

Markov Chains and applications CM

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| Course title - Intitulé du cours | Markov Chains and applications CM |
| Level / Semester - Niveau /semestre | M1 / S1 |
| School - Composante | Ecole d'Economie de Toulouse |
| Teacher - Enseignant responsable | Jean-Paul IBRAHIM |
| Other teacher(s) - Autre(s) enseignant(s) | |
| Lecture Hours - Volume Horaire CM | 15 |
| TA Hours - Volume horaire TD | 0 |
| TP Hours - Volume horaire TP | 0 |
| Course Language - Langue du cours | Anglais |
| TA and/or TP Language - Langue des TD et/ou TP | |

Teaching staff contacts - Coordonnées de l'équipe pédagogique :

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Office : MC002 If you have questions, you may drop by my office at any time but it is better to make an appointment before. You can also send me e-mails.

Course's Objectives - Objectifs du cours :

This course is an introduction to the Markov chains on a discrete state space. At the end of the course, students must be able to :

- Understand the notion of a random process.
- Give the definition of a Markov chain on a discrete state space .
- Recognize any experiment or any real-life situation that can be modeled using Markov chains.
- Give the transition matrix of a given Markov chain.
- Recognize homogenous Markov chains.
- Deal with closed and open communicating classes and then with irreducibility
- Deal with transient and recurrent states.
- Determine, when it exists, an invariant distribution.
- Write the system that allows to compute the probability to hit a state j starting from state i .
- Write the system that allows to compute the expected time to hit a state j starting from state i .
- Understand the link between the long-run proportion of time spent in a given state, the expected return time to this state and the invariant distribution.
- Understand the definition of an aperiodic Markov chain and the convergence to equilibrium.
- Applications : Gambler's ruin, life insurance, Penney's Game.

Prerequisites - Pré requis :

Probability basis : Sample space (finite or countably infinite), conditional probability, random variables, convergence in distribution. Linear algebra: basic operations on matrices, diagonalization.

Grading system - Modalités d'évaluation :

One final exam.

Bibliography/references - Bibliographie/références :

Please check the moodle workspace for more information about references.