

# Hussein Mahfouz

SENIOR RESEARCH ASSOCIATE - URBAN ANALYTICS

Cairo, Egypt

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## Education

### University of Leeds - Institute for Transport Studies (ITS)

Leeds, UK

PHD (IN PROGRESS) IN TRANSPORT DATA SCIENCE AND SIMULATION

Oct. 2022 - Oct. 2025 (Expected)

- 2nd year PhD student studying transport and energy demand (funded by the Centre for Research into Energy Demand Solutions (CREDS))
- Research is focused on bus network design and the integration of demand-responsive transport (DRT) with traditional bus networks
- Research methods include: Optimization (metaheuristics), Agent-based modelling, Network analysis, Exploratory data analysis (EDA)
- Research visit at the Alan Turing Institute: Building an Activity-based model (Github repo)

### University College London - The Bartlett Centre for Advanced Spatial Analysis (CASA)

London, UK

MSC (DISTINCTION) IN SMART CITIES AND URBAN ANALYTICS

Sep. 2019 - Aug. 2020

- Studied quantitative geography, network analysis, statistics and urban systems theory.
- Dissertation: Prioritizing Road Segments for Investment in Segregated Cycling Infrastructure - A Methodological Framework [link].
  - Received the RGS-IBG GIScience Dissertation Prize [link].
- Selected Projects:
  - Solving the Dead Mileage Problem for the Bus Fleet of the Cairo Transport Authority (CTA) using Linear Optimization [link]
  - Transport Accessibility Analysis in Greater Cairo - The role of informal transport [link]
  - Transport profiles in England and Wales (Cluster Analysis, Classification, and Web Visualization) [link]

### The American University in Cairo

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BSC (HIGH HONORS) IN CONSTRUCTION ENGINEERING

Sep. 2011 - Jun. 2016

- Focused on Structural Engineering and Construction Project Management.

## Work Experience

### Institute for Transport Studies, University of Leeds

Leeds, UK

RESEARCHER

Oct. '22 - Now

- PhD research on simulating integration of DRT with public transport.
- Working on CRUSE tool for Transport Infrastructure Ireland (TII) [link]

### Transport for Cairo

Cairo, Egypt

FREELANCE CONSULTANT

May. '23 - Now

- Worked on *Electric Bus (e-bus) Demonstration Project Detailed Planning and Design Study for Cairo Transport Authority (CTA)*.
  - Developed a Direct Demand Model (DDM) to predict future ridership on routes chosen for electrification in order to inform a scale-up strategy

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SENIOR RESEARCH ASSOCIATE

Jan. '22 - Feb. '23

- Technical Lead for a project funded by the New Urban Mobility Alliance (NUMO) *Using New Urban Mobility Data in Accessibility Analysis*.
  - Studied the impact of Micromobility on Accessibility to opportunities, focusing on travel time improvements, micromobility supply constraints, and equity of access to opportunities
  - Responsible for literature review, methodology, data analysis, and project management
  - Data analysis scripts: augmenting OSM PBF files with realistic speeds from UBER/Mapbox data; Travel time matrix for different mode combinations (including micromobility) using r5r (calculated by running code in a docker image on a Digital Ocean droplet); cumulative accessibility calculations; equity of spatial distribution of accessibility

## RESEARCH ASSOCIATE

Sep. '18 - Aug. '19 / Sep. '20 - Dec. '21

- Worked on the World Bank funded *Greater Cairo Region Mobility Assessment and Public Transport Improvement Study (MAPTIS)*.
  - Drafted a sampling strategy for primary data collection
  - Cleaned, validated, and prepared datasets for input into a four-step model
  - Data analysis scripts: travel time estimations (from GPS data) and GTFS feed creation; employment accessibility analysis; road segment passenger flow analysis; spatiotemporal boarding and alighting patterns
- Worked on the *Ghana Urban Mobility and Accessibility Project (GUMAP)* component on *Short term technical assistance for the completion of databases and maps of public transport routes and passenger flows in GAMA*.
  - Managed the field research operation
  - Conducted knowledge transfer workshops on data collection and analysis for the local departments of transport
  - Analysed the public transport network of Greater Accra, and co-authored project reports
- Worked on creating a spatial model of employment of Casablanca, Morocco for the World Bank
  - Proposed and implemented a methodology to create spatially disaggregated employment datasets in a data-poor context, accounting for informal employment
  - Documented the process in reproducible markdown files with embedded code
- Worked on the World Bank funded study: *Multimodal Transport Strategy for the Greater Cairo Region*.
  - In charge of fieldwork for mapping entire formal and informal public transport networks of the Greater Cairo Region
  - Developed a methodology to quantify and compare the impact of proposed bus corridors on regional accessibility
- Research and Development.
  - Developing and maintaining software to convert transit GIS data from primary data collection to GTFS feeds that are used for trip planning and analysis tasks (feeds contain both formal and informal modes of public transport)
  - Modelling road segment-level travel speeds for different travel modes using gps trackpoints from primary data collection exercises
  - Creating spatially disaggregated models of employment for cities without such data

**Access to Knowledge for Development Center**

Cairo, Egypt

## RESEARCH ASSISTANT

Mar. '18 - Sep. '18

- Worked on gaining insights into transportation sector through data-driven research
- Carried out research on informal transportation on Cairo's Ring Road. The research focused on how informal transportation fills demand gaps, and the role of unofficial access points in accessibility to transport
- Carried out research on the impact of ride-sharing applications on the livelihoods and safety of women in Egypt

**UN-Habitat**

Cairo, Egypt

## INTERN

Jul. '16 - Dec. '16

- Worked on the mobility program which supported the government in shifting towards an integrated transportation system. Proposed solutions included a BRT system, bike infrastructure and improved passenger information
- Worked on a land readjustment project which provided inclusive solutions to the issue of urban sprawl on agricultural land

## Technical Skills

**Programming Languages (selected packages):** R (tidyverse, data.table, sf, terra, sfnetworks, dodgr, r5r, gtfsrouter, ggplot, tmap), Python (pandas, numpy, scipy, scikit-learn, geopandas, networkx, osmnx), SQL

**Markup Languages:** CSS, HTML, LaTeX, RMarkdown

**Spatial Analysis and Cartography:** R, QGIS

**Databases:** PostgreSQL/PostGIS, MySQL, dbplyr

**Version Control:** Git

**Transport Related Data Standards:** GTFS, GBFS

## Publications

**All Possible Commutes**

Report

## NEW URBAN MOBILITY ALLIANCE

05, 2023

- **Mahfouz, H.**, Kalila, A., Kelleny, B., Melegy, A. (2023). "All Possible Commutes: How Micromobility and Realistic Car Travel Times Impact Accessibility Analyses" NUMO. <https://www.numo.global/resources/all-possible-commutes-accessibility-analysis-micromobility-paper>

**A Road Segment Prioritization Approach for Cycling Infrastructure**

Preprint

## ARXIV

04, 2021

- **Mahfouz, H.**, Arcaute, E., Lovelace, R. (2021). "A Road Segment Prioritization Approach for Cycling Infrastructure. arXiv. <https://arxiv.org/abs/2105.03712>"

**Multimodal network planning, identification of high capacity bus corridor and park and ride facilities in the Greater Cairo Region**

Report

## WORLD BANK REPORT

08, 2019

- Hegazy, M., Kalila, A., **Mahfouz, H.** (2019). "Multimodal Network Planning, Identification of High Capacity Bus Corridor and Park and Ride Facilities." World Bank Group.

## Awards

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- 2023 **Turing Enrichment Scheme** - *Alan Turing Institute*  
The Alan Turing Institute is the UK's national institute for data science and AI. Information about the scheme is available [here](#).
- 2021 **rstudio::global 2021 Diversity Scholarship** - *RStudio*  
RStudio is a company that develops free an open source tools for the R programming language. Each years they provide a number of scholarships where recipients attend workshops held by their lead developers.
- 2020 **RGS-IBG GIScience Dissertation Award** - *Royal Geographic Society*  
The Royal Geographical Society (with the Institute of British Geographers) - RGS-IBG - GIScience Research Group is a group of academics and practitioners working on Geographic Data Science. Each year they award a prize for the best postgraduate dissertation in geographic information science in the UK and Ireland.
- 2019 **Chevening Scholarship** - *UK Foreign & Commonwealth Office*  
Chevening Scholarships are the UK government's global scholarship programme. Scholarships are awarded to outstanding candidates to do postgraduate degrees in the UK.

## Languages

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**Arabic:** Native.

**English:** Proficient User.

**French:** Basic User.