Umair Durrani, Ph.D.

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Curriculum Vitae
August 2022

Education

2022 **Ph.D. Civil Engineering** — University of Windsor
Windsor

2009 **B.Sc. Transportation Engineering** — University of Engineering and Technology
Lahore

Research Interests

- Applications of Machine Learning and Artificial Intelligence in Transportation Engineering
- Driver Behaviour
- Connected and Autonomous Vehicles
- Traffic Flow Modeling and Simulation
- Road Safety
- Spatiotemporal Analysis of Road Networks

Research Experience

2022 - Present **Research Associate** — University of Windsor
Windsor

- Developed computer programs to extract and combine data from various sources
- Supervised undergraduate and graduate students in the development of experimental studies
- Analyzed data and performed statistical modeling, resulting in completion of 3 articles and 2 conference presentations

2013 - 2022 **Research Assistant** — University of Windsor
Windsor

- Developed workflows for data extraction, import, analysis, mapping and reporting in R and Python, resulting in completion of 3 collaborative research projects with other graduate students and Ministry of Transportation, Ontario
- Designed and conducted driving simulator experiments to collect driving data in various scenarios
- Analyzed and visualized data, performed statistical modeling and machine learning, resulting in 3 peer-reviewed articles and 5 conference presentations

Research Projects

2020 - Present **Mitigating Distracted Driving based on Understanding of Drivers' Personality, Motivational, and Mobile Phone Dependency Characteristics. Road Safety Research Partnership Program (RSRPP), Ministry of Transportation of Ontario** — University of Windsor
Windsor

- Collaborated in the development of driving simulator scenarios to evaluate driver distraction
- Developed and deployed a dashboard application that worked with real-time driving simulator data to evaluate driver distraction due to music and navigation tasks
- Created computer programs to extract and analyze driving data and participant heart rate
- Created clusters of drivers with unsupervised machine learning techniques

2021 - 2022 **Classifying Drivers using Supervised and Unsupervised Machine Learning Techniques. In collaboration with University of South Florida**

- ➤ Developed clusters of drivers with similar behaviours based on self-reported, psychophysiological, and performance metrics within a simulated environment
- ➤ Applied machine learning models to predict moderate and conservative drivers

2018 - 2019 **Safety Impacts of a Variable Speed Limit System. Highway Infrastructure Innovation Funding Program (HIIFP), Ministry of Transportation of Ontario** University of Windsor Windsor

- ➤ Collaborated in the development of a new criterion to propose various sites for the deployment of the Variable Speed Limit System in Ontario
- ➤ Analyzed the weather patterns in Ontario to identify the locations with the most severe weather conditions
- ➤ Developed an interactive map application for the visualization of precipitation and proposed sites for the Variable Speed Limit System in Ontario

Reviewer

Reviewed articles for the following journals:

- ➤ Accident Analysis and Prevention
- ➤ Transportation Research Part D: Transport and Environment
- ➤ Transportation Research Record: Journal of the Transportation Research Board
- ➤ Transportation Letters: the International Journal of Transportation Research

Teaching Experience

2019 - Present **Data Analytics Instructor** St. Clair College Windsor

- ➤ Taught courses for the data analytics graduate certificate program at Zekelman School of Business and Information Technology
- ➤ Supervised capstone projects of graduate students that involved developing and fine-tuning machine learning models

Semester	Course(s)
Spring 2022	Capstone Project
Winter 2022	Machine Learning I, Capstone Project
Fall 2021	Intro. to Artificial Intelligence, Machine Learning I
Spring 2021	Machine Learning I, Basic Statistics and Exploratory Data Analysis
Winter 2021	Analytic Tools and Decision Making, Basic Statistics and Exploratory Data Analysis
Fall 2020	Analytic Tools and Decision Making, Ethics for Analytics
Spring 2020	IT Service Management
Fall 2019	Analytic Tools and Decision Making
Spring 2019	IT Service Management

2019 - 2019 **Data Centre Graduate Student Assistant** University of Windsor Windsor

- ➤ Provided excellent statistical software support (R and ArcGIS) to undergraduate and graduate students

2013 - 2018 **Graduate Assistant** University of Windsor
Windsor
- ➤ Delivered lectures and labs for multiple classes of 30+ undergraduate students
- ➤ Scheduled and maintained 2+ office hours per week to assist students in course work

Semester	Course	Instructor
Winter 2018	Technical Communications	Dr. Jacqueline Stagner
Spring 2017	Highway Design and Construction	Dr. Chris Lee
Winter 2017	Treatment of Experimental Data	Dr. Lindsay Miller
Fall 2016	Engineering Software Fundamentals	Dr. Edward Lang
Spring 2016	Transportation and Traffic Engineering	Dr. Chris Lee
Winter 2016	Numerical Analysis for Engineering	Dr. Edward Lang
Fall 2015	Engineering Software Fundamentals	Dr. Edward Lang
Spring 2015	Highway Design and Construction	Dr. Chris Lee
Fall 2014	Engineering Profession	Dr. Leo Oriet
Spring 2014	Transportation Systems Analysis	Dr. Hanna Maoh
Spring 2014	Highway Design and Construction	Dr. Chris Lee
Winter 2014	Civil Engineering Information System	Dr. Hanna Maoh
Fall 2013	Engineering Mechanics I	Dr. Amr El Ragaby

2010 - 2012 **Lecturer/Lab Engineer** University of Engineering and Technology
Lahore
- ➤ Taught Construction Materials and Machinery, Construction Management, and Railway Engineering to undergraduate students

Guest Lectures

- ➤ "Reaction Time in Car-following" Lecture for *Institute of Highway Engineers*, UK.

Publications and Presentations

Peer-reviewed Articles

1. Durrani, U., Lee, C., & Shah, D. (2021). Predicting driver reaction time and deceleration: Comparison of perception-reaction thresholds and evidence accumulation framework. *Accident Analysis and Prevention*, *149*(November 2020), 105889. https://doi.org/10.1016/j.aap.2020.105889
2. Durrani, U., & Lee, C. (2019). Calibration and Validation of Psychophysical Car-Following Model Using Driver's Action Points and Perception Thresholds. *Journal of Transportation Engineering Part A: Systems*, *145*(9), 1–11. https://doi.org/10.1061/JTEPBS.0000264
3. Durrani, U., Lee, C., & Maoh, H. (2016). Calibrating the Wiedemann's vehicle-following model using mixed vehicle-pair interactions. *Transportation Research Part C: Emerging Technologies*, *67*, 227–242. https://doi.org/10.1016/j.trc.2016.02.012

Submitted Papers

1. Durrani, U., & Lee, C. (2023). Applying the Accumulator Model to Predict Driver's Reaction Time based on Looming in Approaching and Braking Conditions. *Journal of Safety Research*, *Submitted*.
2. Kummetha, V. C., Durrani, U., Mason, J., Concas, S., & Kondyli, A. (2023). Driver Classification Using Self-reported , Psychophysiological , and Performance Metrics within a Simulated Environment. *Journal of Big Data Analytics in Transportation*, *Submitted*.

In Preparation

1. Durrani, U., & Lee, C. (2022). A New Car-Following Model with Incorporation of Markkula's Framework of Sensorimotor Control in Sustained Motion Tasks. *Manuscript in preparation*.

Conference Presentations

1. Durrani, U., & Lee, C. (2022). Estimating Driver's Reaction Time Based on Looming in Approaching and Braking Conditions: Comparison of Wiedemann Car-Following Model and Accumulator Model. *Presented at 101st Annual Meeting of Transportation Research Board*.
2. Durrani, U., Lee, C., & Shah, D. (2021). Prediction of Driver Reaction in Approaching and Braking Conditions using Perception Thresholds and Evidence Accumulation Framework. *Presentated at 100th Annual Meeting of Transportation Research Board*.
3. Durrani, U., Lee, C., & Shah, D. (2020). Determining Perception-Reaction Time for Different Spacings and Types of Lead Vehicle–Based on Driver's Perception Threshold. *Presented at 99th Annual Meeting of Transportation Research Board*.
4. Durrani, U., & Lee, C. (2019). Investigating Heterogeneity in Car-following Behavior Due to Driving Style and Lead Vehicle Type: Implications for the Wiedemann Model. *Presented at 98th Annual Meeting of Transportation Research Board*.
5. Durrani, U., & Lee, C. (2019). Assessing the influence of lead trucks on driver's perception and response using a driving simulator. *Presentated at Road Safety and Simulation International Conference*.
6. Durrani, U., & Lee, C. (2018). Assessing Impacts of Surrounding Trucks on Car Drivers' Lane Change Duration Using Driving Simulator. *Presentated at 97th Annual Meeting of Transportation Research Board*.
7. Durrani, U., Lee, C., & Zhao, P. (2016). *Understanding the Differences in Lane Change Maneuvers of Cars and Heavy Vehicles on Freeways*.
8. Durrani, U., Lee, C., & Maoh, H. (2014). Understanding differences between car and truck movements on freeways using vehicle trajectory data. *Proceedings of 49th Annual Canadian Transportation Research Forum Conference, Windsor, Ontario*, 301–313.

Thesis

1. Durrani, U. (2022). *A New Car-Following Model with Incorporation of Markkula's Framework of Sensorimotor Control in Sustained Motion Tasks* [PhD thesis, University of Windsor]. https://www.proquest.com/openview/af8d25f185b83c3052c1ef21075166ac/1?cbl=18750%7B&%7Ddiss=y%7B&%7DloginDisplay=true%7B&%7Dpq-origsite=gscholar

Software

- **Car-following Models**: A package to run car-following models in R programming environment
- **Open Data Windsor**: A package to access data from open data portal of City of Windsor
- **Data-driven car-following models**: Machine learning models of car-following in Python

Honors / Awards

2021-07-09 **Best Graduate Research Showcase (Engineering) on Twitter** Faculty of Graduate Studies
University of Windsor

2021-06-03 **Winning team member of Gordie Howe International Bridge Smart Infrastructure Faceoff** Windsor-Detroit Bridge Authority (WDBA) and Autonomous Vehicle Innovation Network (AVIN) Ontario
Windsor, ON

2020-01 **Recepient of TAC/Esch Scholarship** Transportation Association of Canada
Windsor, ON

2016-17 **Ontario Graduate Scholarship**
ON

2009 **Recepient of Gold Medal for Top Position** University of Engineering and Technology
Lahore, Pakistan

Skills

Programming / Software

- R
- Python
- PTV VISSIM
- Git and GitHub
- Shiny applications
- Microsoft Office

Analysis / Modeling

- Machine Learning
- Regression
- Traffic Modeling

Professional Memberships

- Application in process for Professional Engineers Ontario license

Languages

- English
- Urdu

References

Dr. Chris Lee
Associate Professor
Civil and Environmental Engineering
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