## Q-Voter Model with Weighted Social Influence to Study **Consensus Building**

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## Abstract

I would like to present a model of opinion formation where an individual's opinion is influenced by interactions with a group of agents. The model introduces a novel bias mechanism that favors one opinion, a feature not previously explored. In the absence of bias, the system reduces to a mean field voter model. We identify three regimes: favoring negative opinions, favoring positive opinions, and a neutral case. In large systems, equilibrium outcomes become independent of group size, with only the bias influencing the final consensus. For smaller groups, however, the time to reach equilibrium depends on group size. Our results show that even a small initial bias leads to a consensus, with all agents eventually sharing the same opinion if the bias is not zero. The system also exhibits critical slowing down near the neutral bias, which acts as a dynamical threshold. The time to reach consensus scales logarithmically for non-neutral biases and linearly with system size for the neutral case. While short-term dynamics are influenced by group size, long-term behavior is determined solely by the bias.

## **Keywords**

Opinion dynamics, Voter model, Decision making, Social simulation, Consensus formation

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