Afshin Oroojlooy

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Research Interests

Reinforcement Learning, Deep Neural Network, Multi-echelon Supply Chain, Mixed Integer Programming, Optimization Methods for Machine Learning, Forecasting.

Education

Ph.D. **Lehigh University**, Sep. 2014 – Now, Industrial Engineering, GPA: 3.74
Research: *Application of Machine Learning in Supply Chain Problems*
Advisers: *Prof. Lawrence Snyder* and *Prof. Martin Takac*

M.Sc. **Sharif University of Technology**, Sep. 2010 Oct. 2012
Industrial Engineering, GPA: 4.0
Thesis: *Mixed Integer Programming model for Train Timetabling on multiple track and station capacity railway with enhanced upper bound heuristic method and Lagrangian Relaxation lower bound*
Adviser: *Prof. Kourosh Eshghi*

B.Sc. **Isfahan University of Technology**, Sep. 2006 Sep. 2010,
Industrial Engineering- Industrial Production, GPA: 3.87

Computer Skills

Programming Languages	Python, C/C++, MATLAB
DNN & Deep Learning	TensorFlow, TensorBoard, PyTorch, caffe
Cluster Computing	Apache Spark
Time Series Analysis	SAS
Mathematical Modelling	CPLEX, Gurobi, AMPL, ILOG OPL
Data Bases	Microsoft SQL
OS/ General	Linux, Bash Scripting, LaTeX, Windows, Microsoft Office

Relevant Professional Experiences and Projects

- **Machine Learning Intern at SAS Institute**, Jun 2017 up to now
  - Member of RL team in developing general RL package.
  - Developed a Deep CTD and DQN algorithm for customer journey optimization.
  - Drafted and submitted the corresponding provisional patent application.
- **Research Assistant at Lehigh University**, Fall 2014 up to now
  - Developed an adjusted DQN algorithm to solve the ordering problem in a serial network.
  - Developed an Integrated Policy Gradient algorithm and Pointer Network to solve the Stochastic Vendor Route Problem.
    - Implemented DQN, Deep TD, Deep Concurrent TD, Policy Gradient, and DDPG algorithms.
    - Implemented classical Q-learning and Sarsa(λ) algorithms.
    - Implemented on PyTorch and TensorFlow.
  - Integrated Estimation and Optimization Research Project for Supply Chain Problems.
    - Implemented a Stock-out prediction tool with Deep Neural Networks for general multi-echelon supply chain problem.
    - Proposed and implemented a Deep Neural Networks algorithm to solve newsvendor problem (competitive to the current approaches).
    - Implemented on caffe (C++) and TensorFlow.
  - System Administrator of the COR@L lab, Aug 2016 up to now.
  - Course Projects of Computational Methods in Optimization: Developed in C++
    - Parallel implementation of Conjugate Gradient algorithm with Boost::MPI.
    - Cache efficient implementation of different factorization methods.
    - Cache efficient implementation of different sort and matrix multiplication algorithms.
    - Parallel implementation of a matrix vector multiplication algorithm.
  - Course Projects of Mining Massive Datasets: Implemented with Apache Spark Python
    - Dimensionality reduction algorithm based on singular value decomposition.
    - A-Priori Algorithm to extract frequent item sets and association rule in transactional databases.
    - Latent factor model as a recommendation system for Netflix problem.
    - PageRank algorithm to rank Wikipedia web pages.
    - K-means, SVD and SVM algorithms.
    - Min hashing algorithm to obtain text and web page similarity.
- **SAP ERP Implementation Consultant** at SamenEA, Banking corporation- June 2011- Sep 2014

- Responsible for system design, mapping, development, implementation, training and supporting
    - Consulted with modules Financial Accounting: Asset, Account Payable/Receivable, Cost Accounting, Employee/Manager Self Service, Personal Development, Personal Time management, Organization Management , Personal Administration, Workflow Management On (ECC 6.0)
    - Analyzed gathered data and prepared AS-IS documents (e.g. process and organization models, etc.)
    - Developed solutions, proposed improved methods of actions, documented TO-BE materials.
    - Prepared manuals and trained workers in use of new forms, reports, procedures or software, according to organizational policy.
- **System Architecture and Analyzer**- Isfahan Municipality and Isfahan's Fire Station - Jun-Sep 2010
    - Interviewed with key users, gathered required data, analyzed the data and prepared AS-IS documents (e.g. process and organization models, etc.).

Relevant Publications

- A. Oroojlooy, R. Nazari, L. Snyder, and M. Takac. "A Deep Q-Network for the Beer Game with Partial Information." arXiv preprint arXiv:1708.05924 (2017).
- R. Nazari, A. Oroojlooy, L. Snyder, and M. Takac. "A Reinforcement Learning Framework for Solving Combinatorial Optmization Problems: Applications in Stochastic Vehicle Routing Problem." Working Paper (2017).
- R. Nazari, A. Oroojlooy, M. Kabul. "Online Reinforcement Learning with the applications in Customer Journey Optimization." Under review (2017).
- A. Oroojlooy, L. Snyder, M. Takac. "Stock-out Prediction in Multi-echelon Networks." arXiv preprint arXiv:1709.06922 (2017).
- A. Oroojlooy, L. Snyder, and M. Takac. "Applying Deep Learning to the Newsvendor Problem." *arXiv preprint arXiv:1607.02177* (2016).
- A. Oroojlooy, K. Eshghi, Train Timetabling on multiple track and station capacity railway with enhanced upper and lower bound heuristic method for same train in network, will appear in *Scientia Iranica*, Oct 2016
- BR. Vellaboyana, A. Oroojlooy, D. Fooladivanda, J. Taylor, L. Snyder, Optimal Scheduling of Networked Energy Storages, *IEEE Global Conference on Signal and Information Processing 2015, Orlando, Florida, USA*
- A. Oroojlooy, M. Firouz, L. Snyder, Simulation based approach for solving Unequal Area Facility Layout Problems in Stochastic condition by Genetic Algorithm, arXiv preprint arXiv:1608.08321 (2016).
- A. Oroojlooy, B. Ghalebsaz Jeddi, Transfer Function and ARIMA Models to Forecast Atmospheric Carbon Dioxide Emission, working paper, Oct 2015
- K. Kianfar, S.M.T. Fatemi Ghomi, A. Oroojlooy, 2012, Study of stochastic sequence-dependent flexible flow shop via developing a dispatching rule and a hybrid GA, *Engineering Applications of Artificial Intelligence* 25 (2012) 494506.

Notable Graduate Level Courses Taken

- Machine Learning
- Computational Methods in Optimization
- Mining Massive Datasets
- Convex Analysis and optimization
- Advanced Algorithms
- Dynamic Programming
- Graph Theory
- Time Series Analysis
- Conic Optimization
- Nonlinear Optimization
- Integer Programming
- Sequencing and Scheduling Theory
- Decision Making
- Advanced Inventory Models
- Fundamentals of Computer Simulation
- Design and Analysis of Experiments

Teaching Assistantship

- ***Introduction to Deterministic Optimization Models in Operations Research***, spring 2016.
    - Included teaching AMPL and MATLAB.
- ***Introduction to Stochastic Models in Operations Research***, fall 2015.
- ***Production Analysis***, spring 2015.
- ***Resource Planning and Scheduling*** (graduate course), fall 2014.
    - Included teaching CPLEX IBM ILOG, Defining project and grading.
- ***Graph Theory*** (graduate course), spring 2013.
- ***Operations Research I***, fall 2011, spring 2012.
- ***Design and Analysis of Experiments*** (graduate course), fall 2011.
- ***Inventory Control and Production Planning***, spring 2009.