

Causal Inference for Time Series Analysis

Organizer(s) Raphaël Liégeois

2 ECTS

Summary This course will provide an introduction into the theoretical background and main causal inference methods for time series data. The students will gain a critical understanding of the different approaches, enabling selection of the most adequate method and proper interpretation of the corresponding results.

Course level **Introductory**
Basic notions of linear algebra are required: matrices, (auto)correlation, regression.

Content of course sessions **Theoretical sessions**
Session 1: The elusive notion of causality
Session 2: Specificities of time series data
Session 3: From causal inference to causal networks
Session 4: The linear case - Granger causality and related methods
Session 5: Towards nonlinear causal inference
Session 6: Advanced methods
Session 7: Interpretation of causal links – focus on neuroimaging data

Hands-on sessions
Session 1: Identifying causal networks
Session 2: Granger causality - evaluation and interpretation
Session 3: Advanced methods

Course materials

- Go to "<https://moodle2.unil.ch>"
- Log in with your institutional address (unil, chuv, epfl)
- Click on "[Faculté de Biologie et de Médecine](#)" > "[Ecole doctorale / doctoral school](#)" > "[Lemanic Neuroscience Doctoral School](#)"
- Course materials and the connection link for remote participation (if finally needed) will be stored under the course name "*Causal Inference for Time Series Analysis*"

References

- J. Pearl. Causality: Models, reasoning and Inference. 2nd Edition, Cambridge University Press (2009).
- J. Peters, D. Janzing & B. Schölkopf. Elements of Causal Inference. The MIT Press (2017).

Location The course will take place in the "Atelier des Saveurs", [Campus Biotech Geneva](#). Possibility to attend remotely, but in-person attendance in Geneva is strongly preferred.

- Course dates** Classes will take place on 4 successive Wednesdays: Nov. 17, Nov. 24, Dec. 1 & Dec. 8. The schedule is 8h30-12h30 and 14h-17h.
Final project presentations will take place on Wed. 15/12.
- Evaluation** Evaluation is based on a project presentation. The project consists in applying methods seen in the course to a dataset that will be provided. Students are also welcome to work on their own dataset, upon approval by the organizer.
- Registration** The course is limited to 20 participants. **Register before October 29** by writing a mail to indsourses@gmail.com (with your supervisor in copy) and stating the course title as subject.