Mohamed Eldafrawi

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ABOUT ME

My research interests lie at the intersection of transportation engineering, optimization, and artificial intelligence, with a particular focus on the development and implementation of innovative methodologies for solving complex urban transportation problems. One key area I explore is using surrogate models to efficiently predict and analyze travelers' behavior, which helps design more effective transportation systems and policies.

EDUCATION AND TRAINING

Ph.D., Transport and Infrastructure
Sapienza University of Rome [11/2020 – Current]

City: Rome
Country: Italy
Thesis: Thesis Topic: Integrating Graph Neural Networks and Advanced Optimization Approaches for Enhanced Traffic Assignment Problem Resolution in Urban Transportation Systems.

Master degree in Transportation System Engineering
Università degli Studi di Roma "La Sapienza" [09/2017 – 01/2020]

City: Roma
Country: Italy

- I graduated with grade 110/110 with honor.
- **Thesis topic**: Development of a new methodology for Dynamic Origin Destination Matrix Estimation for congested urban networks.

Postgraduate Diploma , Project Management
The American University in Cairo [08/2016 – 08/2017]

• B.Sc. in Civil Engineering
Mansoura University, Egypt. [20/09/2011 – 30/06/2016]

- Graduation Project: Highway and Airport Engineering.
- Graduation Project Grade: (Excellent).
- Graduation grade :very good

WORK EXPERIENCE

Graduate Research Assistant
Sapienza University of Rome [11/2020 – Current]

City: Rome
Country: Italy

- Developing new methodologies for solving and calibrating traffic assignment models using advanced optimization and deep learning techniques.
- Advisor: Guido Gentile.

Visiting Ph.D. Student
Technical University of Denmark [03/2022 – 02/2023]

City: Copenhagen
Country: Denmark

- Working on the development and implementation of advanced deep learning models, specifically utilizing Graph Neural Networks, for the purpose of optimizing traffic assignment and enhancing transportation systems' efficiency in a contemporary urban context.
- Advisor: Francisco C. Pereira.

Research and Development Engineer
PTV Group [01/03/2020 – 11/2020]

City: Rome
Country: Italy

Objective: Developing new features as well as improving the performance of the PTV **Hyperpath** software, by means of Visual Basic.Net and Python programming languages.
- Developed new features and algorithms for **directed shortest path using precomputed cluster distances for intermodal search applicable for the software.** .
- Refactored the current modules to improve the performance and reliability of the software.
- Developed and implemented new unit tests to have better evaluation of performance.
- Troubleshooting and triage issues reported by clients.

Transport modeller intern
PTV SISTeMA [03/2019 – 02/2020]

City: rome
Country: Italy

- Model calibration for PTV Optima for Dubai ITS2020.
- Development of a procedure for dynamic OD matrix estimation.
- project charge_ Traffic studies between adriatic ports.
- Traffic data analysis for demand calibration for PTV Optima Taichung (Taiwan).
- providing documents and reports of exploited methodologies and reports for projects.
- Model calibration support for PTV Optima for Sydney.
- Model network update by map matching data from INRIX for PTV Optima for DiRIF network.

Traffic Engineer Intern
Agenzia Roma servizi per la Mobilita' Srl [09/2018 – 12/2018]

City: Rome
Country: Italy

- Traffic modelling and simulations using VISSIM .
- Traffic planning and public transport planning .
- Bus priority and vehicle-actuated signal programming.
- Performed traffic signal timing analyses, network optimizations and signal warrant studies
- Conducted traffic studies and design LOS calculations, intersection analysis & freeway simulation.
- Recommended traffic operational improvements such as channelization, signalization and signage.

Highway Engineer
Orascom Road construction [02/2017 – 09/2017]

City: Cairo
Country: Egypt

- Monitored projects during construction to ensure projects conform to design specifications.
- Assisted in the preparation with planning construction procedures, work schedules, and material needs.
- Surveyed jobs sites, analyzed material submittals, monitored job costs.

- Design/calculations of several other elements for highway detailed design projects including: vertical and horizontal alignments, superelevation, maintenance of traffic, cross sections, erosion control and landscaping.
- Prepared cost estimates for new design projects.

Civil engineer
Engineering Company for Integrated Projects [08/2016 – 02/2017]

City: 6 october

Country: Egypt

- Inspect project sites to monitor progress and ensure design specifications as well as safety and sanitation standards are being met.
- Guide managerial and industrial personnel by providing technical advice regarding design, construction, structural repairs, and program modifications.
- Oversee all construction, maintenance, and operations activities on project sites.
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CONFERENCES AND SEMINARS

Transport Research Board (TRB) annual meeting 2023
[Washington, D. C., 08/01/2023]

One-Level Joint Formulation of the Travel Demand Estimation Problem Under User Equilibrium as a Non-Linear Equation System.

Mohamed Eldafrawi, Guido Gentile. Transportation Research Board Annual Meeting (TRB), 2023.

Reliability and Statistics in Transportation and Communication (RelStat-2022)
[Riga, Latvia, 19/10/2022]

A single-level formulation for travel demand estimation under stochastic user equilibrium.

Mohamed Eldafrawi, Guido Gentile. Reliability and Statistics in Transportation and Communication (RelStat), 2022

European Transport Conference 2020
[Milan, Italy, 10/09/2020]

Exploiting congestion information to improve the Dynamic OD matrix Estimation problem.

Mohamed Eldafrawi, Lorenzo Meschini, Guido Gentile. European Transport Conference (ETC), 2020.

PUBLICATIONS

A Single-Level Joint Formulation for Travel Demand Estimation under Stochastic User Equilibrium
[2023]

Effect of Spatio-Temporal Granularity on Demand Prediction for Deep Learning Models
[2023]

GRANTS AND RESEARCH FUNDING

Sapienza University Research Fund (2022)

- Awarded a grant of e 15,000 to support innovative research and advance academic pursuits.
- Funding source: Sapienza University of Rome.

HONOURS AND AWARDS

Honours and awards

I have been honored by the Minister of Transportation and Egyptian Engineers Syndicate as **The Best Highway and Airport Engineering Graduation Project 2016** among all the competing projects from all the participated universities in the annual competition held by the syndicate.

KEY SKILLS

Technical skills

- Software development.
- Transport planning.
- Transport modelling.
- Traffic management.
- Dynamic demand estimation.
- Track design (alignment, layout, plain line and switch and crossing, gauge clearance)
- Signal and train control design (scheme development, construction design)
- Highway design.
- Roundabout design.
- Junction and interchanges design.

Software SKILLS

- Experienced in Using PTV **Visum, vissim, Optima and Synchro**.
- Proficient in **Python, C#, MATLAB, VB.NET and PostgreSQL**.
- -QGIS.
- -Cube.
- -Docker/kubernetes.
- -Autodesk Autocad.
- -Autodesk Autocad Civil 3D.
- -Microsoft Office (Excel, Word, PowerPoint).
- -Adobe Illustrator.
- -Google Sketchup.

LANGUAGE SKILLS

Mother tongue(s): **Arabic**

Other language(s):

English

LISTENING C1 **READING** C1 **WRITING** C1

SPOKEN PRODUCTION C1 **SPOKEN INTERACTION** C1

Italian

LISTENING A2 **READING** A2 **WRITING** A2

SPOKEN PRODUCTION A2 **SPOKEN INTERACTION** A2

French

LISTENING A1 **READING** A1 **WRITING** A1

SPOKEN PRODUCTION A1 **SPOKEN INTERACTION** A1

Levels: A1 and A2: Basic user; B1 and B2: Independent user; C1 and C2: Proficient user