

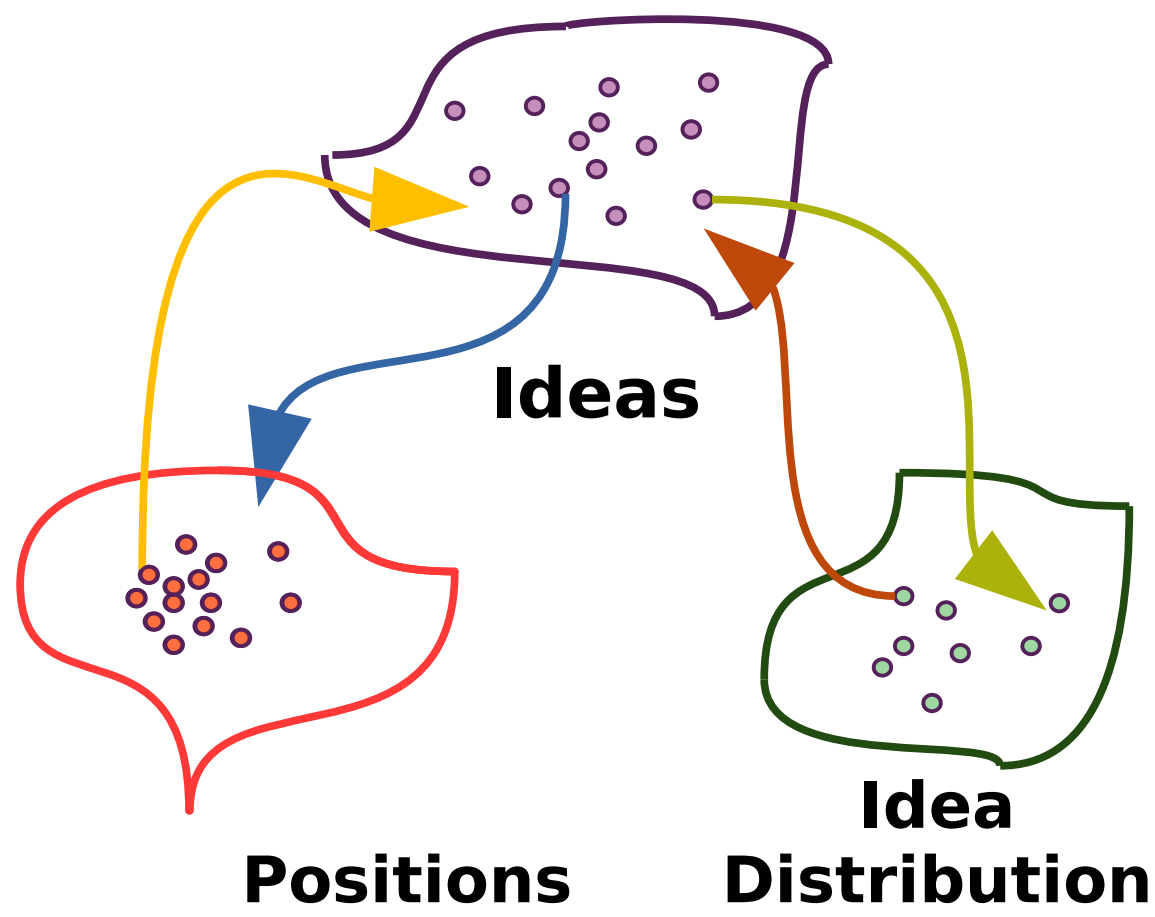
# Modeling idea transfer between communities of members



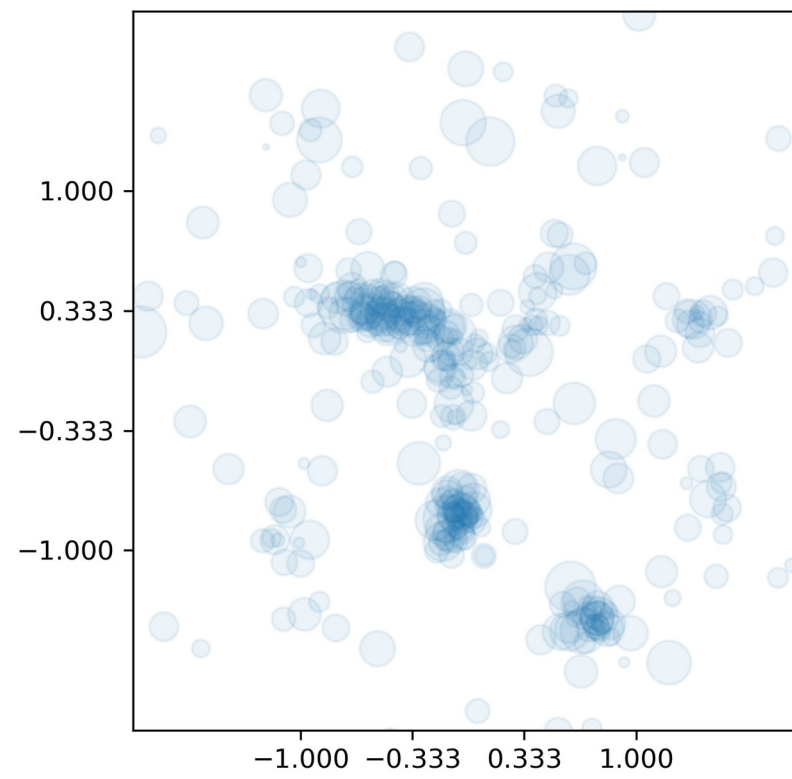
Clark Ikezu  
Fall 2019, CS 221

**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

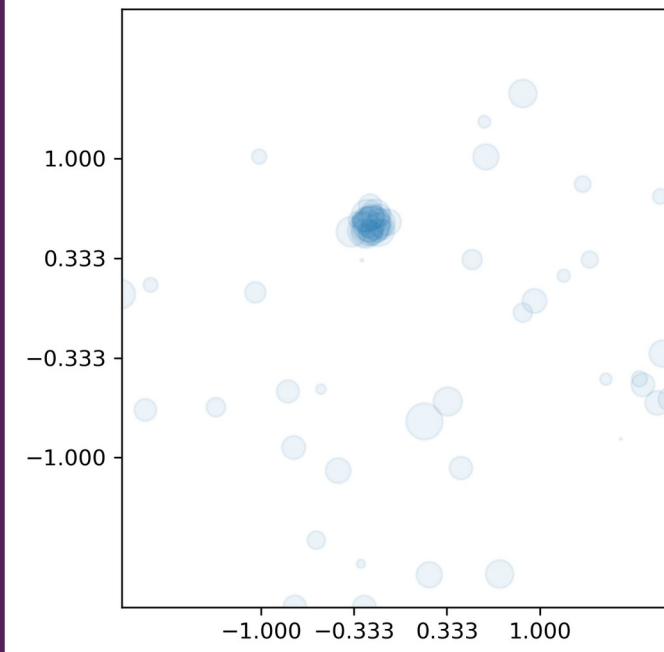
## Model



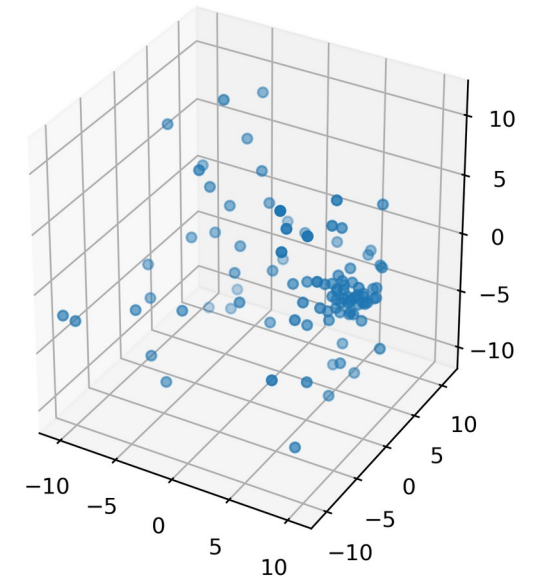
## Communities form in positions



## RL for spreading ideas

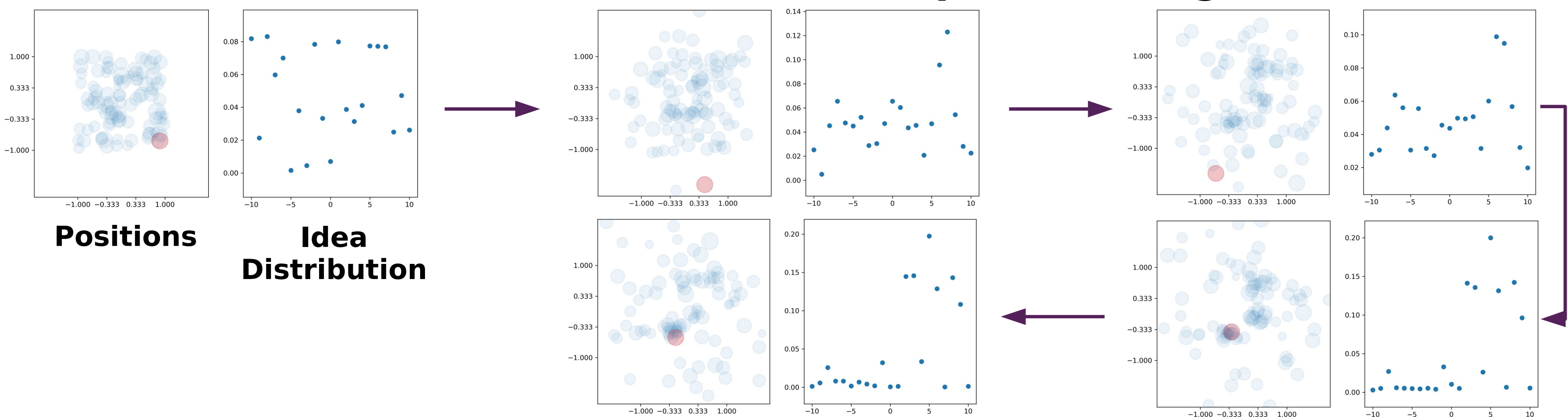


Positions



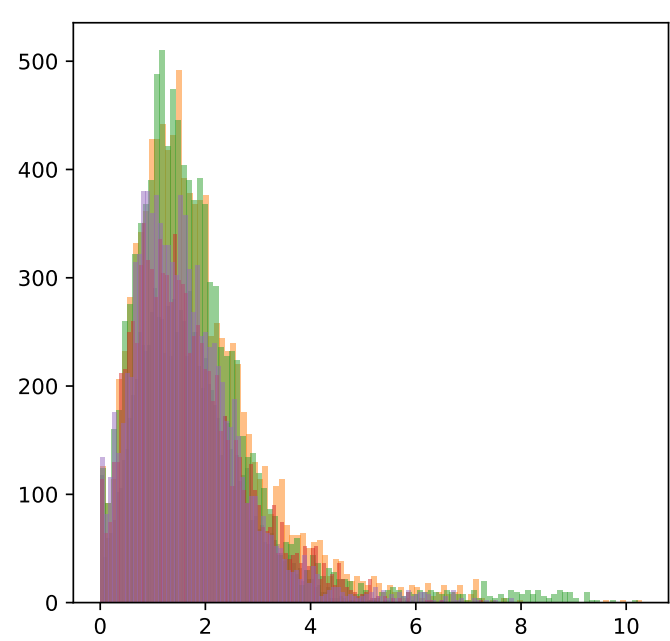
Ideas

## Members move in the direction of pair-wise agreement

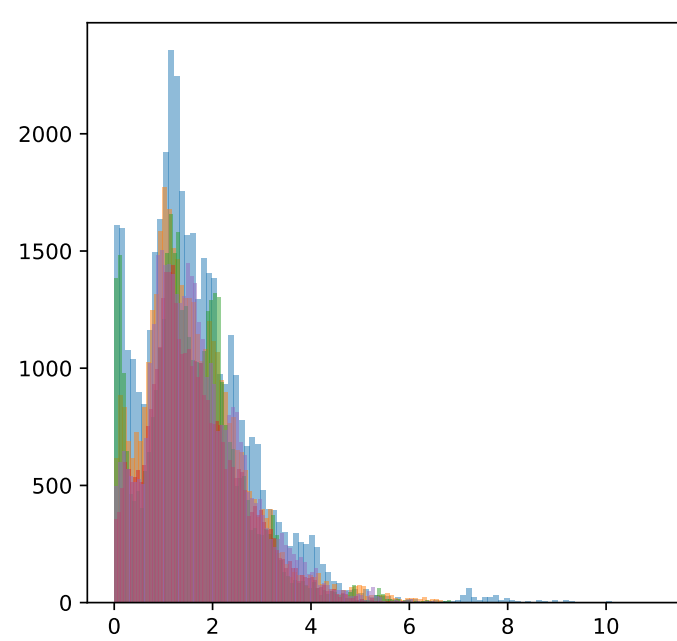


## Member density determines number of communities

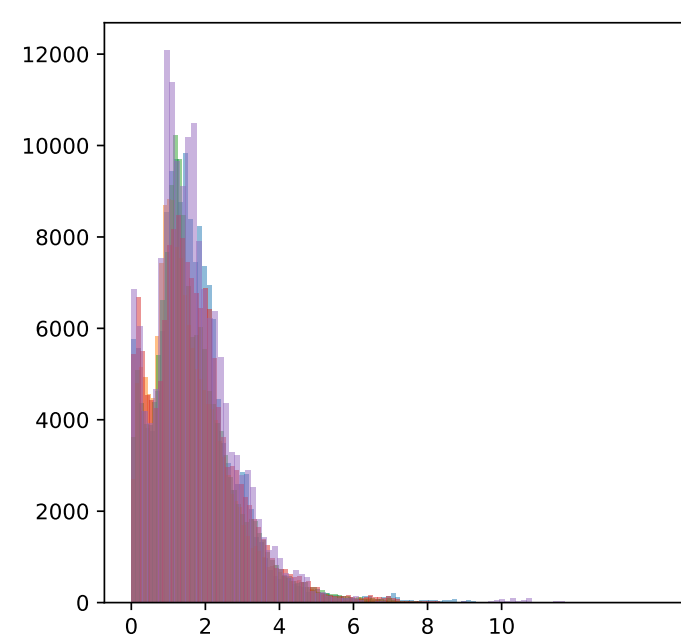
### Histograms of pairwise-distances between member positions



100 members

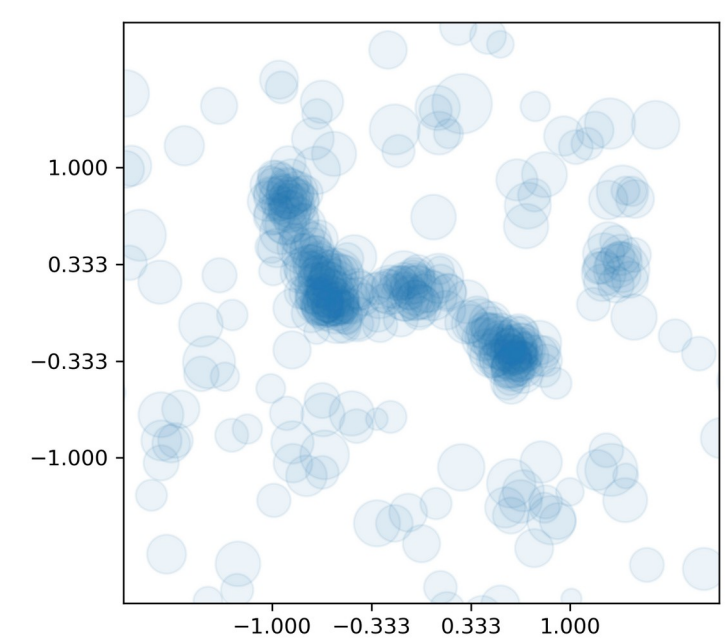


200 members



400 members

### Representative positions



400 members

## 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.

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

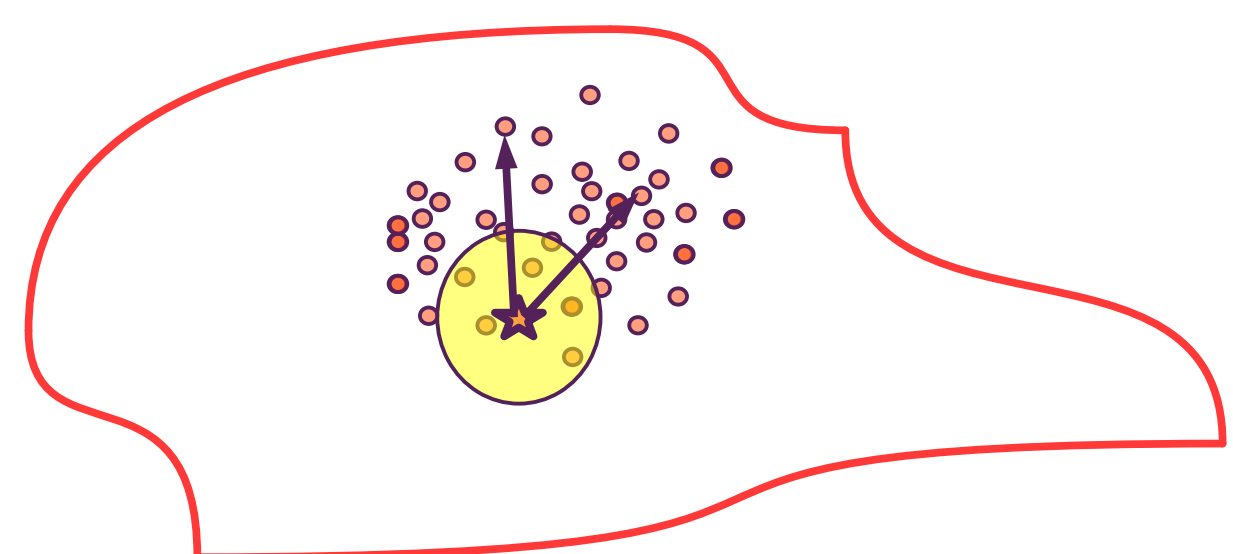
$$p_{\text{ideas},i} \leftarrow \sum_{m_j \in C} (1 - \gamma_i) p_{\text{ideas},i} + \gamma_i p_{\text{ideas},j} \text{prob}(\text{Idea Transfer})_{ij}$$

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

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.



Positions