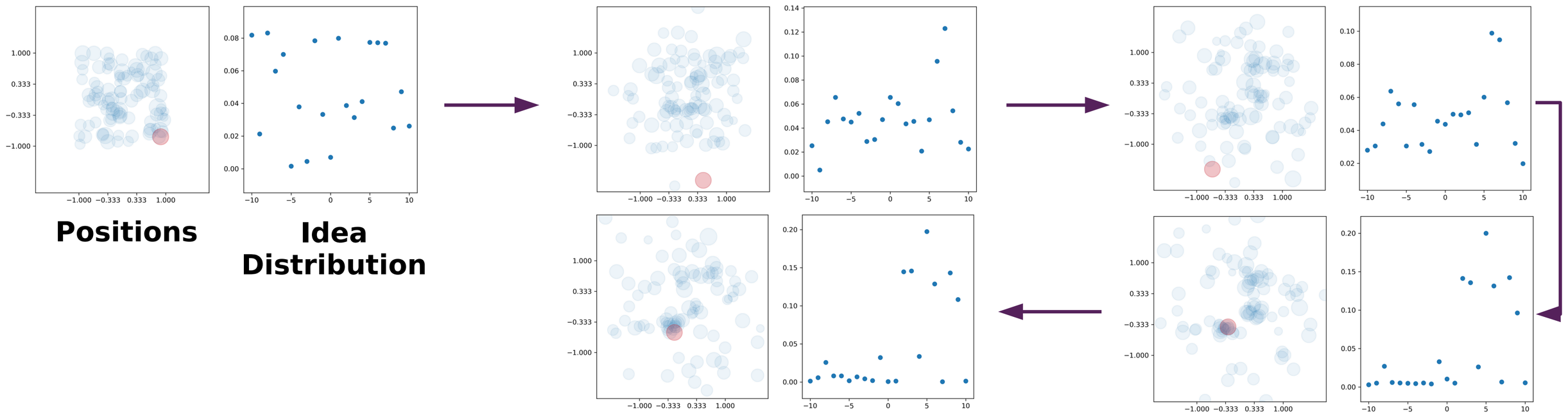
Communities form in positions



RL for spreading ideas

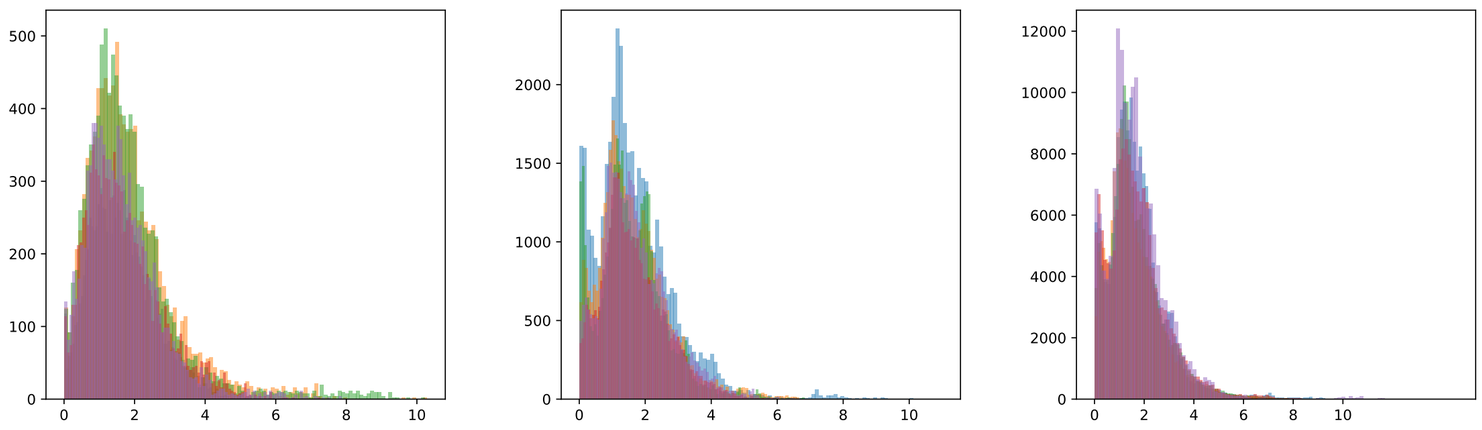


Members move in the direction of pair-wise agreement

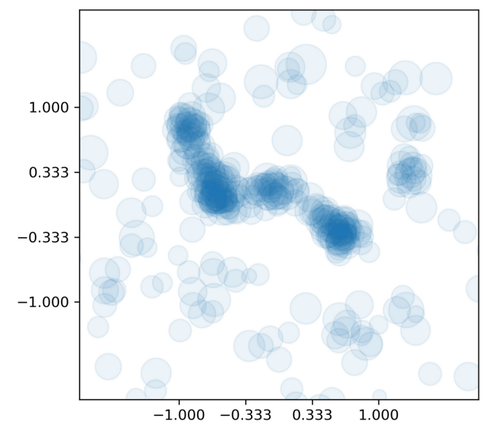


Member density determines number of communities

Histograms of pairwise-distances between member positions



Representative positions



Model update function

How can we model the spreading of ideas amongst a community of members? Can such a model represent the spreading of fake news? Here is a simplified version of the community update function, iterated until convergence.

$$\text{prob(Idea Transfer)}_{ij} = \Theta_i(\text{Agreement}_{ij}) \times \text{prob(Interaction}_{ij})$$

$$p_{\text{ideas},i} \leftarrow \sum_{m_j \in C} = (1-\gamma_i)p_{\text{ideas},i} + \gamma_i p_{\text{ideas},j}\text{prob(Idea Transfer)}_{ij}$$

$$\text{pos}_i \leftarrow \text{pos}_i + \nu_i \tau \cdot (\sum_{m_j \in C} \text{prob(IdeaTransfer)}_{ij}(\text{pos}_j - \text{pos}_i)$$

An idea from member *j* is transferred to member *i* only if they agree or disagree beyond *i*'s threshold, and also near each other in position. Then the member's idea *distribution* is updated incrementally to create a new distribution to sample from for the next time step. Positions are updated similarly, where members either move towards or away from members they agree or disagree with.

RL for spreading ideas

What if we trained an RL agent to get the community to agree with the member? This would be kind of like optimizing the spread of any news.