

Learning and Experimentation

Course title – Intitulé du cours	Learning and Experimentation
Level / Semester – Niveau /semestre	MRes/S2
School – Composante	Ecole d'Economie de Toulouse
Teacher – Enseignant responsable	Johannes Hörner
Other teacher(s) – Autre(s) enseignant(s)	
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Other teacher(s) – Autre(s) enseignant(s)	
Lecture Hours – Volume Horaire CM	15h
TA Hours – Volume horaire TD	
TP Hours – Volume horaire TP	
Course Language – Langue du cours	English
TA and/or TP Language – Langue des TD et/ou TP	English

Teaching staff contacts:

- email(s) address(es), joh.horner@gmail.com
- office(s) number(s), TBA
- office(s) hours/day(s) of the week when students can drop by: by appointment
- preferred means of interaction (after the classes, by email, prior appointment,...)

You are welcome to contact me at any time by prior appointment.

Course Objectives: newly acquired knowledge once the course completed should be well identified

In more detail :

- ideas, theories or methods that will be illustrated in class;
- methods that will be used and that students are expected to be proficient in;
- skills that will be developed during the course (type of problems to be resolved, ability to provide written and oral comments on an empirical analysis,...).

It is preferable to specifically list simple objectives with verbs, so that it is easy to evaluate whether these objectives are achieved at the end of the course or to identify the areas for improvement (for instance : for implementation goals - test hypotheses and draw correct inferences using test statistic; for conceptual goals - characterize first-degree, second-degree and third-degree price discrimination;...).

The goal is to review the recent literature in economics and decision sciences on learning and experimentation. In particular, so-called bandit models will be reviewed, from the point of view of a single agent, of agency (principal-agent) and the strategic case (equilibrium). The framework will be (mostly) Bayesian, and the payoff criterion discounted.

Prerequisites :

- skills and competences needed/previously acquired
- or the title(s) of the compulsory course(s) which should have been taken before

Mathematical maturity is expected. Prior knowledge of probability theory and game theory is required.

Practical information about the sessions:

- please specify if laptops or tablets are accepted or not in the class,
- expectation on students' participation,
- how will be treated students that arrive to class late.....

Laptops are accepted in class. Lecture notes will be provided. I hope that the course can be as interactive as possible, so participation is encouraged.

Grading system :

- final exam or midterm exams
- Teaching Assistant grading
- weights of the weighted average main cours-TA (consistent with the voted examination "arrêté d'examen"),
- semester calendar,
- how to handle late homework...

A final term paper will be used for evaluation, based on a series of (somewhat open-ended) problems.

Bibliography/references :

- list of assigned readings and other course materials : books (chapters), internet links,...

Prerequisites: Fudenberg and Tirole, Game theory, MIT Press.

Background material on bandits and MDP:

Kallenberg, Markov decision processes, University of Leiden.

Gittins, Weber, Multi-armed bandit allocation indices, Wiley.

Key papers:

Bolton, P. and C. Harris (1999): "Strategic Experimentation," *Econometrica*, 67, 349–374.

Bonatti, A. and J. Hörner (2011): "Collaborating," *American Economic Review*, 101, 632–663.

Cohen, A. and E. Solan (2013): "Bandit Problems with Lévy Payoff Processes," *Mathematics of Operations Research*, 38, 92–107.

Keller, G. and S. Rady (2015): "Breakdowns," *Theoretical Economics*, 10, Behavior, 124, 43–61.

Keller, G., S. Rady and M. Cripps (2005): "Strategic Experimentation with Exponential Bandits," *Econometrica*, 73, 39–68.

Rosenberg, D., E. Solan and N. Vieille (2007): "Social Learning in One-Arm Bandit Problems," *Econometrica*, 75, 1591–1611.

I Kremer, Y Mansour, M Perry, Implementing the wisdom of the crowd, *J Political Economy*, volume 122, issue 5, p. 988 - 1012

Session planning :

- presentation of the sessions, connection with the resources

The course will follow the lecture notes. Speed will be adjusted to the overall level.

Distance learning :

Distance learning can be provided when necessary by implementing, for example:

- Interactive virtual classrooms
- Recorded lectures (videos)
- MCQ tests and other online exercises / assignments
- Remote (online) tutorials (classes)
- Chatrooms

If necessary, zoom sessions will be scheduled.