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Matroids, Secretary Problems, and Online Mechanisms

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Abstract

There is a tight relationship between the classical subject of secretary problems, and the problem of designing online digital goods auctions which approximately maximize social welfare when the agents are assumed to arrive in random order. In this work we seek to extend this relationship to domains more complicated than digital goods auctions. Specifically, we study matroid domains, in which the sets of agents which may be simultaneously satisfied constitute a matroid. A motivating example is the "unit-demand domain", in which each agent is interested in purchasing one element from a subset of the items for sale, and is indifferent between the elements of this subset. We conjecture that all matroid domains have a social choice function which is constant-competitive when the agents arrive in random order, and that there is a mechanism which truthfully implements this social choice function. This talk will survey progress toward proving this conjecture, including a solution of special cases such as graphic matroids, truncated partition matroids, and bounded degree unit-demand domains (in which the set of items which can satisfy an agent has bounded cardinality). Interestingly, many of these mechanisms are truthful even when both the set of satisfying outcomes and the value for receiving such an outcome are private information.

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