

Agent Based Models and Q-learning in Pandemic Mitigation Strategies

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Abstract: In this paper we implement an agent-based model to study the economic and public health effects of the COVID-19 pandemic. Our model will discuss two control problems: Firms seeking to maximize their profit by determining optimal salary levels and Policymakers who dynamically implement mitigation strategies to alleviate the healthcare and economic burden caused by the virus. HJB equations will be derived, and the finite time optimal controls will be presented for both problems. Our paper then takes the example of a small town and simulates its local economic and pandemic related features. Approximate solutions to our control problems are obtained using Deep Q-learning algorithms and our trained "intelligent" Agents are tested against one-shot and commonsense-policy Agents. This work is the fruit of a collaboration with Dr. Andrew Papanicolaou and Dr Negash Medhin.

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