

URB-404

Computational methods in urban studies

Gumy Alexis, Rames Clément Luc

Cursus	Sem.	Type
Systèmes urbains	MA1	Opt.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	During the semester
Workload	90h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Project	1 weekly
Number of positions	

Summary

CMUS will focus on acquiring insights into, engaging with, and modeling the processes of spatial transformation in contemporary societies. It will integrate statistical techniques and critical urban theory in order to promote socially and environmentally fair policies against the climate crisis.

Content

The formation, deformation, and transformation of inhabited urban and rural places are the result of a complex set of flows, including people, goods, capital, and information. The (im)mobility of individuals, as well as the transportation systems supporting or impeding them, have become one of the defining features of modern societies, both in terms of their functioning and dysfunctions. Therefore, understanding and unraveling the ways in which people move in space provides crucial insights into the motivations and consequences of **(un)sustainable urban planning practices**. This course will examine how the sociological quantification of mobility infrastructures and patterns can facilitate the understanding of both social and environmental fairness in practice.

The course will build on existing and ongoing research at the Urban Sociology Laboratory and elsewhere to familiarize students with interdisciplinary data collection processes (web scraping, automatic speech recognition, survey design, etc.) and advanced statistical modeling techniques (geometric data analysis, social network analysis, latent variables models, GPS data analysis, etc.). The course will address a number of topics related to sustainable urban systems, including the carbon footprint associated with home and work locations, the future of automobility in urban environments, the (un)necessity of large-scale transportation infrastructures, the impact of social acceleration and subsequent calls for deceleration, and low-carbon scenarios within urban policies. The course will adopt the perspective of **reflexive quantification**, whereby empirical examples will be informed by existing theory drawn from disciplines such as urban sociology, critical geography, and science and technology studies (STS). This course will facilitate students' capacity for reflexive thinking in relation to their future professional activities in **urban planning**. All materials presented in class will be coded in R language and made accessible to students for reproduction.

During the course of the semester, students will be required to engage in a group exercise, which will entail: 1) the application of sociological principles to formulate a problem related to urban sustainability; 2) the identification of the most appropriate methodological tools and data (quantitative, qualitative and/or geospatial) to address this problem; 3) the presentation of empirical results in the context of the existing literature.

Upon completion of the course, students will be expected to demonstrate both an understanding of **advanced quantification procedures** and a **critical engagement with sustainable urban planning theories**.

Keywords

- Computational social science
- Urban studies, planning, and sociology
- Transportation infrastructures
- Mobility practices and behavior
- Quantification processes and data collection techniques

- Social and spatial inequalities

Learning Prerequisites

Recommended courses

A fundamental comprehension of coding principles (R) is recommended, although all the materials related to coding will be made available to students for reproduction.

Learning Outcomes

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

- Derive concepts from urban studies to describe and analyze contemporary cities and peripheries.
- Apply advanced statistical techniques to the field of urban studies.
- Quantify and model sociological processes and mechanisms that underlie urban mobility and its impact on urban systems.
- Assemble empirical evidence to support sustainable urban planning.
- Estimate social and spatial inequalities in order to reduce their negative impact in urban policies.

Transversal skills

- Set objectives and design an action plan to reach those objectives.
- Use a work methodology appropriate to the task.
- Take account of the social and human dimensions of the engineering profession.
- Take responsibility for environmental impacts of her/ his actions and decisions.
- Demonstrate the capacity for critical thinking
- Access and evaluate appropriate sources of information.
- Collect data.
- Write a literature review which assesses the state of the art.

Teaching methods

The course will comprise lectures presenting significant theoretical elements and concepts related to urban and/or mobility studies, as well as the manner in which statistical techniques can incorporate such theories and concepts to yield empirical results. This will be illustrated through the use of open-access and reproducible codes, which will be made available to students.

During the course of the semester, students will have the opportunity to work in groups to advance their exercise under the guidance of the teaching team. A designated period will be devoted to the presentation and discussion of each group's research question, methodological design and empirical results in the context of the existing literature.

Expected student activities

Over the course of the semester, students will engage in a group project comprising three distinct phases: formulation of the research question, development of the methodological design, and presentation of the empirical results. Each group will be required to present their work twice during the semester in order to receive feedback and to submit a scientific report, including a literature review, a contribution to the state of the art and operational guidelines, by the end of the semester.

The students are free to select their research question, determine whether they wish to gather new data or utilize existing data, and choose the computation techniques they will employ. A list of recommended literature, in the form of scientific papers, will be made available on the Moodle platform.

Assessment methods

The evaluation will be based on the group exercise completed throughout the semester, with the presentations

accounting for 60% (30% each) of the total grade (individual assessment based on the quality of restitution of concepts and methods learned in class) and the final report for the remaining 40% (collective assessment based on the quality of the structure and demonstration related to the research question).

Supervision

Office hours	No
Assistant.e.s	No
Forum	No
Others	The schedule includes "atelier" sessions overseen by the teaching team, where students will have the opportunity to advance their project and receive feedback.

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

Indicative bibliography - subject to updates

- Banister D. (2018), *Inequality in Transport*, Alexandrine Press.
- Brenner N. & Schmid C. (2015), *Towards a new epistemology of the urban?*, City 19 (2-3).
- Castells M. (2010), *The Rise of the Network Society*, Wiley-Blackwell.
- Desrosières A. (2014), *Prouver et gouverner : une analyse politique des statistiques publiques*, La Découverte.
- Forgarty B. (2023), *Quantitative Social Science Data with R: An Introduction*, SAGE.
- Illich I. (1974), *Energy and Equity*, Calder & Boyard.
- Ohnmacht T. et al. (2016), *Mobilities and Inequality*, Routledge.
- Rosa H. (2013), *Social acceleration: a new theory of modernity*, Columbia University Press.
- Urry J. (2000), *Sociology beyond societies: mobilities for the twenty-first century*, Routledge.
- Wacquant L. (2022), *Bourdieu in the City: Challenging Urban Theory*, Wiley.

Ressources en bibliothèque

- [Find the references at the Library](#)

Moodle Link

- <https://go.epfl.ch/URB-404>