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

Ph.D. Candidate in Mechanical Engineering
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EDUCATION

- **Ph.D. Candidate in Mechanical Engineering** May 2018 - Present
  University of Alberta, Edmonton, Canada
  - Thesis: Emission control of the internal combustion engine using AI/ML approaches
  - GPA: 3.8/4 | Expected completion date: Dec 2022
- **M.Sc. in Mechanical Engineering, Vehicle Dynamics and Control** Sep 2014 - Feb 2017
  K.N. Toosi University of Technology, Tehran, Iran
  - Thesis: Designing the desired path and navigating the vehicle in drowsy driving situation
  - GPA: 4/4 | Ranked 1st
- **B.Sc. in Mechanical Engineering** Sep 2010 - Aug 2014
  University of Tabriz, Tabriz, Iran
  - Thesis: Design and numerical analysis of composite pressure vessel
  - GPA: 3.28/4 | Ranked 17th among 111 students

ACADEMIC EXPERIENCE

- **Doctoral Researcher** May 2018 - Present
  University of Alberta, Edmonton, Canada
  - 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** May 2018 - Present
  University of Alberta, Edmonton, Canada
  - 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** Sep 2014 - Feb 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** Sep 2015 - Dec 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

HONORS & AWARDS

- **Sadler Graduate Scholarship in Mechanical Engineering** Oct 2021
  The Sadler Graduate Scholarship in Mechanical Engineering is awarded annually to five full-time students in master's or doctoral programs in Mechanical Engineering. Selection is made on the basis of academic merit, creativity, and intellectual curiosity.

- **Mojgan Daneshmand Pedram Mousavi and Flight PS752 Memorial Graduate Scholarship** Sept 2021
  The selection Criterion for this award are based on academic standing research potential and demonstrated involvement in community leadership.
- **Best presentation award, Autonomous Systems Initiative Annual Symposium** Jun 2021
  Presentation title: AI-based Advance Control Methods for next generation combustion engines.
- **Alberta Innovates Graduate Student Scholarship - Data-Enabled Innovation** Nov 2020
  This award is designed to enable promising students to succeed in the Emerging Technology Area of Data-enabled Innovation including artificial intelligence, machine learning, and data analytics.
- **J.R. (Bob) Connell Memorial Scholarship (two times)** Jun 2019-July 2020
  International Society of Automation (ISA) - Edmonton Section

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, IBM Watson Studio, MS Office, Git
- **Libraries:** Scikit-learn, Keras, TensorFlow, Pandas, Dash, SciPy

CERTIFICATIONS

- **Deep Learning Specialization** by deeplearning.ai on Coursera in August 20, 2021 (including 5 courses).
- **Reinforcement Learning Specialization** by University of Alberta and Alberta Machine Intelligence Institute (AMII) on Coursera in April 2021 (including 4 courses).
- **IBM Data Science Professional Certificate** by IBM on Coursera in March 2021 (including 10 courses).
- **Complete Python Bootcamp** by Chris Croft on Udemy in May 2020.
- **Digital Signal Processing** by École Polytechnique Fédérale de Lausanne (EPFL) on Coursera in December 2019.
- **The Complete Product Management** by Charles Du on Udemy in November 2019.
- **Control of Mobile Robots** by Georgia Institute of Technology on Coursera in June 2019.
- **Leadership: Practical Leadership Skills** by Chris Croft on Udemy in June 2019.
- **Python Data Structures** by University of Michigan on Coursera in June 2019.
- **Machine Learning** by Stanford University on Coursera in May 2019.
- **Managing Major Engineering Projects Specialization** by University of Leeds on Coursera in Dec 2018 (including 3 courses)

PUBLICATIONS

Peer-reviewed journal papers:

1. D.C. Gordon, **A. Norouzi**, G. Blomeyer, J. Bedei, M. Aliramezani, J. Andert, and C.R. Koch, Support Vector Machine Based Emissions Modeling using Particle Swarm Optimization for Homogeneous Charge Compression Ignition Engine, *International Journal of Engine Research* (In press- accepted for publication).
2. **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.
3. **A. Norouzi**, M. Aliramezani, C.R. Koch, A correlation based model order reduction approach for a diesel engine $\mathrm{NO_x}$ and BMEP dynamic model using machine learning, *International Journal of Engine Research*, 22.8 (2021): 2654-2672.
4. 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.
5. **A. Norouzi**, A. Barari, H. Adibi-Asl, Stability Control of an Autonomous Vehicle in Overtaking Manoeuvre Using Wheel Slip Control, *International Journal of Intelligent Transportation Systems Research*, 2019, P 1-11.
6. **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*, 2019 May 17;14(3):239-64.
7. **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.

8. **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.
9. **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.
10. H. Biglari, **A. Norouzi**, Design and Numerical Analysis of Composite Pressure Vessel based on Unit Load Method, *Journal of Mechanical Engineering, University of Tabriz*, 2015, page 1-13 (In Persian).

Peer-reviewed conference papers:

1. 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*. (Accepted).
2. **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, *4^{th} IEEE Conference on Control Technology and Applications (CCTA 2020)*, Montreal, QB, Canada.
3. **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.
4. M. Aliramezani, **A. Norouzi**, C.R. Koch, Support vector machine for a diesel engine performance and $\mathrm{NO_x}$emission control-oriented model, *IFAC World Congress 2020*, July 12-77, 2020, Berlin, Germany.
5. **A. Norouzi**, KH. Ebrahimi, C.R. Koch, Integral Discrete-time Sliding Mode Control of Homogeneous Charge Compression Ignition (HCCI) Engine Load and Combustion Timing, *9^{th} Symposium on Advances in Automotive Control (AAC19)*, June 23-27, 2019, Orleaon, France.
6. **A. Norouzi**, C.R. Koch, Robotic manipulator control using PD-type fuzzy iterative learning control, *32^{nd} Canadian Conference on Electrical & Computer Engineering (CCECE)*, May 5-8, 2019, Edmonton, AB, Canada.

Submitted manuscript:

1. 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* (Submitted: Oct 20, 2021).
2. **A. Norouzi**, H. Heidarifar, A. Borhan, M. Shahbakhti, C.R. Koch, Application of integration of Model Predictive Control and Machine Learning in Automotive Control System: A review and future directions, *Control Engineering Practice* (Work in progress).
3. **A. Norouzi**, S. Shahpouri, D. Gordon, A. Winkler, E. Nuss, M. Shahbakhti, and C. R. Koch, Integration of Machine Learning, Deep Learning, and ModelPredictive Control in Emission reduction of Compression Ignition Combustion Engines, (Work in progress).

Posters & non-refereed conference papers :

1. D. Gordon, **A. Norouzi**, C.R. Koch, AI-based Advance Control Methods for next generation combustion engines,*2021 Future Energy Systems Research Symposium, Sept 20, 2021*, September 20, 2021, Edmonton, Canada.
2. D. Gordon, **A. Norouzi**, C.R. Koch,AI-based Advance Control Methods for next generation combustion engines,*Autonomous Systems Initiative (ASI) Annual Symposium*, June 2, 2021, Edmonton, Canada (Best presentation award).
3. **A. Norouzi**, M. Shahbakhti, C.R. Koch, Machine Learning-Based Diesel Engine-Out Emissions Model and Control Using the Learning-Based Control Technique,*WCX SAE World Congress*, April 13, 2021, Detroit, USA.
4. M. Aliramezani, **A. Norouzi**, D. Gordon, C.R. Koch, Emission reduction of internal combustion engines with advanced control and machine learning techniques, *Future Energy Systems Real World Industry Mixer*, Feb 20, 2020.
5. D. Gordon, **A. Norouzi**, M. Aliramezani, C.R. Koch, Combustion Control Research –*University of Alberta, Canadian Graduate Engineering Consortium*, Sept 2019
6. M. Aliramezani, **A. Norouzi**, C.R. Koch, R. E. Hayes, A control oriented diesel engine NOx emission model for on board diagnostics and engine control with sensor feedback, *Proceedings of Combustion Institute Canadian Section (CICS)*, May 13-16, 2019, Kelowna, BC, Canada.

7. **A. Norouzi**, M. Aliramezani, C.R. Koch, Diesel Engine NOx Reduction Using a PD-type Fuzzy Iterative Learning Control with a Fast Response NOx Sensor, *Proceedings of Combustion Institute Canadian Section (CICS)*, May 13-16, 2019, Kelowna, BC, Canada.
8. D. Gordon, **A. Norouzi**, M. Aliramezani, C.R. Koch, Real-time Engine Control Utilizing Emission Measurement with FPGA Controller, *2^{nd} annual Future Energy Systems Open house*, Oct 3, 2018

PROFESSIONAL & VOLUNTEER ACTIVITIES

- Journal and conference reviewer Aug 2017 - Present
  - 40+ reviews in IEEE, Elsevier, ASME, Springer, Willey, and Sage journals and conferences such as IFAC conferences
- Judge for the undergraduate capstone project, MEC E Department, University of Alberta Apr 2021
  - Reviewed and scored projects related to robotic, control, and energy
- Faculty of Graduate Studies and Research (FGSR), University of Alberta, Edmonton, Canada Sep 2020 - Aug 2021
  - Graduate students representative FGSR academic appeals committee
  - Graduate students representative voting member in FGSR council
- Graduate Students' Association (GSA), University of Alberta, Edmonton, Canada Jan 2020 - July 2021
  - Member of Governance Committee (GSA GC) of Graduate Students' Association (GSA)
  - Councillor-at-Large (CAL) of Graduate Students' Association (GSA) Council
- Mechanical Engineering Graduate Students' Association (MEGSA), University of Alberta, Edmonton, Canada Nov 2019 - Aug 2021
  - Organized multiple workshop series, industrial speech, and game sessions for graduate students
  - Vice-President Academic and Vice-President Even
- President of International Society of Automation (ISA)-UofA Student Section July 2019 - July 2020

PROFESSIONAL MEMBERSHIPS

- **APEGA** (Association of Professional Engineers and Geoscientists of Alberta) 2020 - Present
- **IEEE** (Institute of Electrical and Electronics Engineers) - student member 2018 - Present
  - Control Systems Society (CSS), Vehicular Technology Society (VTS), Robotics and Automation Society (RAS)
- **AMSE** (American Society of Mechanical Engineers) - student member 2019 - Present
- **SAE** (Society of Automotive Engineers) - student member 2020 - Present