KHALED YOUNES

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EDUCATION

Stanford University, Stanford, CA Sept. 2021 – Aug. 2026 (expected)
Ph.D. in Mechanical Engineering
Thesis: Characterizing the Picosecond Dynamics of Liquid Water Subject to Hard X-ray Irradiation
Committee: Mike Dunne, Matthias Ihme, David Reis

University of Waterloo, Waterloo, ON Sept. 2019 – Aug. 2021
M.A Sc. in Mechanical Engineering
Thesis: Velocity Scaling of High-Speed Turbulent Boundary Layer Flows with Wall Heat Transfer
Degree Honors: Finalist for the Alumni Gold Medal & Governor General's Gold Medals

University of Waterloo, Waterloo, ON Sept. 2012 – June 2017
B.A Sc. in Mechanical Engineering
Degree Honors: With Distinction, Dean's Honors List

PUBLICATIONS

[Google Scholar]

17. **K. Younes**, H. Li, A. Majumdar, Y. Sun, P. Ho, T. Osaka, I. Inoue, S. Song, D. Zhu, D. Reis, M. Ihme, "Direct Observation of Radiation Track Formation in the Radiolysis of Liquid Water," (in preparation)

16. M. Asplund, H. Liu, T. Yoon, Y. Liu, R. Wallick, S. Bhattacharyya, X. Cheng, S. Eisenberg, R. England, M. Graßl, ..., **K. Younes**, B. Fingerhut, M. Ihme, T. Elsaesser, M.-F. Lin, B. Schwartz, J. Rouxel, L. Young, "Direct measurement of the structure of the hydrated electron," (in preparation)

15. A. Majumdar, H. Li, Y. Sun, S. Song, G. Vignat, P. Muhunthan, T. Sato, **K. Younes**, A. Halavanau, A. Lutman, D. Sokaras, D. Zhu, M. Ihme, "Emergence of ultrafast collective dynamics from nanostructural heterogeneities in supercritical H2O and D2O," (Under review in Nature Communications)

14. J. Fan, T. Yoon, G. Vignat, H. Li, **K. Younes**, A. Majumdar, P. Muhunthan, D. Sokaras, T. Weiss, I. Rajkovic, M. Ihme, "Supercritical Ethanol-CO_2 Mixtures Exhibit Microscopic Immiscibility: A Combined Study Using X-ray Scattering and Molecular Dynamics Simulations," *J. Phys. Chem. Lett.*, vol. 16, no. 27, 2025. doi:10.1021/acs.jpclett.5c01293

13. P. Muhunthan, A. Majumdar, **K. Younes**, G. Vignat, H. Li, I. Rajkovic, T. Weiss, D. Sokaras, M. Ihme, "A self-consistent analysis of cluster morphology in supercritical carbon dioxide from Small Angle X-ray Scattering," *Chemical Physics Letters*, vol. 876, no. 142190, 2025. doi:10.1016/j.cplett.2025.142190

12. P. Muhunthan, H. Li, G. Vignat, E. R. Toro, **K. Younes**, Y. Sun, D. Sokaras, T. Weiss, I. Rajkovic, T. Osaka, I. Inoue, S. Song, T. Sato, D. Zhu, J. L. Fulton, M. Ihme, "A versatile pressure-cell design for studying ultrafast molecular-dynamics in supercritical fluids using coherent multi-pulse x-ray scattering," *Rev. Sci. Instrum.*, vol. 95, no. 013901, 2024. doi:10.1063/5.0158497

11. **K. Younes**, M. Poli, P. Muhunthan, S. Ermon, M. Ihme, "Autonomous screening of complex phase spaces using Bayesian optimization for SAXS measurements," *Nuclear Inst. and Methods in Physics Research, A*, vol. 1057, no. 168719, 2023. doi:10.1016/j.nima.2023.168719

10. T. Zirwes, G. Vignat, E. R. Toro, E. Boigné, **K. Younes**, D. Trimis, M. Ihme, "Improving volume-averaged simulations of matrix-stabilized combustion through direct X-ray µCT characterization: Application to NH3/H2-air combustion," *Combustion and Flame*, vol. 257, part 2, no. 113020, 2023. doi:10.1016/j.combustflame.2023.113020

9. G. Vignat, T. Zirwes, E. R. Toro, **K. Younes**, E. Boigné, P. Muhunthan, L. Simitz, D. Trimis, M. Ihme, "Experimental and numerical investigation of flame stabilization and pollutant formation in matrix stabilized ammonia-hydrogen combustion," *Combustion and Flame*, vol. 250, no. 112642, 2023. doi:10.1016/j.combustflame.2023.112642

8. **K. Younes** and J.-P. Hickey, "Mean velocity scaling of high-speed turbulent boundary layer flows under nonadiabatic wall conditions," *AIAA Journal*, 2022. doi:10.2514/1.J062547

7. **K. Younes**, B. Gibeau, S. Ghaemi, J.-P. Hickey, "A Fuzzy Cluster Method for Turbulent/Non-Turbulent Interface Detection," *Experiments in Fluids*, vol. 62, no. 73, 2021. doi:10.1007/s00348-021-03169-9.

6. **K. Younes**, A. Grenke, J.-P. Hickey, M. Gagnon, B. Elzein, "Enhanced Delayed Detached Eddy Simulations of Shock-Vector Control," *23rd AIAA International Space Planes and Hypersonic Systems and Technologies Conference*, AIAA 2020-2411. doi:10.2514/6.2020-2411.

5. J.-P. Hickey, **K. Younes**, M. Yao, D. Fan, J. Mouallem, "Targeted turbulent structure control in wall-bounded flows via localized heating," *Physics of Fluids*, vol. 32, no. 035104, 2020. doi:10.1063/1.5144387. **(Featured Article; Highlighted in Scilight)**

4. **K. Younes** and J.-P. Hickey, "Fluidic Thrust Shock-Vectoring Control: A Sensitivity Analysis," *AIAA Journal*, vol. 58, no. 4, 2020. doi:10.2514/1.J058922.

3. **K. Younes** and J.-P. Hickey, "Effects of shear layer growth on the indirect noise in compound nozzles," *Journal of Sound and Vibration*, vol. 468, no. 115090, 2020. doi:10.1016/j.jsv.2019.115090.

2. **K. Younes** and J.-P. Hickey, "Indirect noise prediction in compound, multi-stream nozzle flows," *Journal of Sound and Vibration*, vol. 442, pp. 609–623, 2019. doi:10.1016/j.jsv.2018.10.061.

1. J.-P. Hickey and **K. Younes**, "Path to turbulence in a transitional asymmetric planar wake," *Physics of Fluids*, vol. 31, no. 104107, 2019. doi:10.1063/1.5118891.

CONFERENCE PRESENTATIONS

10. **K. Younes**, M. Poli, P. Muhunthan, S. Ermon, M. Ihme, "Rapid, Online Screening of Complex Phase Spaces Using Bayesian Optimization with Application to SAXS Measurements," *15th International Conference on Synchrotron Radiation Instrumentation*, Hamburg, Germany, Aug. 2024. **(Invited)**

9. **K. Younes**, H. Li, Y. Sun, S. Song, T. Osaka, I. Inoue, M.-F. Lin, P. Ho, D. Zhu, M. Ihme, "Observing the Ultrafast Structural Response of Liquid Water Subject to Strong XFEL Radiation," *15th International Conference on Synchrotron Radiation Instrumentation*, Hamburg, Germany, Aug. 2024.

8. **K. Younes**, H. Li, Y. Sun, S. Song, T. Osaka, I. Inoue, D. Zhu, M. Ihme, "Ultrafast Structural Reorganization of Supercritical Water Molecules Under XFEL Radiation," *APS Division of Atomic, Molecular and Optical Physics*, Fort Worth, TX, Jun. 2024.

7. **K. Younes**, M. Poli, P. Muhunthan, S. Ermon, M. Ihme, "Rapid, online screening of complex phase spaces using Bayesian Optimization for SAXS measurements," *Ultrafast Imaging and Tracking Instrumentation, Methods and Applications Conference*, Menlo Park, CA, Mar. 2023. **(Student Award)**

6. **K. Younes** and J.-P. Hickey, "Mean-velocity scaling of compressible turbulent boundary layer flows under non-adiabatic wall conditions," *APS Division of Fluid Dynamics Meeting Abstracts*, Nov. 2020.
5. J.-P. Hickey, H. Daryan, and **K. Younes**, "Dynamics of compound, compressible flow contractions," *APS Division of Fluid Dynamics Meeting Abstracts*, Nov. 2020.
4. M. Yao, **K. Younes**, D. Fan, J. Mouallem, and J.-P. Hickey, "Targeted modal turbulent flow control via localized heating," *APS Division of Fluid Dynamics Meeting Abstracts*, Seattle, WA, Nov. 2019.
3. **K. Younes** and J.-P. Hickey, "Effects of shear layer growth on the indirect noise in compound nozzles," *Thousand Islands Fluid Dynamics Meeting*, Gananoque, ON, Apr. 2019.
2. **K. Younes**, M. Yao, J. Wang, and J.-P. Hickey, "Towards predictive simulations for rocket propulsion," *Ontario Aerospace Council*, Toronto, ON, Mar. 2019.
1. **K. Younes** and J.-P. Hickey, "Indirect noise in compound-compressible nozzle flows," *Thousand Islands Fluid Dynamics Meeting*, Gananoque, ON, Apr. 2018.

PROFESSIONAL EXPERIENCE

Research Engineer | *Multi-Physics Interaction Laboratory* July 2017 – Aug. 2019

- Developed low-order analytical models in Python to compute the noise generated in compound nozzles and study the fluidic thrust shock-vectoring performance of rocket engines.
- Conducted global variance-based sensitivity analyses to explore the full state space, identify main flow inputs, and reveal intra-variable interactions.
- Performed multi-phase, chemically active numerical simulations in OpenFOAM, modeling the thermal decomposition of H_2O_2 for industrial NO_x emissions reduction.

TEACHING EXPERIENCE

Graduate Teaching Assistant | *Stanford Mechanical Engineering* Jan. 2024 – Apr. 2026

- Delivered lectures and bi-quarterly review sessions to 60+ students on advanced thermodynamic concepts, as part of ME 30: Engineering Thermodynamics and ME 357: Gas Turbine Analysis.
- Prepared and graded examinations, regularly monitoring student progress and ensuring fair assessment.
- Held weekly help sessions to provide one-on-one support on course material.

Graduate Teaching Assistant | *Waterloo Faculty of Engineering* Jan. 2020 – Aug. 2021

- Responsible for running tutorial sessions and marking exams for 85+ third-year mechanical engineering students, as part of ME 353: Heat Transfer and ME 351: Fluids Mechanics I.

In-House Residence Tutor | *Claudette Millar Hall Residence* Sept. 2017 – Apr. 2018

- Tutored 10 first-year engineering students Calculus on a weekly basis.

General Teaching Assistant | *Waterloo Engineering Endowment Foundation* Jan. 2014 – Apr. 2014

- Mentored and advised 450+ first-year students, emphasizing time management and perseverance.
- Conducted weekly and monthly help sessions in Calculus and Physics for 150 students.

OUTREACH ACTIVITIES

seeME | *Instructor* May 2024 – Apr. 2026

- Delivered a series of hands-on lessons on Newton's Laws to middle- and high-school students, demonstrating the concepts in a tangible and interactive way using practical objects.

STEMfest | *Demonstrator & Volunteer* Apr. 2024 – Apr. 2026

- Set up and stationed the fluid mechanics booth showcasing turbulence structures to over 3,000 visitors using water and food coloring dyes.

AWARDS & SCHOLARSHIPS

- Early Career Award (ULITIMA Conference) 2023
- Postgraduate Scholarship: Doctoral (NSERC PGS D) 2021
- Canada Graduate Scholarships: Master's Program (NSERC CGS M) 2020
- President's Graduate Scholarship 2020
- Sandford Fleming Foundation Teaching Assistantship Excellence Award 2020
- Graduate Research Studentship 2020
- University of Waterloo Graduate Scholarship 2020
- Engineering Excellence Master's Fellowship 2019
- Engineering Dean's Entrance Award 2019
- People's Choice Award 2017
- John Deere Limited Scholarship 2017
- First In Class Engineering Scholarship 2016
- University of Waterloo President's Scholarship 2013
- Engineering International Student Scholarship 2013

ACADEMIC SERVICE

- Reviewer for Progress in Energy and Combustion Science
- Reviewer for Journal of Fluid Mechanics
- Reviewer for Physics of Fluids
- Reviewer for Journal of Aerospace Engineering
- Reviewer for AIAA Journal
- Reviewer for the Aeronautical Journal
- Reviewer for IEEE Transactions on Aerospace & Electronic Systems

MENTORSHIP

- Liu Deng (Rotating Ph.D. student, now at FX Lab) Sep. 2025 – Dec. 2025
- Kshitij Ghormode (Master's student, now at NVIDIA) Sep. 2023 – Apr. 2024
- Kai Rayle (Undergraduate student, now at Amidon Heavy Industries) June 2023 – Aug. 2023