ARASH JALIL KHABBAZI
LinkedIn | GitHub | Website

Curriculum Vitae

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EDUCATION

University of British Columbia (UBC), Kelowna, Canada — *May 2021 – Present*

- M.A.Sc. in Mechanical Engineering
  GPA: 4.3/4.3 (94/100)
  Thesis: *Mixing Hydrogen into a Natural Gas Distribution Pipeline through a Tee Junction: A case study in British Columbia for reducing GHG emissions*
  Adviser: Sunny Ri Li
  Industry partners: Renewable Gas Supply, FortisBC

University of Tabriz, Tabriz, Iran — *Sep 2016 – Aug 2020*

- B.Sc. in Mechanical Engineering
  GPA: 4.0/4.0 (19.12/20) (95.6/100), *Rank: **2**nd/124*
  Thesis: *Thermodynamic and exergy analysis of Kalina cycle system 11 and a new type with three pressure levels*
  Thesis grade: 100/100, (Received distinctions)
  Adviser: Seyed Mohammad Seyed Mahmoudi

Shahid Madani I (NODET), Tabriz, Iran — *Sep 2012 – Sep 2016*

- High School, Mathematics and Physics
  GPA: 19.55/20 (97.75/100)

RESEARCH INTERESTS

Machine Learning, High-performance Computing, Turbulence, Multiphase Flows, Energy Systems

JOURNAL ARTICLES

[1] A. J. Khabbazi, R. Li, V. Chou, and J. Quinn, "Integration of Hydrogen into Distribution and Transmission Gas Pipelines in British Columbia via T-junctions for GHG emissions reduction," **submitted** to the International Journal of Hydrogen Energy, **May 2023**.

[2] A. J. Khabbazi, R. Li, V. Chou, and J. Quinn, "On the Analysis of Mixing Homogeneity of Hydrogen and Methane in the Vertical Low-pressure Pipes," **to be submitted**.

CONFERENCE PROCEEDINGS

[1] A. J. Khabbazi, M. Zabihi, R. Li, V. Chou, and J. Quinn, "Blending of Hydrogen into a Natural Gas Distribution Pipeline in British Columbia through a Tee Junction for Reducing GHG Emissions," in Proceedings of the Canadian Society for Mechanical Engineering International Congress, 2023, pp. 1–6., submitted on **Feb 2023**, accepted and to be published, *(link)*.

- ***Third Best** paper awardee*.

[2] A. Khabbazi, R. Li, and J. Quinn, "Green Hydrogen Supply to Urban Infrastructure and Buildings through Blending into the Existing Grid," in Proceedings of the Canadian Society for Mechanical Engineering International Congress, 2022, pp. 1–1., *(Link)*.

- ***Best** presentation of the symposium*.

[3] A. Khabbazi, R. Li, J. Quinn, and M. Hoorfar, "The Blending and Transmission of Hydrogen and Natural Gas in Transmission and Distribution Pipelines," in Proceedings of the 13th International Green Energy Conference, 2021, pp. 1–1., *(Link)*.

RESEARCH

Graduate RA at the School of Engineering, — *Jul 2021 – Present*
UBC, Supervisor: Prof. Sunny Ri Li

- Summary: A numerical study on blending 5-20%mol hydrogen via Tee junctions into the existing natural gas pipeline infrastructure within BC to reduce GHG emissions is conducted. Multi-species ideal/real gas equations of state (EoS) and mixing/combining rules are developed separately via C and compiled into ANSYS Fluent. The impacts of the momentum ratio of two streams, turbulent diffusion, and buoyancy forces on the possible stratification within the pipelines are investigated. Different cases are proposed and studied to achieve an immediate homogeneous mixture following the hydrogen injection.

Undergrad RA at the Department of Mechanical Engineering, — *Dec 2019 – May 2020*
UofTabriz, Supervisor: Prof. Seyed Mohammad Seyed Mahmoudi

- Summary: Comparing the efficiency of Kalina cycle system 11 (KCS11) and Kalina cycle system 111 (KCS111) based on different decision variables. The results were compared with some benchmarks in the literature. From a thermodynamics perspective, and apart from KCS111's complex configuration and high costs, it is more efficient than the base cycle, KCS11.

HONORS & AWARDS

- Third Best Paper Award at CSME 2023 International Congress, *(Certificate in)* — *CSME, 2023*
- Best Presentation Award at CSME 2022 International Congress, *(Certificate in)* — *CSME, 2022*
- Graduate Research Scholarship, 3,000 CAD — *UBC, 2022*
- Graduate Dean's Entrance Scholarship, 5,000 CAD — *UBC, 2021*
- Fully-funded graduate student in Mechanical Engineering, 26,000 CAD/year — *UBC, 2021*
- Merit-based admission to M.Sc. studies from distinguished universities in Iran, including, Sharif University of Technology, University of Tehran, and University of Tabriz — *BSc, 2020*
- 2^{nd} place among 124 B.Sc. students of Mechanical Engineering, class 2016 entry — *BSc, 2020*

TEACHING

- APSC172 | Engineering Analysis I, *Role: Tutorial instructor*, MASc — *Fall'21, Fall'22*
- ENGR385 | Heat Transfer Applications, *Role: Lab instructor*, MASc — *Winter'22, Winter'23*
- ENGR310 | Fluid Mechanics II, *Role: Lab instructor*, MASc — *Fall'21*
- Thermodynamics II, *Role: Course support*, BSc — *Winter'20*
- Computer Programming (C/C++), *Role: Head tutorial instructor*, BSc — *Fall'18, Winter'19, Fall'19*

SKILLS

- Technical Software:
  ANSYS Workbench, OpenFOAM, Fluent Meshing, Tecplot, Paraview, Gmsh, CATIA
- Programming:
  Python, C/C++, Matlab, EES, PyTecplot, Git, HTML
- Frameworks:
  NumPy, Pandas, SKlearn, SciPy, Matplotlib, Seaborn, TensorFlow
- System and computation:
  Linux, High-performance Computing (HPC)

SELECTED COURSES

- Thermofluids (all A+)

  Multiphase Flows | Turbulence | Topics in Engineering - H2NG TRANS * | Heat Transfer I | Fluid Mechanics I&II | Thermodynamics I&II | Refrigeration Systems | Power Plants
- Numerical Analysis (all A+)

  Computational Fluid Dynamics (CFD) | Fundamentals of CFD | Numerical Computations
- Computers and Systems (all A+)

  Applied Machine Learning

COURSE PROJECT

MASc:

- *H2NG TRANS:*
  Developing a novel code via C language, compilable to ANSYS Fluent through Linux and Windows, for Soave-Redlich-Kwong (SRK) Equation of state (EoS) included with Van der Waals linear mixing/combining rules for multi-species mixtures. An advanced version was developed and applied to the MASc thesis later on.
  (sample codes)
- *CFD:*
  Carrying out several Python-based mini-projects such as Wave-convection-inviscid-medium and 2D-flow-square-duct as well as OpenFOAM-based ones, including 2D-lid-driven-cavity-flow, Turbulent-flow-backwards-facing-step, Converging-diverging-nozzle, etc.
  (codes + results)
- *Multi-phase Flows:*
  Studying the linear instability of 2-D inviscid liquid sheets through the representation of results in Matlab. The derivation of dispersion relation for both anti-symmetrical and axi-symmetrical disturbances was carried out, and the instability limits and instability growth rate was also studied.

*Mainly covered advanced thermodynamics topics, e.g., mixing/combining rules, advanced equations of state, etc. The relevant course project is described in the Course Project section.

- *Applied Machine Learning:*
  An ML model was trained, which takes images of Lego pieces on a conveyor belt and classifies them into three different labels. For the stage 1, Lego pieces were ideal without orientation. The images were pre-processed through cropping, gray scaling, and resizing, and a maximum of 64*64 inputs were taken. The final accuracy was 94%. In the stage 2, the pieces were off-centered and oriented in different directions. Through feature engineering, different image-processing techniques in PIL and OpenCV such as edge detection was implemented, and a an accuracy of 80% was achieved.
  (codes + results)

BSc:

- *Heat Transfer I:*
  Simulation of convection and conduction heat transfer in a section of co/counter-current double pipe heat exchanger with periodic BCs
  , via ANSYS Fluent and ANSYS Meshing.
- *Fundamentals of CFD:*
  Steady-state 2-D and 3-D simulation of flow across a fin with different boundary conditions
  , via ANSYS Fluent and Gambit.
- *Mechanical Parts Desgin I:*
  Design, simulation, and fabrication of an electromechanical lift
  , via CATIA, C++, ANSYS Mechanical.
- *Refrigeration Systems:*
  Pinch point analysis of several zeotropic refrigerants
  , via ANSYS Fluent and Matlab NIST REFPROP Database.
- *Design of Mechanisms:*
  Simulation and analysis of a 4-DoF mechanism in a space telescope base
  , via EES and Adams software.

Coursera:

- *Machine Learning*, *(Certificate)*
  Deep learning.AI, *in 33 hours*
- *Introduction to Data Science in Python*, *(Certificate)*
  University of Michigan, *in 31 hours*
- *Applied Plotting & Data Representation in Python*, *(Certificate)*
  University of Michigan, *in 21 hours*, *(codes + results)*
- *Python Data Structures*, *(Certificate)*
  University of Michigan, *in 19 hours*

References

Prof. Sunny Ri Li
Professor of Mechanical Engineering
School of Engineering
The University of British Columbia
Role: Advisor, Instructor, and TA
sunny.li@ubc.ca

Prof. Joshua Brinkerhoff
Associate Professor of Mechanical Engineering
School of Engineering
The University of British Columbia
Role: Committee Member, Instructor, and TA
joshua.brinkerhoff@ubc.ca

Prof. Faramarz Ranjbar
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