HUGUES BLACHE

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PhD Engineer and Researcher

SUMMARY AND OBJECTIVE

- **PhD engineer and researcher** with over **5 years of experience** in research and development across Europe, North America, and Australia.
- **Expert in applied sciences**, with a focus on **data analysis**, **machine learning**, **traffic modelling**, **planning**, and **simulation**.
- Proven ability to deliver immediate value to projects, with hands-on experience in **traffic impact** and **test & validation processes**.
- Seeking **opportunities in Australia** to apply my skills and contribute to innovative transportation solutions.

WORK EXPERIENCE

AI Developer (Personal Project)

France/Australia *2025 (3 months)*

- Developing a conversational agent using a Large Language Model (LLM) architecture and other deep-learning methods in collaboration with a close-knit team.
- Actively exploring ideas to apply AI and mathematical methods in practical scenarios within my field and beyond.

Traffic/Transport Engineer, Researcher and Analyst

French Ministry of Ecological Transition, France *2021/2024 (3 years)*

Supervised by Nour-Eddin El Faouzi and Pierre-Antoine Laharotte in the Licit-Eco7.

- Development of an innovative methodology for validating connected and automated vehicle systems, reducing testing time and enhancing efficiency.

Major Achievements

- Generated over 1 billion tests using ontology and assigned critical safety indices based on real drones data and traffic theory, analyzing over 100,000 trajectories and using fundamental diagrams.
- Extracted latent relationships in tests using embedding approaches to forecast criticality for over 400,000 new tests, leveraging machine learning (e.g., neural network, predictive AI, and analysis of generative AI).
- Selected representative traffic situation by modifying classic clustering approaches based on semantic and criticality terms. Proposed new guidelines to optimize time and criticality coverage of tests.
- Conducted an international survey of experts to develop a decision-support tool for differentiating between simulation and field tests (e.g., Analytical Hierarchy Process). Additionally, assessed the impact of intelligent transport systems using microscopic traffic modeling with the chosen test method.
- Standard considered: SAE J3016, ISO 26262, SOTIF (ISO/PAS 21448), ISO 15622, ISO 34503, PAS 1880:2020

University Tutor

Polytechnique Montreal and ENTPE, Canada and France *2020/2024 (4 years)*

Taught over 50 advanced-level students annually, imparting in-depth knowledge and practical skills across various academic disciplines:

- **Data Science**: Introduced students to various techniques used in data science, ranging from handling large datasets to machine learning (e.g., clustering, regression technique).
- **Intelligent Transport Systems**: Studied the impacts of C-ITS services in the traffic, using simulation (Sumo, Neovya) and conducting both microscopic and macroscopic analysis.
- **Traffic Theory and Engineering**: Taught fundamental traffic analysis concepts such as Fundamental Diagrams (FD) and Cumulative Vehicles Curve (CVC), and managed courses involving the use of traffic simulation tools (e.g., SUMO) and data collection analysis, including microscopic and macroscopic analysis.

Traffic/Transport Researcher and Analyst

Polytechnique Montreal in the department of CGM, Canada *2019/2021 (2 years)*

Supervised by Nicolas Saunier and Brunilde Sanso. Worked with Professor Sanso's team in partnership with Ericsson and funded by the Electrical Engineering Department.

- Developed a taxonomy of ITS applications and telecommunication tools, and built a large-scale and simple model of a metropolitan region for testing connected ITS applications.

Major Achievements

- Creation of a taxonomy for decision-making enabling the linkage between the performance of 20 telecommunication technologies and the needs of 60 intelligent transport applications for a good deployment.
- Development of an automated large-scale microscopic and mesoscopic traffic simulation model ($470km^2$) to evaluate the impacts of intelligent transport applications on transport infrastructure by simulating over 100,000 trajectories.

Traffic/Transport Research Intern

City College of New York, Department of Civil Engineering, USA *2019 (5 months)*

Supervised by Mahdieh Allahviranloo.

- Conducted research on graph theory applications in transportation, focusing on network subdivision and the competition between different modes of transport (e.g., taxi, metro, cycle) within Manhattan ($59km^2$).

Major Achievements

- Contributed to a study on an online platform for trading shares of automated vehicles, which was published in the Transportation Research Record.

Civil Engineering Intern

Spie Batignolles, France *2018 (1 month)*

- Full-time internship as an on-site road construction worker across 4 sites in the Perpignan area. Worked alongside a team to gain hands-on experience in pipeline installation and road construction.

LEADERSHIP EXPERIENCE

Volunteer Treasurer and Scouts Leader

Scouts and Guides of France, France *2013/2015 - 2022 (3 years)*

- Planned humanitarian projects in Madagascar and secured over 20,000€ in travel funding. Supported over 40 young people annually, fostering teamwork, encouraging autonomy, and inspiring initiative.

EDUCATION

Ph.D in Civil Engineering
ENTPE - School of Civil, Environmental and Urban Engineering *2021/2024 (3 years)*

Majoring in Traffic Engineering

Master of Science (research-based) in Civil Engineering
Polytechnique Montreal *2019/2021 (2 years)*

Majoring in Traffic Engineering

Master of Science (courses-based) in Civil, Environmental and Urban Engineering
ENTPE - School of Civil, Environmental and Urban Engineering *2017/2021 (4 years)*

Majoring in Traffic Engineering
Additional training in public policy analysis at *IEP Lyon* and Affordable housing in *ENTPE*

Ph.D Student Visitor
University of New South Wales in the rCITI laboratory, Australia *2024 (3 months)*

- This exchange allows me to enrich my thesis with new perspectives and gain a broader vision through various transportation and mobility projects in Australia.

KEY SKILLS

Programming Languages and Frameworks

- **Languages**: Python, R, SQL, Matlab, HTML, CSS, JavaScript
- **Libraries**: Pandas, Numpy, Scikit-learn, PyTorch, TensorFlow, Transformers, React
- **Frameworks**: PySpark, CUDA
- **Modelling & Simulation Tools**: SUMO, Aimsun, Neovya Hubsim, AutoCAD, SIDRA, Vissim
- **Development Tools**: VS Code, GitHub, Jupyter, Anaconda, Hugging Face, Google Collab
- **Data Visualization**: QGIS, Matplotlib, Plotly, Seaborn
- **Office Suites**: Microsoft Excel, LaTeX, Office, Google Docs Editors, OpenOffice

Languages

- **English**: Advanced
- **French**: Native

Teamwork Skills

- Effective communication and active listening
- Collaborative problem-solving and decision-making
- Ability to work well in diverse and multidisciplinary teams
- Conflict resolution and mediation skills
- Leadership and project management experience
- Adaptability and flexibility in dynamic environments

AWARDS

- Awarded Best Master's Thesis of 2021 in the Department of Civil, Geological, and Mining Engineering (CGM) at *Polytechnique Montréal, Canada*

MAIN RECENT PUBLICATION

- Blache, H., & Saunier, N. (2025). Is It Possible to Automatically Build a Large Scale Metropolitan Traffic Model? Evidence from a Study of Connected Transportation Applications in Montreal. Transportation Research Procedia, 82, 495-514.
- Blache, H., Laharotte, P. A., & El Faouzi, N. E. (2024). Toward a Criticality-Guided Sampling Strategy to Reduce Tests for Automated Driving Validation. Data Science for Transportation, 6(3), 26.
- Bhattacharyya, K., Laharotte, P. A., Fauchet, E., Blache, H., & El Faouzi, N. E. (2024). Enhancing Traffic Efficiency and Sustainability through Strategic Placement of Roadside Units and Variable Speed Limits in a Connected Vehicle Environment. Sustainability, 16(17), 7495.
- Other works are available on Google Scholar and some are in the process of being published and submitted.

REFERENCE

- Nour-Eddin El Faouzi, Professor at *Université Gustave Eiffel, France* and an Former Adjunct Professor with the *Queensland University of Technology, Australia*. E-mail: nour-eddin.elfaouzi@univ-eiffel.fr
- Pierre-Antoine Laharotte, Researcher at *University Gustave Eiffel, France*. E-mail: pierre-antoine.laharotte@univ-eiffel.fr
- Nicolas Saunier, Professor at *Polytechnique Montréal, Canada*. E-mail: nicolas.saunier@polymtl.ca