PhD Post in Modelling and Optimisation of Urban Evacuation Procedures

Supervisor: Dr Jose Escribano, Department of Civil and Environmental Engineering

Background

Evacuation constitutes the most fundamental strategy in the response to a humanitarian disaster. Key among the factors impeding evacuation is the unique traffic patterns that arise due to the sudden surge in travel demand, which contravene nominal traveller behaviour. Even when extensive warning is given, the mass mobilisation imposes excessive strains on the transport network due to the small-time window, the lack of resources, and the number of evacuees involved. As a result, network congestion is among the most significant challenges encountered during emergency evacuations and is aggravated by spillbacks, shockwaves, and gridlocks.

Previous research by Escribano on this topic has developed agent-based simulation models and optimisation frameworks for urban evacuations, incorporating new technologies for improved evacuation management. We are now seeking to improve the current capabilities to consider multi-modal evacuation and infrastructure disruption.

Project description

This PhD project will focus on improving the capability of stochastic optimisation methodology to include new technologies in the evacuation system and multiple modes of travel (incorporating evacuee decisions). This will include application of statistics and scientific programming in our existing Python code. The improved methodology and code will be applied to analyse the evacuation procedures of major cities vulnerable to natural disasters. As such, this will require the following objectives to be met:

1. Development of datasets on urban transport systems and demographics.
2. Formulation of stochastic mathematical problems, design of optimisation models, and improvement of our Python code.
3. Creation of solution method that allows the creation of a palette of solutions based on network properties within reasonable runtime, enabling the tool to be used for planning and operational purposes.

Academic requirements and experience

- A First Class Degree (or International equivalent), in civil engineering, or closely-related disciplines.
- A Masters level degree qualification.
- Programming experience in Python.
- English language requirements (e.g., IELTS 6.5 overall, minimum 6.0 in all elements).

How to apply

Applicants wishing to be considered for this opportunity should send the following application documents to Dr Jose Escribano (j.escribano@imperial.ac.uk):

1. An up-to-date CV for the applicant including degree result and, if possible, class ranking.
2. A 1-2 page personal statement. The statement should discuss your motivation for pursuing a PhD degree and how this fits in with your desired progression or career aspirations.

3. English testing results.
4. Contact details of two academic referees

Review of applications will begin immediately and continue until the position is filled. Application via the Imperial College Registry is not necessary at this stage.

About the funding

The studentship will provide funding for up to 3.5 years, including Home tuition fees (3 years) and a tax-free stipend at the standard UKRI London rate, £20,062 for the 2023/24 academic year, for 3.5 years. Full funding is available to Home students.

Other scholarships can be found on the university website:

www.imperial.ac.uk/students/fees-and-funding/postgraduate-funding/scholarships/