



Reinforcement Learning Algorithms for Entropy-Regularized HJB Equations with Model Uncertainty

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Abstract:

We study the convergence of the Policy Iteration Algorithm (PIA) for a broad class of continuous-time entropy-regularized stochastic control problems. Instead of relying on complex PDE estimates, we provide a simple, self-contained proof using probabilistic representations of PDE solutions and their derivatives. For both finite horizon models and infinite horizon models with large discount factor, we obtain super-exponential convergence rate without tear. The approach also extends to one-dimensional diffusion control problems with a super-exponential convergence rate. Furthermore, we address model uncertainty and propose a new algorithm that bypasses explicit coefficient forms, relying only on observable values, thereby improving practical applicability.

个人简介:

Gaozhan Wang is a Ph.D. candidate in Mathematics at the University of Southern California, co-advised by Professors Jin Ma and Jianfeng Zhang. His research focuses on continuous-time reinforcement learning and exploratory stochastic control. He has a strong background in stochastic analysis, differential equations, control theory, and mathematical finance. Before USC, he worked as a quantitative research analyst and registered investment advisor at OSAM (Franklin Templeton) in New York, and holds a master's degree in Mathematical Finance from Columbia University.

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