

APPROXIMATING CARATHEODORYS THEOREM AND NASH EQUILIBRIA

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In this talk I will present an approximate version of Caratheodory's theorem and its algorithmic applications. In particular, I will show that for every vector in the convex hull of a set of vectors X there exists a nearby (under p -norm distance, for p at least 2) vector that can be expressed as a convex combination of at most b vectors of X , where the bound b is independent of the dimension of the vectors.

Given the significance of Caratheodory's theorem, this approximate version is interesting in its own right. It also has notable algorithmic applications. Specifically, I will describe how this approximate version of Caratheodory's theorem leads to a new algorithm for computing approximate Nash equilibria in two-player games. This algorithm, in particular, provides a polynomial-time approximation scheme for Nash equilibrium in games where the sum of the payoff matrices is sparse. Moreover, for arbitrary two-player games the running time of the algorithm matches the best-known upper bound, which is obtained in (Lipton, Markakis, and Mehta 2003).

Arxiv preprint: <http://arxiv.org/abs/1406.2296>