Large-Sample Rankings of Information Structures in Games *

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April 12, 2021

Abstract

Blackwell (1951) characterizes when one information structure induces higher expected payoffs than another in all single-agent decision problems. Extending this ranking to multi-agent settings faces several well-known difficulties, which the literature has addressed so far by (i) only considering comparisons across very limited pairs of information structures, or (ii) restricting attention to special subclasses of games, such as common-interest or zero-sum games.

In this paper, we provide a ranking of information structures under the assumption that agents observe many i.i.d. draws of signals prior to playing a game. We show that, under this assumption, equilibrium welfare across any two information structures can be ranked uniformly for a rich class of welfare functions and games. We characterize this ranking using an efficiency index that considers the statistical distance between each player's marginal signal distributions across different states; thus, correlations across players' signals are irrelevant for the ranking. A key lemma underlying the proof highlights a novel relationship between higher-order beliefs and Kullback-Leibler divergence.

As a by-product, we obtain a characterization of the speed of common learning (Cripps, Ely, Mailath, and Samuelson, 2008): In particular, the speed at which players achieve approximate common knowledge of the state is the same as the slowest player's speed of individual learning. We also apply the results to discuss when information structures are complements vs. substitutes, and to optimal information design in games.

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