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Research Statement

I am a microeconomic theorist. My research focuses on how the structure of the informational environment impacts the transmission of information, and the effect this has on outcomes and welfare. My research is divided naturally into two parts, based on whether communication is strategic or non-strategic. Overall, my papers develop new models, and leverage novel techniques on stochastic processes to provide a rich representation of uncertainty in complex informational environments.

Strategic Communication.

1. Complex Environments. My job market paper (Aybas and Callander, 2023*a*) introduces a new framework for modelling complex environments. In a complex environment, an expert knows many more things than does a non-expert. In contrast, canonical models of strategic communication study much simpler environments in which the expert's advantage is only a single piece of information (Crawford and Sobel, 1982).

Complex environments capture more accurately expertise in practice. A doctor, for example, knows many things that a patient does not. Moreover, in complex environments the expert's knowledge is not perfectly invertible. Thus, when the doctor recommends her most preferred treatment, the patient cannot invert this to infer his own most preferred treatment. In the simple environments of canonical models, the doctor's expertise is invertible.

In complex environments, the expert advice and decision making is very different. We identify an equilibrium that is efficient and expert optimal. The expert recommends his most preferred action and the decision maker accepts it despite knowing that the expert is biased. In complex environments the expert gains leverage whereas he has none in simple environments. This leverage resonates with expertise in practice. As Arrow (1963, p.965) famously wrote many years ago, the 'informational inequality' in the doctor-patient relationship means that the patient 'must delegate to the physician his freedom of choice'. Our model captures this expert power and shows how it derives from the complexity of the environment.

Experimentation and Expertise. The framework we developed in my job market paper opens up many interesting questions. One such question is the relationship between expert advice and experimentation. In practice, a decision maker has the choice of accepting expert advice, experimenting on his own, or doing both. This choice becomes particularly relevant in dynamic settings where the decision-maker can experiment during the initial periods and leverage the acquired information in subsequent ones.

In our subsequent project (Aybas and Callander, 2023*b*), we investigate how a decision maker utilizes advice and experimentation, and explore how an expert can provide advice knowing that the decision maker also has the option to experiment. This question is trivial in a simple environment, the decision maker learns everything after taking a single action and observing its payoff. Our complex environment framework enables us to study the interaction between experimentation and expert advice in a meaningful and realistic way.

We show that expert advice and experimentation can coexist in equilibrium, giving rise to an intriguing interplay. While experimentation and expert advice are complements for the decision-maker, they act as substitutes for the expert. As the expert's recommendations become more precise, a decision maker can learn more with experimentation, using this information to their advantage, often at the expense. In response, the expert may opt for less precise communication. Notably, while efficient communication is feasible in a single-period interaction (Aybas and Callander, 2023*a*), over a longer horizon, the decision-maker's ability to experiment makes communication inefficient and the quality of decision-making deteriorates.

Future Work. In my future research, I am planning to investigate how the complexity of the informational environment impacts other dynamic games of incomplete information, such as repeated online auctions, bargaining, and reputation. In these settings, repeated interactions among players are central for learning, and a single outcome does not reveal all information about the other players involved. In a separate ongoing project with Steve Callander and Spencer Pantoja, we apply the complex environment framework to investigate how sellers strategically reveal various attributes of a product when attributes are imperfectly correlated.

2. Coarse Communication. Another way the environment can impact strategic communication is the coarseness of the messages available for communication. For instance, a CEO may only have time for an executive summary of a proposal, or bureaucratic advice to a legislature is limited to particular policy dimensions. In Aybas and Turkel (2023) we explore how the structure of strategic communication and the expert's persuasive ability is influenced by the availability of messages.

We develop a geometric representation for the expert's payoff as a function of the number of messages available to her. With coarser communication, the expert's influence over the decision maker's action diminishes, and she values gaining access to an additional message. This value increases as the decision maker's uncertainty about the state intensifies or as he becomes more challenging to persuade into taking actions that benefit the expert.

However, surprisingly, restricted access to messages does not always result in reduced information transmission in equilibrium. We identify a class of games in which, with a reduced number of messages, the expert communicates in a way that provides more information about the states critical to the decision-maker's choice. Consequently, the decision-maker may find it beneficial to limit the expert's communication capacity. This implies that regulations on the communication capacity can potentially shift the balance of power from the expert to the decision-maker and improve welfare.

Social Networks

Countervailing Effects of Homophily. My research on social networks centers on investigating how network structure influences social learning. While the structure of social networks are inherently complex, they exhibit fundamental patterns.

One of the most pervasive patterns of social networks: *homophily*, which refers to individuals tendency to associate more with others who are similar to themselves. In Aybas and Jackson (2023), we study how homophily plays a role in influencing the efficiency of social learning. Our exploration of homophily's impact uncovers both its advantages and drawbacks.

On the positive side, homophily enhances individuals' learning from their friends' experiences, as they can derive more insights from observing the success of someone similar to them

in a given task, compared to individuals with different backgrounds and skills. However, on the negative side, homophily can restrict a person's exposure to a limited set of choices. If a person's friends primarily belong to a single group and tend to make the same choice, that individual ends up learning about that particular choice but remains unaware of the alternatives.

With a small number of friends and a high degree of homophily, a group can end up herding on inefficient decisions because of a lack of information about the alternatives, a phenomenon we refer to as '*sample herding.*' However, when individuals have a larger social network or encounter reduced uncertainty, they observe more about the previously unexplored actions, leading to improved learning across all groups. This improves learning from all groups, and eventually it becomes more important to be learning from people with similar characteristics to find the optimal action suited for them, making homophily beneficial for learning.

These results suggest that networks that maximize social learning demonstrate homophily in characteristics that influence payoffs. When these payoff-relevant characteristics are not independent of other innate characteristics, it can lead to '*incidental homophily*' in those innate characteristics. This offers a first explanation for previously puzzling empirical patterns in social networks (Jackson, Nei, Snowberg and Yariv, 2022).

Future Work. In an ongoing project with Matthew Jackson and Ben Davies, we explore how the distribution of homophily in a network impacts the efficacy of social learning. Specifically, we show that a society with a more dispersed but lower level of homophily may experience slower learning and greater inefficiencies compared to one with higher homophily with less dispersion.

Projects in Other Fields

Social Microclimates. I've been engaged in interdisciplinary project with the Stanford Social Neuroscience Lab to measure the collective impact of individual, social network, and microclimate factors on the well-being of first-year college students (Courtney et al., 2021). We show that students who were part of tightly-knit friend networks within their dormitories experienced more cohesive microclimates and, consequently, reported significantly reduced levels of psychological distress. Particularly, our research highlights the interplay between the structure of social networks, physical environments, and well-being.

Organizational Economics. In a work-in-progress with Spencer Pantoja we study the internal design of organizations and focus on a novel trade-off that arises between specialization and conflict. When designing the optimal departmental structure, incorporating an additional perspective can enhance the collective knowledge within the organization. However, it may also intensify internal disagreements and conflicts. Our objective in this project is to explain how organizations resolve this trade-off and to illustrate how distinct internal structures can emerge for organizations with different characteristics.

Algorithmic Mechanism Design. In another ongoing project with Mitchell Watt, we study a dynamic model of trade involving a single uninformed buyer and multiple uninformed sellers, where the strategies for all players are defined by regret minimizing algorithms. We show that, in equilibrium, a buyer who follows a standard no-regret learning algorithm is vulnerable to exploitation by sellers using a collusive algorithm. However, if the buyer can commit she can extract a significant portion of the surplus, effectively employing an algorithm analogous to a descending price auction.

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