

Meshal Alharbi

GRADUATE STUDENT · MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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Research Interests: Statistical Machine Learning, Mathematical Optimization, and Computational Modeling

Education

Massachusetts Institute of Technology (MIT)

Cambridge, MA

MASTER OF SCIENCE IN COMPUTATIONAL SCIENCE AND ENGINEERING, 5.00/5 GPA

Sep 2021 – May 2023

- Advisors: Munther Dahleh and Mardavij Roozbehani.

King Saud University (KSU)

Riyadh, SA

BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING, 5.00/5 GPA

Sep 2013 – May 2018

- Minor in communication systems and signal processing.
- Graduated as the valedictorian and maintained Dean's List award for all academic years.
- Advisor: Saleh Alshebeili.

Experience

Massachusetts Institute of Technology

Cambridge, MA

RESEARCH ASSISTANT

Sep 2021 – Present

- Working with faculty from the Laboratory for Information and Decision Systems (LIDS) and the Institute for Data, Systems, and Society (IDSS) on multiple interdisciplinary research projects.
- Organizing and presenting various workshops (15+ attendees each) and participating in the MIT Independent Activities Period.

Center for Complex Systems at KACST and MIT

Riyadh, SA and Cambridge, MA

RESEARCHER

Dec 2018 – Sep 2021

- Conducted several research projects that tackled the problems of time series forecasting for power demand, robust reinforcement learning for economic dispatch, and computationally efficient agent-based modeling for infectious diseases.
- Engaged with high-ranking stakeholders from the energy and health sectors for research utilization and commercialization.

Saudi Telecom Company

Riyadh, SA

JUNIOR NETWORK MAINTENANCE ENGINEER - TALENT INCUBATION PROGRAM

Sep 2018 – Nov 2018

- Assisted in network monitoring, network traffic management and optimization, and reconfiguration of network systems.

Alsalam Aerospace Industries

Riyadh, SA

ENGINEER INTERN - AVIATION COMMUNICATION SYSTEMS

May 2017 – Aug 2017

- Evaluated airborne electro-optical camera systems and participated in SATCOM upgrade project for Boeing 777 aircraft.

Research Projects

Robust Reinforcement Learning

2021 – Present

PIs: MUNTHER DAHLEH (MIT) AND MARDAVIJ ROOZBEHANI (MIT)

- Developing new robust and sample efficient reinforcement learning methods in continuous spaces through state aggregation.
- Analyzing and quantifying regret and probably approximately correct learning bounds for the newly developed methods.
- Benchmarking the proposed algorithms against optimal statistical estimator for the dynamics demand response problem.

E-Cast: Electricity Power Demand Forecasting

2019-2020

PIs: DEVAVRAT SHAH (MIT) AND MANSOUR ALSALEH (KACST)

- Enhanced a time-series imputation and forecasting technique through low-rank approximation by singular value decomposition.
- Developed and tuned a deep learning model capable of predicting three days-ahead of electricity demand with high accuracy.
- Formulated a new ensemble method that improves forecasting performance by combining independent peak and valley predictors.
- The developed algorithms were commercialized by a third-party company and are utilized by the national electricity company.

Non-Technical Losses Detection in Electrical Grids

2019-2020

PIs: DEVAVRAT SHAH (MIT) AND AHMAD ALABDULKAREEM (KACST)

- Designed a highly nonlinear gradient boosting model that detects anomalies in electricity consumption from low-resolution signals.
- Developed a novel synthetic control anomaly magnitude estimator that outperformed traditional regression methods.
- Analyzed spatiotemporal correlations of anomalies and engineered features that enhanced models' precision and recall performance.
- Combined models to optimize for return on investments and analyzed suitable metrics to evaluate the system performance.

Modulation Classification for Millimeter Wave over Fiber Channels

2017-2018

SUPERVISOR: SALEH ALSHEBEILI (KSU)

- Designed autoencoder-based classification algorithm capable of operating under the distortions of millimeter-wave optical systems.
- Built an optical simulation environment for millimeter-wave systems that emulates a multitude of noises and distortions such as fibers nonlinearity, chromatic dispersion, and amplified spontaneous emission.
- Proposed a novel preprocessing step that precedes the classifier and considerably reduces the required number of training samples.
- Validated simulation results with experimental work utilizing state-of-the-art photonic devices at KSU RFTONICS research lab.

Presentations & Workshops

2022	Data Efficient Reinforcement Learning Workshop , at MIT IDSS - Presenter	Cambridge, MA
2020	Riyadh Smart City Platform , at Saudi 3rd IoT Conference - Presenter	Riyadh, SA
2019	Energy Analytics and Online Learning Workshops , at MIT IDSS - Organizer and Presenter	Cambridge, MA
	Power Demand Forecasting for Saudi Arabia , at KACST - Presenter	Riyadh, SA

Coursework & Activities

2022	6.860: Statistical Learning Theory and Applications , Tomaso Poggio, MIT
	6.231: Dynamic Programming and Reinforcement Learning , John Tsitsiklis, MIT
2021	6.255: Optimization Methods , Patrick Jaillet, MIT
2020	Structure and Interpretation of Deep Neural Networks , MIT CSAIL
	System Dynamics: Systems Thinking and Modeling for a Complex World , MIT Sloan
	Building Synthetic Aperture Radar , MIT Lincoln Laboratory
	Introduction to GIS and Mapping & Data Cleaning with OpenRefine , MIT Libraries
2019	Machine Learning for Remote Sensing , IEEE GRSS
	Learning From Data , Caltech
	Complete Python 3 Bootcamp , Udemy

Honors & Awards

Awarded Fully Funded Scholarship for Masters and PhD , KACST Technology Leaders Program (TLP)	2020 - Present
Dean's List Award for Excellence , College of Engineering - King Saud University	2014 - 2018
The Valedictorian with First-Class Honors , King Saud University	2018
Certificate for Excellent Capstone Projects , King Saud University and BAE Systems	2018
Excellence Award for Scientific Distinction , National Center for Assessment (Qiyas)	2013

Skills & Scores

Programming Languages	Python, Julia, MATLAB, C++, PyTorch, TensorFlow, Pyomo
Engineering Software	VPIphotonics, NI Multisim, CST Studio, QGIS
Languages	English (Bilingual Proficiency: TOEFL iBT 105), Arabic (Native)
GRE	Q170 / V157 / 3.0 AWA

Publications

Published

- [1] **M. Alharbi**, A. Alhuseini, A. Ragheb, M. Altamimi, T. Alshawi, and S. Alshebeili, "Automatic Modulation Classification: Investigation for Millimeter Wave over Fiber Channels," in IEEE Photonics Technology Letters, Volume 31, Issue 13, July 2019.
- [2] **Meshal Alharbi**, Saud Alghumayjan, Mansour Alsaleh, Devavrat Shah, and Ahmad Alabdulkareem, "Electricity Non-Technical Loss Detection: Enhanced Cost-Driven Approach Utilizing Synthetic Control," in IEEE PES ISGT NA 2021.
- [3] Bader Alaskar, Abdullah Alhadlaq, **Meshal Alharbi**, Saud Alghumayjan, Ahmad Alabdulkareem, Mansour Alsaleh, and Devavrat Shah, "Next-day Electricity Demand Forecast: A New Ensemble Recommendation System Using Peak and Valley," in IEEE PES ISGT NA 2021.

In Preparation

- [4] **Meshal Alharbi**, Mardavij Roozbehani, and Munther Dahleh, "Sample Efficient Reinforcement Learning in Continuous Spaces Through State Aggregation."
- [5] Abdulrahman Alabdulkareem, **Meshal Alharbi**, Noor Almazroa, Boris Katz, and Andrei Barbu, "Identifying Symbolic Communication in Simulated Environments by Bayesian Modeling."