Reinforcement Learning

Art of learning to take sequential decisions while discovering the world!

- Strong mathematical foundations...
- But a lot of heuristics in the implementations.

- **Understanding the heuristics requires understanding the math!**
By the end of the course, you should

- understand the math of the reinforcement learning setting,
- have a comprehensive view of most RL techniques and their heuristics,
- be able to read research articles,
- be able to implement them.
Syllabus

- 5 lectures of 3h30 hours mixing several sources!

Outline

1. 10/11: Sequential Decisions, MDP and Policies
2. 17/11: No lecture!
4. 01/12: Reinforcement Learning: Prediction and Planning in the Tabular Setting
5. 08/12: Reinforcement Learning: Approximation of the Value Functions
6. 15/12: Reinforcement Learning: Policy Approach

Grade

- Article reading with or without implementation

The course *Stochastic approximation and reinforcement learning* by P. Bianchi focuses on stochastic approximation, a central tool that will only be used (and not proved) in my course.
References

R. Sutton and A. Barto. 
Reinforcement Learning, an Introduction (2nd ed.) 
MIT Press, 2018

O. Sigaud and O. Buffet. 
Markov Decision Processes in Artificial Intelligence. 
Wiley, 2010

M. Puterman. 
Wiley, 2005

D. Bertsekas and J. Tsitsiklis. 
Neuro-Dynamic Programming. 
Athena Scientific, 1996

W. Powell. 
Wiley, 2022

S. Meyn. 
Control Systems and Reinforcement Learning. 
Cambridge University Press, 2022

V. Borkar. 
Stochastic Approximation: A Dynamical Systems Viewpoint. 
Springer, 2008

T. Lattimore and Cs. Szepesvári. 
Bandit Algorithms. 
Cambridge University Press, 2020