Ph.D/postdoc opportunities at Imperial College/HEC Montreal to study inverse problems with transportation applications.

In many areas of science and engineering inverse problems arise. These problems consider a set of field observations and aim to derive the causal factors that generated the data. Inverse problems are difficult to tackle because they are underdetermined, i.e., there is often a, possibly infinite, set of causal factors that are consistent with the field data. These solutions are then used to tackle control problems. This project aims to characterize the set of solutions and to quantify their impact on the solution set of the control problems. This ultimately enables the design of robust causal inference and robust counterfactual analysis techniques.

This project develops compute-efficient optimization techniques to tackle these problems. The project can cover research areas such as bilevel optimization, fixed-point problems, game theory, traffic assignment, travel demand estimation.

The project is motivated by high-dimensional inverse problems that arise in the field of urban mobility and transportation. The inverse problems consider traffic field data that describes congestion patterns and aim to derive the travel demand that generated these congestion patterns. Control problems include congestion pricing and traffic management problems.

Research Team.

The researcher will be co-advised by Prof. Dario Paccagnan (Department of Computing, Imperial College London) and Prof. Carolina Osorio (Scale AI Research Chair, Department of Decision Sciences, HEC Montreal; Google Research). Academic affiliations can be at either Imperial College or at HEC Montreal with potential affiliations to various research centers (e.g., CIRRELT, GERAD) and numerous career opportunities within the Scale AI and the IVADO ecosystems. Details on the PhD program at Imperial College can be found at link. Similarly, for HEC Montréal, see link.

Application process.

A strong background in mathematics, operations research, optimization, game theory, control theory, computer science, statistics, or other related disciplines is required. A successful candidate should have proficiency in programming and an interest in transportation applications. Applicants are invited to submit: (i) a full CV, (ii) a copy of all their university-level transcripts, (iii) a short statement (at most 3 pages) describing why they want to work on this topic, what subtopics they would like to focus on (e.g., describe the first few papers they'd like to work on) and why they think they are qualified to do so; (iv) the names and contact details of three references (including graduate supervisors). If desired, applicants can include a copy of one of their scientific publications. All documents should be compiled into a single pdf file and send to: univ.vacancies@gmail.com with the subject "Application Inverse Problems Research".