**Satish Panda**

**Research Proposal for Graduate School**

---

I am interested in probabilistic machine learning, algorithms and game theory. As a researcher, I plan to work on their applications in Planning and Resource Allocation, Fairness in AI and Democratic Systems. By pursuing a PhD in CS Theory, I seek to acquire the skillset needed to rigorously investigate and shape the Social Impacts of AI.

One part of my motivation is about fairness in AI systems that inform planning decisions such as disaster or pandemic response, healthcare coverage, and public budget allocation. For example, already urbanized regions are often allocated higher budget or have more funds to spare on further upgrades and expansion whereas rural, poorly connected regions may be given agricultural or industrial subsidies just to keep them barely afloat to serve the urban ones. Pandemic response may suffer from inadequate vaccine distribution or resistance among vulnerable and sceptical populations. Wealthier urban areas might receive priority in disaster response through faster relocation and reconstruction.

I am interested in quantifying social fairness in these numerous situations and in questions such as whether fair outcomes exist, the complexity of finding such solutions and design of systems guaranteeing approximate fairness.

Second, I am fascinated by information asymmetry in democratic systems. The sheer scale of human societies necessitates black-box compartmentalization and hierarchy. In governments, institutions may operate almost opaque to one another's objectives with intercommunication at the highest levels and information trickling down on a strictly need-to-know basis. Individuals at higher levels or behind the scenes have highly asymmetric global knowledge in comparison to the average person. Ignorance of vulnerable voters may be misused by information advantaged political agents to misguide them by pushing polarizing or false narratives or drowning out unfavorable candidate manifestos, using them as vote banks and allowing lobbying groups to operate in secrecy.

I aim to study how information compression and distortion—intentional or otherwise—occur in hierarchical decision systems. Then, I plan to design mechanisms that make electoral processes more deliberative and incentive-compatible for candidates to reveal their true intentions.