



THE UNIVERSITY OF  
CHICAGO

Computational and Applied Mathematics  
&  
Statistics Student Seminar

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Strategic Feature Extraction:  
Methods for Low-Dimensional Representation of Games

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Searle 240A

ABSTRACT

Games are widely used to test reinforcement learning paradigms, to study competitive systems in economics and biology, and to model decision tasks. Empirical game theory studies games through observation of populations of interacting agents. We introduce a generic low-dimensional embedding scheme that maps agents into a latent space which enables visualization, interpolation, and strategic feature extraction. The embedding can be used for feature extraction since it represents a generic game as a combination of simpler low dimensional games. Through examples, we illustrate that these components may correspond to basic strategic trade-offs. We then show that the embedding scheme can represent all games with bounded payout, or whose payout has finite variance when two agents are sampled at random. We develop a formal approximation theory for the representation, study the stability of the embedding, provide sufficient sampling guidelines, and suggest regularizers which promote independence in the identified features.