Exploring Reinforcement Learning:
From Fundamentals to Advanced Techniques
16 hours Course

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Course Description

Reinforcement Learning (RL) represents a transformative paradigm in machine learning, allowing autonomous agents to make sequential decisions and optimize strategies through interaction with dynamic environments. This course introduces the theoretical and computational foundations of RL, bridging fundamental principles with advanced techniques that address the challenges of complex, high-dimensional spaces.

The course begins with the basics of the Markov Decision Process (MDP), the mathematical framework underlying RL, and dynamic programming methods for deriving optimal policies. It then transitions to model-free reinforcement learning techniques, such as Monte Carlo methods and Q-Learning, which enable effective learning without prior knowledge of the environment's dynamics. Advanced topics include value function approximation, deep-Q-learning, and policy gradient methods, providing a foundation for applying RL to intricate problems. The course concludes with an exploration of modern developments in RL, including learning from demonstrations and leveraging deep neural networks for decision-making tasks.

Lectures and hands-on tutorials will allow participants to understand theoretical concepts while implementing practical solutions in Python, fostering a solid grasp of RL techniques applicable to research problems in science and engineering.

Course structure

- Introduction to Markov Decision Process and Dynamic Programming (4 hours)
- Model-Free Reinforcement Learning: Monte Carlo and Q-Learning (4 hours)
- Value Function Approximation and Deep-Q-Learning (4 hours)
- Policy Gradient Methods and Learning from Demonstrations (4 hours)

Requirements

Notebook with Python and Google Colab installed and tested

PhD Course

14, 16, 21, 23 Gennaio 2025
Aula 23, 11:30 -13:30 e 14:30 - 16:30
Università Cattolica del Sacro Cuore
via Garzetta 48, Brescia

Partecipa alla riunione ora

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