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“UNAWARENESS, INFORMATION THEORY, AND APPLYING GAME THEORY IN THE REAL WORLD”

Abstract: One of the enduring challenges of game theory is how to model unawareness of an event, in which a player does not simply assign low probability to that event, but does not even know that it is possible (``unknown unknowns"). In general, a player's behavior in a game will depend on their unawareness concerning the possible events in that game. Yet without a formal model of unawareness, it is impossible to analyze this dependence.

Another enduring challenge of game theory is how to apply it to complicated real world systems. Especially challenging is how to apply game theory to situations in which the players interact with automated systems that cannot be described in closed form, but only via computational simulators.

In this talk I present a way to represent games using graphical models that can solve both these challenges. In particular, I show how to use this representation to analyze the information theoretic aspects of changes in player awareness. This allows us to use information theory to analyze how information acquired via changes in awareness is related to information acquired via conventional information channels.

I also show how to use this framework to model the interactions of human pilots with one another and with their cockpit data systems in near mid-air collisions.