

MATH-463

Mathematical modelling of behavior

Bierlaire Michel

Cursus	Sem.	Type
Civil & Environmental Engineering		Opt.
Civil Engineering	MA1, MA3	Opt.
Civil engineering minor	H	Opt.
Computational science and Engineering	MA1, MA3	Opt.
Computational science and engineering minor	H	Opt.
Financial engineering	MA1, MA3	Opt.
Ing.-math	MA1, MA3	Opt.
Mathématicien	MA1, MA3	Opt.
Minor in statistics	H	Opt.
Statistics	MA1, MA3	Opt.

Language of teaching	English
Credits	5
Session	Winter
Semester	Fall
Exam	Written
Workload	150h
Weeks	14
Hours	4 weekly
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

Discrete choice models allow for the analysis and prediction of individuals' choice behavior. The objective of the course is to introduce both methodological and applied aspects, in the field of marketing, transportation, and finance.

Content

1. Introduction and examples
2. Choice theory
3. Binary choice
4. Multinomial choice
5. Specification testing
6. Prediction
7. Nested Logit model
8. Multivariate extreme Value models
9. Sampling
10. Mixed models.
11. Choice models with latent variables.
12. Discrete choice and machine learning

Learning Prerequisites**Required courses**

The course assumes knowledge of basic probability and statistics (random variables, linear regression)

Learning Outcomes

By the end of the course, the student must be able to:

- Model discrete choice

Transversal skills

- Use a work methodology appropriate to the task.
- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Use both general and domain specific IT resources and tools

Teaching methods

The course is a combination of ex-cathedra lectures and practical sessions. The practical sessions consist in exercises and laboratories. They are organized every week during the semester. The students will estimate the parameters of behavioral models based on real data.

Expected student activities

Every week, the students are supposed to

1. read the appropriate material, according to the schedule (the material for a given week is supposed to be read **before** the lecture of that week);
2. work on the assignments for the laboratories.

Assessment methods

A graded project must be submitted during the semester.

A written exam is held during the official examination session.

Resources

Bibliography

Ben-Akiva and Lerman (1985) Discrete Choice Analysis, MIT Press. Train (2003) Discrete Choice Methods with Simulation, Cambridge University Press.

Ressources en bibliothèque

- [Discrete Choice Analysis / Ben-Akiva](#)
- [Discrete Choice Methods with Simulation / Train](#)

Websites

- <https://courses.edx.org/courses/course-v1:EPFLx+DiscreteChoiceX+3T2017/course/>

Moodle Link

- <https://go.epfl.ch/MATH-463>