Internship proposal
Optimal adjustability of causal effects

Context: The Pierre Louis Institute of Epidemiology and Public Health (IPLESP), co-accredited by Inserm and Sorbonne University, brings together research strengths in epidemiology and public health within Sorbonne University. IPLESP's main objective is to produce original knowledge on pressing public health issues and related intervention effectiveness, focusing on emerging infectious diseases, chronic diseases, environmental health, and mental health. To tackle these challenges, causal inference [Pearl, 2000, Hernan and Robins, 2023] emerges as an indispensable tool. Therefore, at IPLESP, we are establishing a new team dedicated to developing advanced methodologies rooted in causal inference. One objective of this team is to address the problem of optimality of adjustment sets.

A standard question in causal inference and in epidemiology is to estimate a causal effect between two variables given a causal graphical model Pearl [2009], and with the possible presence of hidden confounding. Multiple graphical criteria such as the backdoor criterion Pearl [1995], the frontdoor criterion Pearl [1995] or the G-computation formula Robins [1986] allow the identification of valid adjustments sets. While an estimator based on any of these sets is unbiased, the estimation variance may differ across various sets. Consequently, we are interested in pinpointing optimal adjustment sets *ie,* adjustment sets which are unbiased and minimize the estimation variance [Henckel et al., 2022, Witte et al., 2020, Smucler et al., 2022].

Proposal: This internship primarily focuses on exploring the state of the art and the feasibility of identifying an optimal adjustment set for estimating the total or direct effect from a graphical criterion. The intern will study for which graphical criterion and in which settings the problem of optimal adjustability is solved. Subsequently, the intern will draw inspiration from the existing results and proofs to explore the feasibility of optimal adjustability in new cases. Furthermore, the intern is expected to apply this new finding to estimate causal effects utilizing epidemiological data.

Candidate: Highly motivated candidate with an M2 degree and strong background in probability, machine learning, and causal inference, along with a keen interest in epidemiology. Proficiency in programming is also required.

Location: The intern will work at IPLESP (`https://iplesp.fr/`), located in Paris. They will be supervised by Simon Ferreira (PhD student) and Charles Assaad.

Dates: Starting date: To be discussed, early 2025, for a duration of 5-6 months.

Contact: To apply, please send a CV and a cover letter to Simon Ferreira simon.ferreira@iplesp.upmc.fr

References

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