Nonlinear Sciences > Adaptation and Self-Organizing Systems

A Monte Carlo Algorithm for Universally Optimal Bayesian Sequence Prediction and Planning

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The aim of this work is to address the question of whether we can in principle design rational decision-making agents or artificial intelligences embedded in computable physics such that their decisions are optimal in reasonable mathematical senses. Recent developments in rare event probability estimation, recursive bayesian inference, neural networks, and probabilistic planning are sufficient to explicitly approximate reinforcement learners of the AIXI style with non-trivial model classes (here, the class of resource-bounded Turing machines). Consideration of the effects of resource limitations in a concrete implementation leads to insights about possible architectures for learning systems using optimal decision makers as components.

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