Armin Norouzi, M.Sc., E.I.T

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QUALIFICATIONS

- 6+ years of experience in control system design in the domain of automotive control systems
- 3+ years of experience in machine learning and deep learning for modeling and control of engineering systems
- Expertise and detailed knowledge in software and hardware components of real-time control systems
- Excellent programming, modeling, and simulation skills in Python and MATLAB/Simulink
- 20+ peer-review journal and conference publications with 180+ citations and an h-index of 7 and i-index of 6
- Excellent teamwork skills with both academia and industry partners, strong analytical skills with the ability to improve research procedures, fast learner, and highly motivated in learning new technologies

EDUCATION

Ph.D. Candidate, Mechanical Engineering May 2018 – Present

University of Alberta, Edmonton, AB

- GPA: 3.8/4.0 | Expected completion date: August 2022
- Thesis: Machine Learning and Deep Learning for Modeling and Control ofInternal Combustion Engines

MSc., Mechanical Engineering, Vehicle Dynamics and Control September 2014 – February 2017

K.N. Toosi University of Technology, Tehran, Iran

- GPA: 4.0/4.0 | Ranked 1st
- Thesis: Path Planning and Navigation of a Vehicle with Drowsy Driving Situation

BSc., Mechanical Engineering September 2010 – August 2014

University of Tabriz, Tabriz, Iran

- GPA: 3.28/4.0

WORK EXPERIENCE

Doctoral Researcher May 2018 – Present

Energy Mechatronics Lab, University of Alberta, Edmonton, AB

- Developed machine learning and deep learning for controlling and modeling internal combustion engines
- Set up experimental rapid prototyping systems using MicroAutoBox - dSPACE to implement controllers in real-time
- Designed and implemented AI to minimize fuel consumption and emission of diesel and H2/Diesel dual-fuel engine
- Cooperated with RWTH Aachen University and companies such as IAV and Cummins
- Supervised two MEng students capstone projects on H2/Diesel dual-fuel and HCCI engine modeling

Teaching Assistant September 2018 – December 2021

Faculty of Engineering, University of Alberta, Edmonton, AB

- Leaded 6 undergraduate courses with up to 60 students, including lab sessions and seminars
  - Updated course material for online delivery due to the COVID19 online classes
  - Transferred course example simulation to Python using Jupyter notebook
- Leaded 2 graduate courses classes, including seminars, workshops, and lectures
  - Designed and developed Machine Learning and Deep Learning examples in Python and MATLAB
  - Developed course material for Machine Learning Control with Engineering Applications course
  - Lectured multiple sessions on theoretical machine learning and implementation in Python and MATLAB
  - Supervised students' course project on robotic, automotive control systems, and aerospace propulsion

Research Assistant September 2014 – February 2017

Dep. of Mechanical Engineering, K.N. Toosi University of Technology, Tehran, Iran

- Designed and simulated nonlinear control for an autonomous vehicle in MATLAB/Simulink and CarSim co-simulation
- Supervised an undergraduate capstone project in the field of vehicle dynamics control

Teaching Assistant September 2015 – December 2016

Dep. of Mechanical Engineering, K.N. Toosi University of Technology, Tehran, Iran

- Leaded 2 graduate courses classes including seminars and lectures on dynamic, vibration, and engineering mathematics
- Documented a tutorial for 20-sim software to develop Bond graph models

SKILLS

Programming Languages: MATLAB, MATLAB/Simulink, Python, R, SQL, C++
Engineering Software: CarSim/TruckSim, CATIA, ANSYS, SOLIDWORKS, 20-sim, ROS
General: LaTeX, Jupyter Notebook, Google Colab, SQLite, IBM Watson Studio, MS Office, Git, Amazon Web Services (AWS)
Libraries: Scikit-learn, Keras, TensorFlow, Pandas, Dash, SciPy

norouzi@ualberta.ca **Armin Norouzi**

CERTIFICATES

- Learn SQL Course by Codecademy in December 2021
- Build Deep Learning Models with TensorFlow by Codecademy in November 2021
- Build a Machine Learning Model with Python by Codecademy in November 2021
- Learn C++ by Codecademy in November 2021
- Probability Course by Codecademy in November 2021
- Deep Learning Specialization by deeplearning.ai on Coursera in August 2021 (including 5 courses)
- Reinforcement Learning Specialization by the University of Alberta and AMII on Coursera in April 2021 (including 4 courses)
- IBM Data Science Professional Certificate by IBM on Coursera in March 2021 (including 10 courses)
- Digital Signal Processing by EPFL on Coursera in December 2019

HONORS & AWARDS

- Alberta Graduate Excellence Scholarship ($12,000) November 2021
- Sadler Graduate Scholarship in Mechanical Engineering ($12,000) October 2021
- Mojgan Daneshmand Pedram Mousavi and Flight PS752 Memorial Graduate Scholarship ($20,000) September 2021
- Best presentation award, Autonomous Systems Initiative Annual Symposium June 2021
- Alberta Innovates Graduate Student Scholarship - Data-Enabled Innovation ($31,000) November 2020
- J.R. (Bob) Connell Memorial Scholarship July 2019 & 2020

PROFESSIONAL & 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 projects related to robotic, control, and energy
- Faculty of Graduate Studies and Research, University of Alberta September 2020 – August 2021
  - Representative of GSA in FGSR council and academic appeals committee
- Graduate Students' Association, University of Alberta, Edmonton, Canada June 2019 – July 2021
  - Representative of the postgraduate students in GSA council and governance committee of GSA
- MEGSA, University of Alberta, Edmonton, Canada November 2018 – October 2021
  - Organized multiple workshop series, industrial speech, and game sessions for graduate students
- President of ISA University of Alberta Student Section, Edmonton, Canada July 2019 – July 2020
  - Supervised and collaborated effectively with the team and planned for student robotic challenge

SELECTED PROJECTS

- Build Deep Learning Models with TensorFlow Projects (CodeCademy) November 2021
  - Built deep learning classifier using TensorFlow with Keras to predict forest cover type based only on cartographic variables
  - CNN-based classification of Covid-19 and Pneumonia based on X-ray lung scans using TensorFlow with Keras
- IBM Applied Data Science Capstone project: Edmonton's Best neighborhood March 2021
  - Deployed web scraping using beautiful soup package of Python to collect Neighborhood name, postal code, and locations
  - Employed Foursquare API to mine features of Edmonton's neighborhood and deployer K-means clustering algorithm
- Technical report: AI and MPC Applications for Engine Control and Calibration November 2020 – February 2021
  - Analyzed state-of-the-art literature in the field of AI and MPC for ICE applications in collaboration with Cummins
  - Critical reviews of existing methods for implementing real-time MPCs on ICEs
  - Identified promising ML methods to address ICE challenges
- Traffic Flow Nonlinear Control Using PDE Control Theory January 2019 – April 2019
  - Boundary Control of first-order hyperbolic PDE model in traffic flow using Backstepping Boundary Feedback Control
- Temporal-Spatial Parameters In In-line Roller Skating Using Wearable Sensors January 2019 – April 2019
  - Designed FIR and IIR filter to reduce noise in acceleration measured by Inertial Measurement Units (IMUs)
- Robotic Manipulator Control Using PD-type Fuzzy Iterative Learning Control September 2019 – December 2019
  - Designed learning base control by modifying learning rate using a fuzzy logic system for robotic manipulator system
- Vehicle Lane Keeping Assist Control Using Adaptive Control November 2015 – February 2016
  - Developed lane keeping control system using Model Reference Adaptive Controllers (MRACs) with Lyapunov stability proof
  - Simulated controller using CarSim and Matlab/Simulink co-simulations
- Modeling and Simulation of Active Suspension System using BondGraph approach November 2015 – February 2016
  - Modeled vehicle suspension system using BondGraph method and simulated using 20-sim software

JOURNAL PUBLICATIONS

- S. Shahpouri, **A. Norouzi**, C. Hayduk, R. Rezaei, M. Shahbakhti, and C. R. Koch, Hybrid Machine Learning approaches and a systematic model selection process for predicting soot emissions in compression ignition engines, *Energies,*14(23) (2021), 7865.
- D. Gordon, **A. Norouzi**, G. Blomeyer, J. Bedei, M. Aliramezani, J. Andert, and C.R. Koch, Support Vector MachineBased Emissions Modeling using Particle Swarm Optimization for Homogeneous Charge Compression Ignition Engine, International Journal of Engine Research, OnlineFirst, November 2021.
- **A. Norouzi**, H. Heidarifar, A. Borhan, M. Shahbakhti, C.R. Koch, Application of Model Predictive Control for Internal Combustion Engines (ICEs) Control: A review and future directions, *Energies*, 14(19) (2021): 6251.
- **A.Norouzi**, M. Aliramezani, C.R. Koch, A correlation-based model order reduction approach for a diesel engine NOx and BMEP dynamic model using machine learning, *International Journal of Engine Research*, 22.8 (2021): 2654-2672.
- M. Aliramezani, **A.Norouzi**, C.R. Koch, A grey-box machine learning-based model of an electrochemical gas sensor, *Sensors and Actuators B: Chemical* 321 (2020): 128414.
- **A.Norouzi**, H. Adibi-Asl, R. Kazemi, P. Fathi, Adaptive sliding mode control of a four-wheel-steering autonomous vehicle with uncertainty using parallel orientation and position control, *International Journal of Heavy Vehicle Systems (IJHVS)*, Vol. 27, No. 4, 2020.
- **A.Norouzi**, A. Barari, H. Adibi-Asl, Stability Control of an Autonomous Vehicle in Overtaking Manoeuvre Using WheelSlip Control, *International Journal of Intelligent Transportation Systems Research*, 18.2 (2020): 320-330.
- **A.Norouzi**, R. Kazemi, O. R. Abbasi, Path planning and re-planning of lane change maneuvers in dynamic traffic environments, *International Journal of Autonomous Vehicle Systems (IJAVS)*, 2019 May 17;14(3):239-64.
- **A.Norouzi**, M. Masoumi, A. Barari, S. F. Sani, Lateral control of an autonomous vehicle using integrated backstepping and sliding mode controller, *Proc. IMechE, Part K: Journal of Multi-body Dynamics*, 2019 Mar;233(1):141-51.
- **A.Norouzi**, R. Kazemi, Sh. Azadi, Vehicle lateral control in the presence of uncertainty for lane change maneuver using adaptive sliding mode control with fuzzy boundary layer, *Proc. IMechE, Part I: Journal of Systems and Control Engineering*, 2018 Jan;232(1):12-28.

PEER-REVIEWED CONFERENCE PUBLICATIONS

- S. Shahpouri, **A.Norouzi**, C. Hayduk, R. Rezaei, M. Shahbakhti, and C. R. Koch, Soot emission modeling of a compression ignition engine using machine learning, *Modeling, Estimation, and Control Conference (MECC 2021)*, University of Texas at Austin, Texas, United States.
- **A.Norouzi**, D. Gordon, M. Aliramezani, C.R. Koch, Machine Learning-based Diesel Engine-Out NOx Reduction Using a plug-in PD-type Iterative Learning Control, *4th IEEE Conference on Control Technology and Applications (CCTA 2020)*, Montreal, QB, Canada.
- **A.Norouzi**, C.R. Koch, Integration of PD-type iterative learning control with adaptive sliding mode control, *IFAC World Congress 2020*, July 12-77, 2020, Berlin, Germany.
- M. Aliramezani, **A.Norouzi**, C.R. Koch, Support vector machine for a diesel engine performance and NOx emission control-oriented model, IFAC World Congress 2020, July 12-77, 2020, Berlin, Germany.
- **A.Norouzi**, KH. Ebrahimi, C.R. Koch, Integral Discrete-time Sliding Mode Control of Homogeneous Charge Compression Ignition (HCCI) Engine Load and Combustion Timing, *9thSymposium on Advances in Automotive Control (AAC19)*, June 23-27, 2019, Orleans, France.
- **A.Norouzi**, C.R. Koch, Robotic manipulator control using PD-type fuzzy iterative learning control, *32nd Canadian Conference on Electrical & Computer Engineering (CCECE)*, May 5-8, 2019, Edmonton, AB, Canada.

MANUSCRIPTS IN PREPARATION

- **A. Norouzi**, S. Shahpouri, M. Shahbakhti, and C. R. Koch, Diesel Engine Emission Control Using Safe Deep Reinforcement Learning, Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering (Work in progress).
- **A. Norouzi**, S. Shahpouri, D. Gordon, A. Winkler, E. Nuss, M. Shahbakhti, and C. R. Koch, Integration of Deep Learning and Model Predictive Control emission reduction of Compression Ignition Combustion Engines, Mechatronics (Work in progress).
- **A. Norouzi**, S. Shahpouri, D. Gordon, A. Winkler, E. Nuss, M. Shahbakhti, and C. R. Koch, Integration of Machine Learning and Model PredictiveControl in Compression Ignition Combustion Engines Control,10thSymposium on Advances in Automotive Control (AAC22) (Work in progress).
- **A. Norouzi**, H. Heidarifar, A. Borhan, M. Shahbakhti, C.R. Koch, Application of integration of Model Predictive Control and Machine Learning Automotive Control System: A review and future directions, Control Engineering Practice (Work in progress).