# M. Saleh Farham

*Postdoctoral Researcher, Alberta School of Business*

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## ABOUT ME

Postdoctoral Researcher at the University of Alberta with a PhD in Industrial Engineering, specializing in the application of operations research and machine learning to optimize complex challenges in logistics and transportation systems. Experienced in developing hybrid solutions that integrate operations research and machine learning techniques for both academic and industrial applications. Proficient in data analytics and computer programming, with expertise in utilizing various tools for data management, visualization, and analysis. Passionate about creating innovative, efficient solutions to intricate optimization problems, particularly in facility location, transportation networks, and logistics systems. Committed to bridging the gap between theoretical advancements and practical applications in the field.

## RESEARCH INTERESTS

Specializing in the convergence of operations research, data science, and machine learning, with a focus on developing innovative solutions for complex optimization challenges in facility location, transportation, and logistics. Key areas of expertise include:

- Hub Location Problems: Strategic and tactical planning of advanced multi-modal, multi-tier freight transportation networks, addressing capacity, congestion, and stochastic demand.
- Facility Location Problems: Analysis of planar facility location challenges in congested regions, considering geographic constraints and travel penalties.
- Location-Routing Problems: Optimization of single and two-echelon freight transportation systems in urban logistics, emphasizing coordination and consolidation in city distribution networks.
- Machine Learning Integration: Application of data-driven methodologies to simultaneously predict uncertain parameters and make tactical decisions, minimizing decision errors beyond mere prediction accuracy.
- Stochastic Optimization: Modelling and solving optimization problems under uncertainty, utilizing advanced techniques such as two-stage stochastic programming, robust optimization, and distributionally robust optimization.
- Exact and Heuristic Algorithm Development: Design and implementation of exact and heuristic algorithms for complex combinatorial optimization problems, including covering problems, capacitated hub location, and vehicle routing challenges.

## TEACHING INTERESTS

Committed to delivering courses that align with cutting-edge research and equip students with practical skills for addressing real-world challenges in city planning, transportation, and logistics. Prepared to instruct at both undergraduate and graduate levels in the following areas:

- Mathematical Modelling for Real-World Problems
  - Defining and formulating optimization problems using algebraic modelling languages (e.g., IBM CPLEX, Gurobi)
  - Introduction to various optimization types: linear, integer, mixed-integer, quadratic, second-order cone, and nonlinear programming
- Algorithm Design for Optimization
  - Development and implementation of efficient solution algorithms, including decomposition-based methods and problem-specific approaches
  - Practical application of programming languages (Java, Python) for data integration, algorithm coding, testing, and solution interpretation
- Data Analytics and Machine Learning
  - Comprehensive data management: collection, preparation, visualization, and analysis using tools such as Excel, Power BI, Power Query, and Python libraries
  - Application of machine learning algorithms for decision-making, encompassing supervised and unsupervised learning techniques
  - Integration of predictive analytics for forecasting future trends and outcomes
  - Implementation of prescriptive analytics to optimize decision-making processes and recommend best courses of action
- Stochastic Programming
  - Modelling and solving optimization problems under uncertainty using advanced techniques:
    Scenario generation, Recourse models, Two-stage stochastic programming, Robust optimization
  - Analysis of large datasets to determine stochastic factors, such as order quantities, traffic patterns, etc.

## EDUCATION

*Doctor of Philosophy*, Industrial Engineering................................May 2020
Middle East Technical University, Ankara, Turkey

*Master of Science*, Industrial Engineering..............................January 2013
Middle East Technical University, Ankara, Turkey

*Bachelor of Science*, Industrial Engineering..........................September 2010
Middle East Technical University, Ankara, Turkey

*Note:* Middle East Technical University ↗ has been listed in the **top 65 universities** by Times Higher Education World Reputation Rankings in 2013. It has also been ranked 85th amongst the world's best 400 universities in World University Rankings 2014-2015. The B.S. in Industrial Engineering program is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology ↗

## SKILLS

*Data Management & Analytics:*
Excel • Power BI • Power Query • Tableau • Python (pandas, numpy, matplotlib, scipy, scikit-learn) • SQL Server • Access • Minitab statistical software ↗ • PowerPoint

*Optimization & Decision Support:*
Supply chain management • City logistics • Hub location and inter-urban freight transportation • Service network design • Vehicle routing problems • Planar covering problems • Production planning • Inventory management • Scheduling • Supervised and unsupervised learning for data mining

*Mathematical Programming:*
Linear programming • Integer and mixed-integer programming • Quadratic and second-order cone programming

*Programming Languages & Software Development Tools:*
C/C++ and Visual C++ • Java • Python • C# and Visual Basic .NET • SQL • MATLAB and Octave • 1C:Enterprise platform ↗ and 1C:Drive ↗ • Version control software (Git) • Data interchange formats (JSON) • Visual Studio • VSCode • Eclipse • Intellij IDEA • PyCharm

*Algebraic Modelling Languages/Environments:*
IBM CPLEX and OPL ↗ • Gurobi ↗ • SCIP ↗ • Excel Solver

*Office Suites:*
Microsoft Office • LibreOffice • LaTeX

*Languages:*
English (Advanced) • Farsi/Persian (Advanced) • Turkish (Intermediate) • French (Beginner)

## EXPERIENCE

*Research Associate* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . September 2023 – present
AI Center for Decision Analytics (AI4DA) ↗, Alberta School of Business, University of Alberta, Edmonton, AB, Canada
- Data analytics and operations research (OR).

*Postdoctoral Researcher* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . March 2023 – present
Alberta School of Business, University of Alberta ↗, Edmonton, AB, Canada
- Applying hybrid methods of OR and AI to design and implement effective solutions for complex optimization problems in various domains.
- Building data-driven optimization models for optimal fleet management and hub location allocation in transportation and logistics networks.
- Performing data analytics on large-scale mobility data to extract insights and patterns for urban transportation and logistics applications.

*Postdoctoral Researcher* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . March 2022 – February 2023
Lazaridis School of Business & Economics, Wilfrid Laurier University ↗, Waterloo, ON, Canada
- Modeling economies of scale in consolidation-based transportation systems.
- Formulating the price of interactions between different distribution centers in such systems

- Developing decomposition-based algorithms to find optimal network design and routing decisions
- Extending problems to incorporate coverage-based distribution (e.g., drone delivery, mobile depots, etc.)

*Postdoctoral Researcher* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . February 2021 – March 2022
Department of Analytics, Operations, and Information Technology School of Management, Université du Québec à Montréal, and
Inter-university Research Centre on Enterprise Networks, Logistics and Transportation group (CIRRELT) ☒, Montreal, QC, Canada

- Studied the development of Operations Research models and methods for strategic and tactical planning of advanced multi-modal multi-tier freight transportation networks
- Developed service network design models for hierarchical hub location problems with different demand types, capacity and delivery time restrictions
- The results of this project will be provided for practical use to Purolator ☒, a Canadian courier managing and using large-scale freight transportation networks

*Researcher and Computer Programmer* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . April 2019 – April 2020
Department of Industrial Engineering, TED University, Ankara, Turkey

- Involved in the *Hub Location under Congestion and Capacity Considerations* project
- Developed advanced decomposition-based solution approaches for the resulting nonlinear mathematical problem
- Tested on a real-life data of Turkish hub network
- Funded by The Scientific and Technological Research Council of Turkey ☒ for its promising practical applications (Grant no. 218M520)

*Software Developer* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . March 2020 – January 2021
AdinSoft ☒, Ankara, Turkey

- AdinSoft provides ERP and business management solutions for companies of all sizes
- Developed accounting, inventory, retail, trade management and e-commerce solutions by using high-end computer software for cloud data
- Led a team of junior computer engineers at the development/testing department

*Data Analyser and Software Developer* . . . . . . . . . . . . . . . . . . . . . . . . . . . . February 2018 – March 2020
SeçilStore ☒, Ankara, Turkey

- SeçilStore is one of the Turkey's most recognized women's clothing and fashion company
- Collected, prepared, managed, visualized and analysed the data regarding accounting, inventory, retail, trade, and e-commerce operations in the IT department
- Provided decision-making solutions on various Industrial Engineering problems, such as transportation and routing, production scheduling, and inventory management
- Developed a GUI application that improved the efficiency of transportation planning in the retail department by 80%
- Developed a GUI application that automated generating, formatting, and classifying third-party business contracts in the financial department
- Developed spreadsheet-based solutions to track products and operations and determine KPIs, bottlenecks, and delays in the production lines

*Research Assistant* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . April 2013 – October 2016
Middle East Technical University, Ankara, Turkey

- Participated in *Consolidation and Coordination in Urban Areas* project of JPI-Urban Europe ☒
- Worked in close collaboration with different international universities and companies, namely Technical University of Eindhoven (Netherlands), the Vienna University of Economics and Business (Austria), University of Twente (Netherlands), Procter & Gamble, Inner-city Services Netherlands, and Heineken.
- Grant provided by The Scientific and Technological Research Council of Turkey ☒ (Grant no. 113M121)

*Quality Engineering Intern* .......................................January 2010 – February 2010
Marjan Tile Co. ↗, Esfahan, Iran

## CERTIFICATIONS

*Become a Data Analyst*, LinkedIn Learning.......................................January 2022

*Machine Learning*, Stanford University .......................................September 2021

## HONORS & AWARDS

Departmental honours for earning the highest GPA in two semesters of my Master's program. Fall 2012 and Fall 2013.

The Best Poster Award of undergraduate final projects. Our project delivered an improved production planning and scheduling for Hugo Boss fashion and textile company in Izmir, Turkey ↗. Spring 2010.

## PUBLICATIONS

Bayram, V., Yıldız, B., & Farham, MS (2023). Hub Network Design Problem with Capacity, Congestion, and Stochastic Demand Considerations. *Transportation Science*, published online: https://doi.org/10.1287/trsc.2022.0112.

Farham, MS, Süral, H., & Iyigun, C. (2018). A column generation approach for the location-routing problem with time windows. *Computers & Operations Research, 90*, 249-263.

Farham, MS, Süral, H., & Iyigun, C. (2018). Generalization of the restricted planar location problems: Unified metaheuristic algorithms. *Computers & Operations Research, 99*, 48-66.

Farham, MS, Süral, H., & Iyigun, C. (2015). The Weber problem in congested regions with entry and exit points. *Computers & Operations Research, 62*, 177-183.

Gharravi, H. G., & Farham, MS (2014). Applying metaheuristic approaches on the single facility location problem with polygonal barriers. *International Journal of Metaheuristics, 3*(4), 348-370.

## THESES

Farham, MS (2020). *Location-routing and synchronization problems in city logistics* (Doctoral dissertation, Middle East Technical University, Ankara, Turkey). Advisors: Haldun Süral and Cem Iyigun
- Identifies key coordination and consolidation challenges in managing City Logistics networks
- Presents mathematical formulations for the single and two echelon freight transportation problems arising in City Logistics
- Proposes decomposition-based exact and heuristic solution algorithms for the underlying location-routing problems
- Addresses synchronization problems in multi-echelon urban freight transportation networks and solves the problem at the operational level

Farham, MS (2013). *Generalization of restricted planar location problems: unified meta-heuristics for single facility case* (Master's thesis, Middle East Technical University, Ankara, Turkey). Advisors: Haldun Süral and Cem Iyigun
- Studies the planar facility location problem in the presence of congested regions, natural or man-made geographic entities that restrict facility locations and penalize travelling

- Demonstrates how the studied problem generalizes other (restricted) planar facility location problems in the literature
- Proposes metaheuristic algorithms enhanced by local search to solve the resulting non-convex and non-linear cost-minimization problem
- Develops a software program module with a GUI to solve the problem and visualize the solution

## CONFERENCE PRESENTATIONS

Farham, MS, Rostami, B, Zeinali, Y, & Haughton, M (2024). Vehicle-Based Hub Network Design with Routing: Exact and Learning-based Approximation. *CORS Annual Conference*, London, Canada.

Behrooz, M, Farham, MS, & Rostami, B (2024). Last-mile delivery with lockers and local crowd-shippers: The Study of TELUS Data for Good. *CORS Annual Conference*, London, Canada.

Rahimi, F, Rostami, B, Farham, MS, & Hosseini, D (2024). Data-driven Approach in Hub Network Design with Demand Uncertainty. *CORS Annual Conference*, London, Canada.

Zadtootaghaj, P, Rostami, B, & Farham, MS (2024). Evaluating the Impact of 3D Printing on Spare Parts Logistics Considering Quality Difference of Two Sourcing Options. *CORS Annual Conference*, London, Canada.

Farham, MS, & Rostami, B (2023). Data–Driven Fleet Management in Hub Network Design with Demand Uncertainty. *CORS Annual Conference*, Montreal, Canada.

Bayram, V, Yıldız, B, & Farham, MS (2022). A New Perspective and an Exact Solution Methodology for Hub Network Design Problems. *The 41st National Conference on Operations Research and Industrial Engineering*, Denizli, Turkey.

Farham, MS, Crainic, TG, & Rei, W (2022). Hierarchical Hub Location and Service Network Design Problem. *CORS/INFORMS International Conference*, Vancouver, Canada.

Farham, MS, Rostami, B, & Haughton, M (2022). Routes' Interactions in Consolidation-based Transportation Networks. *CORS/INFORMS International Conference*, Vancouver, Canada.

Bayram, V, Farham, MS, & Yıldız, B (2019). The hub location under capacity and congestion considerations. *INFORMS Annual Meeting*, Seattle, USA.

Farham, MS, Bayram, V, & Yıldız, B (2019). The hub location under capacity and congestion considerations. *International Network Optimization Conference (INOC)*, Avignon, France.

Farham, MS (2019). The two-echelon location-routing problem with time windows. *National Operations Research and Industrial Engineering Doctoral Colloquium*, Eskisehir, Turkey.

Atashi Khoei, A, Farham, MS, & Tural, MK (2017). Energy minimizing $p$-connected covering location problem. *The XVIII Congress of the Portuguese Association of Operational Research*, Valença, Portugal.

Farham, MS, Süral, H, & Iyigun, C (2016). The two-echelon freight transportation network in city logistics. *The 28th European Conference on Operational Research*, Poznan, Poland.

Farham, MS (2016). Single-echelon freight distribution network design in city logistics. *National Operations Research and Industrial Engineering doctoral colloquium*, Istanbul, Turkey.

Atashi Khoei, A, & Farham, MS (2015). The two-echelon location-allocation problem under demand uncertainty. *The 35th National Conference on Operations Research and Industrial Engineering*, Ankara, Turkey.

Farham, MS (2014). Two-echelon freight distribution network design. *National Operations Research and Industrial Engineering Doctoral Colloquium*, Ankara, Turkey.

Farham, MS, Süral, H, & Iyigun, C (2013). Generalization of restricted planar location problems: Unified meta-heuristics for single facility case. *The 20th EURO Working Group on Locational Analysis Meeting*, Ankara, Turkey.

Farham, MS, Süral, H, & Iyigun, C (2013). The Weber problem in congested regions with entry and exit points. *The 33rd National Conference on Operations Research and Industrial Engineering*, Istanbul, Turkey.

Gharravi, HG, & Farham, MS (2012). Applying meta-heuristic approaches on the single facility location problem with polygonal barriers. *The 32nd National Conference on Operations Research and Industrial Engineering*, Istanbul, Turkey.

## ATTENDED WORKSHOPS & SCHOOLS

*Using Trained Machine Learning Predictors in Gurobi* ↗ ........................ January 2023
Webinar

*World Class Supply Chain Summit: Creating a sustainable future* ↗ ................. May 2022
Milton, ON, Canada

*EURO WISDOM YW4OR Talks: Data Science & Optimization* ↗ ................. March 2022
Webinar

*INFORMS Transitioning from Student to Professional* ↗ ........................ February 2022
Webinar

*VREF Conference on Urban Freight* ↗ ........................................... March 2021
Virtual conference

*ASBU Transportation & Logistics Workshop* ↗ ................................... January 2020
Ankara, Turkey

*ASBU Transportation & Logistics Workshop* ↗ ................................... March 2019
Ankara, Turkey

*EURO PhD School on Routing and Logistics* ↗ ................................... June 2015
Brescia, Italy

*School on Column Generation* ↗ ................................................ June 2015
Paris, France

## VOLUNTEER ACTIVITIES

Organizer of CORS Prep Workshop, University of Alberta (May 2024) ↗: I played a key role in facilitating a one-day event hosted by the AI Centre for Decision Analytics (AI4DA) at the School of Business. This workshop provided a vital platform for master's, PhD, and postdoctoral researchers to showcase their ongoing projects in preparation for the Canadian Operational Research Society (CORS) conference. My responsibilities included coordinating presentations on diverse topics such as retirement decision-making, wildfire suppression resource prediction, and optimization under uncertainty.

Member of the Design and Optimization group ⬀ in Industrial Engineering Department at Middle East Technical University. We helped undergraduate and graduate students with their research and provided guidelines and aids regarding modelling, computing, analysing, and documenting (for example, how to code in different computer programming languages, how to use MATLAB, IBM CPLEX, Gurobi, how to write with LaTeX, etc.). My activities included the following tutorial sessions, as well:

- *Computer Programming for Optimization:* A 90-minute session on computer programming basics for modelling and solving mixed-integer programming problems for graduate and undergraduate students. Spring 2014.
- *Introduction to Column Generation:* A 150-minute graduate-level session on the principles of a decomposition-based approach for finding the optimal solution to a class of combinatorial mixed-integer programming problems efficiently. Fall 2016.

Provided guidelines and advices on modelling and design and development of solution algorithms that supported the following published theses:

- Atashi Khoei, A (2021). *Green logistics applications in transportation and warehousing* (Doctoral dissertation, Middle East Technical University, Ankara, Turkey).
- Müslim, M (2021). *An evolutionary algorithm to the two-echelon location routing problems with hard time windows* (Master's thesis, Middle East Technical University, Ankara, Turkey).
- Faridyahyaei, A (2017). *A Multi-level continuous minimax location problem with regional demand* (Master's thesis, Middle East Technical University, Ankara, Turkey).

Reviewer and referee for various peer reviewed journals including but not limited to: Computers & Operations Research, Computers & Industrial Engineering, European Journal of Operational Research, Transportation Research Part C: Emerging Technologies, Transportation Research Part E: Logistics and Transportation Review, Information Systems and Operational Research, etc.

## REFERENCES

References are available upon request.