

Job: Postdoc (12 months) in causality @ Laboratoire d'Informatique de Grenoble

Project: Causal effect estimation in time series

Keywords: causal reasoning, estimation, time series

We invite applications for a 12 month post-doc position at the Laboratoire d'informatique de Grenoble (LIG, Université Grenoble Alpes).

Scientific context:

Causality plays a central role in science and has been the subject of many debates among philosophers, biologists, mathematicians and physicists, to name but a few. The recent decades have seen the development, from philosophers, mathematicians, and computer scientists, of different models and methods to infer causal relations from data and to reason on the basis of these relations. If the first studies were dedicated to non temporal data, more and more studies now focus on time series. Indeed, time series arise as soon as observations, from sensors or experiments, for example, are collected over time.

Despite the importance of time series, very few works (apart from [6]) have studied methods to estimate the causal effect of interventions. This project will focus on this through the steps described below.

Main tasks:

- Literature review on the estimation of causal effects [1,2] as well as treatment effects in time series [3,4,5].
- Design of an estimator for back-door probabilities.
- Generalization to other identification probabilities (as in the ID algorithm).
- Theoretical study of the corresponding estimator.

The scientific orientations of the post-doc may vary according to the candidate's background and interests.

Requirements:

- PhD in machine learning or statistics.
- Programming skills: proficiency in R or Python.
- Proficiency in either French or English.

Work environment:

- Location: Laboratoire d'Informatique de Grenoble (LIG), on Université Grenoble Alpes campus.
 - Cosupervision by Charles K. Assaad, Émilie Devijver, Eric Gaussier, Gregor Gössler, Anouar Meynaoui
 - Gross salary: minimum 2400 euros per month (depends on experience).
- Starting date: September 2022 (flexible).

To apply, please send a cv and a cover letter to contacts below as soon as possible (applications are open until the position is filled).

Contacts (for applications or any questions about the position/project):

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[1] *Estimating causal effects using weighting-based estimators*, Jung, Yonghan and Tian, Jin and Bareinboim, Elias, Proceedings of the AAAI Conference on Artificial Intelligence, 2020

[2] *Learning causal effects via weighted empirical risk minimization*, Jung, Yonghan and Tian, Jin and Bareinboim, Elias, Advances in neural information processing systems, 2020

[3] *Time series deconfounder: Estimating treatment effects over time in the presence of hidden confounders*, Bica, Ioana and Alaa, Ahmed and Van Der Schaar, Mihaela, International Conference on Machine Learning, 2020

[4] *Deconfounding Temporal Autoencoder: estimating treatment effects over time using noisy proxies*, Kuzmanovic, Milan and Hatt, Tobias and Feuerriegel, Stefan, Machine Learning for Health, 2021

[5] *Dynamic covariate balancing: estimating treatment effects over time*, Viviano, Davide and Bradic, Jelena, arXiv preprint arXiv:2103.01280

[6] *Estimating causal effects from time series* Shu Li, PhD thesis at ETH Zurich, 2018