Armin Norouzi

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SKILLS

Programming Languages: MATLAB (Expert), Python (Expert), R (Intermediate), SQL (Intermediate), C++ (Beginner)
General: LaTeX, Git, Jupyter Notebook, Google Colab, SQLite
Python Libraries: Scikit-learn (Expert), Keras (Expert), TensorFlow (Expert), NLTK (Intermediate), Pandas (Expert), NumPy (Expert)
Soft Skills: Time management, Teamwork, Communication, Problem-solving, Creativity, Leadership

EDUCATION

Ph.D. Candidate, Mechanical Engineering 3.8/4.0 May 2018 – Expected completion date: August 2022
Univ. of Alberta, Edmonton, AB / Thesis: Machine Learning and Deep Learning for Modeling and Control of Combustion Engines

MSc., Mechanical Engineering, Vehicle Dynamics and Control 4.0/4.0 | Ranked 1st September 2014 – February 2017
K.N. Toosi University of Technology, Tehran, Iran / Thesis: Autonomous Vehicle Navigation using Fuzzy-based Nonlinear Control

BSc., Mechanical Engineering 3.28/4.0 September 2010 – August 2014
University of Tabriz, Tabriz, Iran

SELECTED WORK EXPERIENCE

Machine Learning Researcher at **Energy Mechatronics Lab** (Univ. of Alberta) May 2018 – April 2022
- Developed deep reinforcement learning to minimize engine emission and fuel consumption by enforcing safety constraints
- Robotic manipulator control using model-free fuzzy iterative learning control with real-time implementation (link) (link)
- Supervised two graduate students' master of engineering capstone projects in the field of machine learning-based modeling

Visiting Researcher at **Mechatronics in Mobile Propulsion** (RWTH Aachen Univ.) January 2022 – April 2022
- Developed a dynamics emission model using Long-Short Term Memory (LSTM) with a prediction accuracy of 96% (link)
- Novel systematic optimization by augmenting LSTM model cell states in optimal control optimization problem to minimize engine emission and fuel consumption
- Developed an imitation of the optimal controller using a deep neural network and replacing with online optimization to increase optimization speed by 50 times faster (link) (link)

Machine Learning Consultant at **IAV GmbH** January 2021 – December 2021
- Developed a systematic method using K-means clustering algorithm to select the best developed ML model (SVM, decision tree, ensemble trees, GPR, and ANN) for engine emission according to the application of model (link) (link)

Machine Learning Consultant at **Cummins** November 2020 – January 2021
- Analyzed state-of-the-art literature in the field of AI for automotive applications for Cummins R&D (link)
- Critical reviews of existing methods for implementing real-time state-of-the-art ML algorithms to provide a technical report for the R&D team to help them to set the future direction of the company to achieve next-generation AI-powered engine

Teaching Assistant at **University of Alberta** September 2018 – December 2021
- Leaded 6 undergrad and 2 grad courses with up to 60 students, including lab sessions, seminars, workshops, and lectures
- Lectured multiple sessions on theoretical machine learning with hands-on implementation in Python and MATLAB

Autonomous Driving Researcher at **K.N. Toosi University of Technology** September 2014 – February 2017
- Designed and simulated intelligent control for an autonomous vehicle in MATLAB/Simulink and CarSim co-simulation (link) (link)
- Supervised an undergraduate capstone project in the field of vehicle dynamics control of an autonomous vehicle (link)

SELECTED PROJECTS

- Developing graduate machine learning course material (GitHub repository) June 2021 – March 2022
  Univ. of Alberta, Edmonton, AB, MECE 610 course: Machine Learning Control (40 graduate students each semester)
  - o Implement ML basics, ANN, SVM, and deep learning from scratch with details of optimization techniques
  - o Developed scikit-learn, Tensorflow, and Matlab tutorial with examples of engineering applications in google collaboratory
  - o Developed reinforcement learning and optimal control tutorial along with hands-on examples
- CodeCademy deep learning course capstone projects November 2021
  - Built deep learning classifier using TensorFlow with Keras to predict forest cover type based only on cartographic variables with an average accuracy of 85% and an f1-score of 0.85 for 8 classes (GitHub repository)
  - CNN-based classification of Covid-19 and Pneumonia person based on X-ray lung scans (GitHub repository)
- IBM applied data science capstone project: Edmonton's Best neighborhood (GitHub repository) March 2021
  - o Deployed web scraping using the beautiful soup package of Python to collect neighborhood information of Edmonton
  - o Employed Foursquare API to mine features of Edmonton's neighborhood and identified similar neighborhoods

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SELECTED HONORS AND AWARDS

- Martha Piper Award for Research Communication Excellence — February 2022
- Alberta Graduate Excellence Scholarship ($12,000) — November 2021
- Mojgan Daneshmand Pedram Mousavi and Flight PS752 Memorial Graduate Scholarship ($20,000) — September 2021
- Alberta Innovates Graduate Student Scholarship - Data-Enabled Innovation ($31,000) — November 2020

SELECTED PROFESSIONAL AND VOLUNTEER ACTIVITIES

- Journal and conference reviewer — August 2017– Present
  - 40+ reviews in IEEE, Elsevier, ASME, Springer, Wiley, and Sage journals and conferences such as IFAC conferences
- Judge for the undergraduate capstone project, MEC E Department, University of Alberta — April 2021
  - Reviewed and scored 10+ projects related to robotic, control, and machine learning
- President of International Society of Automation- Univ. of Alberta student section — June 2019 – July 2020
  - Supervised the ISA-UofA team throughout a year and planned for student automation and robotic challenge
  - Communicated with both ISA headquarters and student services on campus to update the new bylaw of the student group

SELECTED PUBLICATIONS (Machine Learning)

- Norouzi, Armin, Saeid Shahpouri, David Gordon, Alexander Winkler, Eugen Nuss, Mahdi Shahbakhti, and Charles Robert Koch. "Machine Learning Integrated with Model Predictive Control for Imitative Optimal Control of Compression Ignition Engines." arXiv preprint arXiv:2204.00142 (2022)- Submitted to 10th Symposium on Advances in Automotive Control (AAC22) on March 4, 2022. (link)
- Norouzi, Armin, Saeid Shahpouri, David Gordon, Alexander Winkler, Eugen Nuss, Dirk Abel, Jakob Andert, Mahdi Shahbakhti, and Charles Robert Koch. "Integration of Deep Learning and Nonlinear Model Predictive Control for Emission Reduction of Compression Ignition Combustion Engines: A Simulation Study." arXiv preprint arXiv:2204.00139 (2022) - Submitted to Control Engineering Practice on March 8, 2022. (link)
- Norouzi, Armin, Saeid Shahpouri, David Gordon, Mahdi Shahbakhti, and Charles Robert Koch., Safe Deep Reinforcement Learning in Diesel Engine Emission Control, Submitted to Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering on April 3, 2022.
- Norouzi, Armin, Hamed Heidarifar, Mahdi Shahbakhti, Charles Robert Koch, and Hoseinali Borhan. "Machine Learning and Model Predictive Control Integration in Automotive Control System: A review and future directions, Submitted to Control Engineering Practice on February 25, 2022.
- Norouzi, Armin, Hamed Heidarifar, Mahdi Shahbakhti, Charles Robert Koch, and Hoseinali Borhan. "Model predictive control of internal combustion engines: a review and future directions." *Energies* 14, no. 19 (2021): 6251. (link)
- Shahpouri, Saeid, Armin Norouzi, Christopher Hayduk, Reza Rezaei, Mahdi Shahbakhti, and Charles Robert Koch. "Hybrid Machine Learning Approaches and a Systematic Model Selection Process for Predicting Soot Emissions in Compression Ignition Engines." *Energies* 14, no. 23 (2021): 7865. (link)
- Gordon, David, Armin Norouzi, Gero Blomeyer, Julian Bedei, Masoud Aliramezani, Jakob Andert, and Charles R. Koch. "Support vector machine based emissions modeling using particle swarm optimization for homogeneous charge compression ignition engine." *International Journal of Engine Research* (2021): 14680874211055546. (link)
- Shahpouri, Saeid, Armin Norouzi, Christopher Hayduk, Reza Rezaei, Mahdi Shahbakhti, and Charles Robert Koch. "Soot emission modeling of a compression ignition engine using machine learning." *IFAC-PapersOnLine* 54, no. 20 (2021): 826-833. (link)
- Aliramezani, Masoud, Armin Norouzi, and Charles Robert Koch. "A grey-box machine learning based model of an electrochemical gas sensor." *Sensors and Actuators B: Chemical* 321 (2020): 128414. (link)

SELECTED PUBLICATIONS (Autonomous Driving)

- Norouzi, Armin, Ali Barari, and Hadi Adibi-Asl. "Stability control of an autonomous vehicle in overtaking maneuver using wheel slip control." International Journal of Intelligent Transportation Systems Research 18, no. 2 (2020): 320-330. (link)
- Norouzi, Armin, Reza Kazemi, and Shahram Azadi. "Vehicle lateral control in the presence of uncertainty for lane change maneuver using adaptive sliding mode control with fuzzy boundary layer." Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering 232, no. 1 (2018): 12-28. (link)
- Norouzi, Armin, Milad Masoumi, Ali Barari, and Saina Farrokhpour Sani. "Lateral control of an autonomous vehicle using integrated backstepping and sliding mode controller." *Proceedings of the Institution of Mechanical Engineers, Part K: Journal of Multi-body Dynamics* 233, no. 1 (2019): 141-151. (link)
- Norouzi, Armin, Reza Kazemi, and Omid Reza Abbassi. "Path planning and re-planning of lane change manoeuvres in dynamic traffic environments." *International Journal of Vehicle Autonomous Systems* 14, no. 3 (2019): 239-264. (link)