

Incremental learning, game theory and applications

ECTS : 3

Volume horaire : 24

Description du contenu de l'enseignement :

This course will focus on the behavior of learning algorithms when several agents are competing against one another: specifically, what happens when an agent that follows an online learning algorithm interacts with another agent doing the same? The natural language to frame such questions is that of game theory, and the course will begin with a short introduction to the topic, such as normal form games (in particular zero-sum, potential, and stable games), solution concepts (such as dominated/rationalizable strategies, Nash, correlated and coarse equilibrium notions, ESS), and some extensions (Blackwell approachability). Subsequently, we will examine the long-term behavior of a wide variety of online learning algorithms (fictitious play, regret-matching, multiplicative/exponential weights, mirror descent and its variants, etc.), and we will discuss applications to generative adversarial networks (GANs), traffic routing, prediction, and online auctions.

[1] Nicolò Cesa-Bianchi and Gábor Lugosi, Prediction, learning, and games, Cambridge University Press, 2006.

[2] Drew Fudenberg and David K. Levine, The theory of learning in games, Economic learning and social evolution, vol. 2, MIT Press, Cambridge, MA, 1998.

[3] Sergiu Hart and Andreu Mas-Colell, Simple adaptive strategies: from regret matching to uncoupled dynamics, World Scientific Series in Economic Theory - Volume 4, World Scientific Publishing, 2013.

[4] Vianney Perchet, Approachability, regret and calibration: implications and equivalences, Journal of Dynamics and Games 1 (2014), no. 2, 181–254.

[5] Shai Shalev-Shwartz, Online learning and online convex optimization, Foundations and Trends in Machine Learning 4 (2011), no. 2, 107–194.

Compétence à acquérir :

Learning procedures when several agents are playing against one-other