Fatemeh Aarabi

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Research Interests

To seek an academic position with a focus on Operations Research.

Education

Summer 2020 **Ph.D. in Operations Research**, *University at Buffalo (UB)*, Buffalo, NY.
Thesis: Scheduling Spatially Distributed Jobs with Degradation
Advisor: Rajan Batta

Fall 2009 **M.sc. in Industrial Engineering**, *K. N. Toosi University fo Technology*, Tehran, Iran.
Thesis: Evaluating the Effect of Variation Reduction on Product Reliability Improvement using Extreme-Value Distributions .
Advisor: Hamid Shahriari .

Summer 2007 **B.Sc. in Industrial Engineering**, *Yazd University*, Yazd, Iran.
Thesis: Design and Implementation of a Maintenance System .
Advisor: Hasan HoseiniNasab .

Publications

○ **Aarabi, Fatemeh**, Rajan Batta. "A mixed integer programming approach for scheduling spatially distributed jobs with degradation rate: application to pothole repair" *Socio-Economic Planning Sciences* 2020

○ **Aarabi, Fatemeh**, Rajan Batta. "Server Positioning and Response Strategies for Spatially Arriving Jobs with Degradation: Light and Medium Traffic Cases" submitted to the *Journal of Operational Research Society*

Papers in Preparation

○ Yu Zhou, **Aarabi, Fatemeh**, Rajan Batta. "A hypercube qeueuing framework for analysis of cross-training and response time in "U-shape" production system"

Presentations

2018 **Aarabi, F.,** Batta, R. , *"Using the Hypercube Queueing Model for Response to Jobs with Degradation"*, Session: Joint Session TSL/Practice Curated:Patrolling and Service Delivery Problems, INFORMS annual meeting 2018, Phoenix, AZ, November 3-8, 2018.

2018 **Aarabi, F.,** Batta, R. , *"An MIP Approach for scheduling jobs with degradation rate"*, UB Engineering graduate student poster competition and 2018 ISE graduate student poster competition, University at Buffalo, The State University of New York at Buffalo.

2017 **Aarabi, F.,** Batta, R. , *"An MIP Approach for Planning Pothole Repair"*, Session: Resilience in Transportation Infrastructure Systems, INFORMS annual meeting 2017, Houston, TX, October 22-25, 2017.

2019 Aarabi, F., **Batta, R.** , *"A Mixed Integer Programming Approach for Scheduling Spatially Distributed Jobs with Degradation Rate: Application to Pothole Repair"* , TRISTAN, Hamilton Island, Australia, June 2019.

Teaching Experience

Fall 2015	**Applied Probability** , *OR undergraduate core course* .

This course covers probability and its application to engineering problems.

Assisted by conducting weekly recitation sessions, providing weekly office hours, grading assignments and exams, giving quizzes, and proctoring.

Fall 2016	**Facilities Design**, *OR graduate level course.*

This course covers facilities design related problems, especially in manufacturing systems.

Fall 2016	**Robotics**, *OR graduate level course* .

This course focuses on Analysis of robots and robotic systems. Kinematics, coordinate transform, vision systems, off-line programming, and simulation of robotic systems.

Spring 2016	**Operations Research I: Deterministic Models**, *OR undergraduate core course* .

This course covers the markov system modeling, markov decision processes and applications, queueing theory

Spring 2017	**Operations Research II: Stochastic Models**, *OR undergraduate core course* .

This course covers the markov system modeling, markov decision processes and applications, queueing theory

Professional Experience

2020   **OR Scientist/Data Scientist**, *Deccan International Co.*, San Diego, CA.

Achievements:

○ Developed a real time data analytic application for relocating EMS/ Fire vehicles currently used in FDNY call center reaching more than 99% satisfaction rate by New York dispatchers

○ Performed data analytics on 911 incidents data utilizing techniques such as clustering, KNN, and decision trees, for improved accuracy.

○ Implemented advanced Operations Research and algorithms such as mixed integer programming, queuing models, dynamic programming and meta-heuristics which boosted performance from 0.5 hour to up to 20 seconds.

○ Supported the optimization engine which has 100K+ lines of legacy C# code. Meantime added new features for an application which is 20% of the company's annual revenue.

○ Owner throughout the life cycle: requirement analysis, algorithm research and investigation, lead developer and people, project management, release deployment, data analysis.

○ Aggregating and cleaning the data of travel time using SQL.

○ Developed a machine learning framework for call-volume prediction.

○ Used AWS to run the big data of Queensland (Australia) for UAT(user acceptance testing).

○ Played a key role in UAT approval, (one month period non-stop working including weekends).

2010-2015   **Project Control Engineer**, *Mahab Ghodss Consulting Engineering Co.*, Tehran, Iran.

Achievements:

○ Cooperated in gathering and analyzing financial data

○ Controlled and monitored the performance of every project in terms of cost, time and resource allocation.

○ Tracked the development of projects and reported the cost and time deviations to the senior manager and project executives to take corrective actions.

○ Prepared project to-do lists containing the tasks which were not directly involved in the execution of the project, defined tasks descriptions, technical requirements, and assignments.

Research Experience

2016- 2020   **Graduate Research Assistant**, *University at Buffalo-The State University of New York*, Buffalo, NY.

- **A mixed integer programming approach for scheduling spatially distributed jobs with degradation rate: application to pothole repair**
  This project considers scheduling spatially distributed jobs with degradation. A mixed integer programming (MIP) model is developed for the linear degradation case in which no new jobs arrive. Properties of the model are analyzed, three heuristics are developed, enhanced greedy, chronological decomposition and simulated annealing. To demonstrate applicability of the model, a case study is presented based on a pothole repair scenario from Buffalo, New York, USA. Findings from the case study indicate that scheduling spatially dispersed jobs with degradation such as potholes requires: (i) careful consideration of the number of servers assigned, degradation rate and depot location; (ii) appropriate modeling of continuously arriving jobs; and (iii) appropriate incorporation of equity consideration.
- **Server cooperation for a set of spatially distributed jobs arriving over time with degradation rate: using the hypercube queuing model**
  This project studies server positioning and response strategies for spatially arriving jobs with degradation, for situations of light and medium traffic. For the light traffic case we show that the p-median solution provides the optimum server positioning, and the optimum response strategy involves no server cooperation. To analyze the medium traffic case, we develop an extended hypercube queuing model to obtain the performance measures of servers that is tailored to handle spatially distributed jobs with degradation rate. Based on the performance measurements, we seek an appropriate set of preferred server assignments for each region. Results are presented for different problem-size instances. To demonstrate applicability of the model, a case study is presented based on an emergency response application. The main finding for the medium traffic case is that the degree of server cooperation is strongly related to the rate of job degradation—the higher the job degradation rate the lower the server cooperation rate.

2009- 2011 **Graduate Student,** , *K. N. Toosi University of Technology*, Tehran, Iran.

- **Statistical Analysis of Air Pollution Data in City of Tehran, Iran**
  The project goal was to analyze the data and implement a Factor Analysis of air pollution in Tehran city. The data was gathered from four main weather stations in Tehran, and two different key factors or independent variables are identified. These factors are a set of pollutant with hydrated base and a set of pollutant with metal material which is supposed to have an effect on air pollution in Tehran. A regression method is implemented to find key independent variables which have most effect on air pollution.
- **Evaluating the Effect of Variation Reduction on Product Reliability Improvement using Extreme-Value Functions**
  In this research the effect of variance reduction for any quality characteristic of a product is investigated using underlying distributions. Theoretical and numerical results indicate that when the variance for a quality characteristic of a manufactured product decreases, the capacity increases and the reliability improves.

Technical Skills

- Programming Languages Python, C#, Matlab
- Optimization Solvers: Gurobi, ILOG CPLEX, AMPL, GAMS
- Statitical: SAS, Minitab
- Data Analysis: Numpy, Scipy, Pandas, Mathematica, Minitab
- Machine Learning: Scikit-learn, TensorFlow, Keras, Jupyter Notebooks
- Simulation: ARENA, AnyLogic
- Other: SQL, LaTex, Tableau

References

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