Learning to bid in multi-item VCG auction using Reinforcement learning

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In this paper, we consider the problem of learning to bid strategically, when we consider a VCG auction composed of similar items in a given marketplace, where each player aims to maximise his overall revenue. It has been proven that VCG auctions are impacted by collusion between players in a truthful bidding context. It was also proven that approximating policy using a neural network can achieve good results in second price auctions with reserve price, when no collusion is considered. We will show that we can introduce an RL agent that will learn to bid optimally and in a stable way, in various marketplace configurations, and compare Its result to truthful bidding, for both single player, and a set of colluding players, and show the competitive advantage of doing so. We will also implement a multi-agent RL environment for VCG auctions, and study its equilibrium and convergence.