

## Project Summary

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I will use percolation theory to model how a third political party garners registered voters during a hypothetical election. My motivation for this project is based on how third parties force major parties to incorporate otherwise ignored issues into their platforms. I will represent a voting population as a scale-free network where nodes represent voters and are occupied depending on how susceptible that voter is to the third party platform (in the simplest case I will consider susceptibility purely as a function of vertex degree). Since literature indicates that most people vote for third parties out of distrust for the government, two nodes  $i$  and  $j$  are connected (i.e.  $i$  "infects"  $j$ ) depending on a randomly distributed probability  $p_{ij}$  that equals 1 when voter  $j$  distrusts the government enough to register for the third party (equals 0 otherwise). To clarify, this model posits the vote as both a function of susceptibility and infection. To initially get a feel for the system, I will run simulations starting with some arbitrary number of initial occupied nodes representing party members. Eventually, though, my focus will be more mathematical as I apply Newman's generator-function method on percolation in random networks to expand on Barabasi's analytical work on scale-free networks. This will also involve questions of translation by addressing what analytical quantities like percolation threshold mean in the context of my model. Permitted time I would also like to address the "fear of the wasted vote" by measuring the robustness/frailty of the system (i.e. knocking out occupied nodes, first randomly and then strategically depending on vertex degree, and observing effect on cluster size, etc.).