Exponent®
Engineering & Scientific Consulting

Arin Hayrapetyan, Ph.D.

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Professional Profile

Dr. Hayrapetyan applies his multidisciplinary expertise in complex thermal, fluid, and mechanically driven systems to deliver high-impact solutions for clients in aerospace, energy, defense, and industrial sectors.

Dr. Hayrapetyan's work spans both experimental and computational analysis. He develops custom test fixtures to provide performance assessment, root cause and failure mode analysis, and engineering forensic investigations across a wide range of advanced engineering and industrial applications. He regularly uses MATLAB and Python to process and analyze experimental data. He excels in signal and image diagnostics, data interpretation, and the application of machine learning algorithms for enhanced data analytics and system modeling. He has experience in computational fluid dynamics (CFD) using Ansys Fluent, Star-CCM+, and COMSOL Multiphysics, including simulation and benchmarking of helicopter rotor blade aerodynamics using meshless methods. He is a Certified SolidWorks Associate (CSWA) and is skilled in finite element analysis (FEA) with SolidWorks Simulation. He has performed tensile, fatigue, and high-pressure testing to replicate field failures in industrial accidents and to evaluate design decisions for industrial products. His experience also includes designing and building drones, unmanned aerial systems, and model rockets.

Prior to joining Exponent, Dr. Hayrapetyan was a graduate researcher at UCLA's Energy and Propulsion Research Laboratory, where he performed experimental studies on acoustically coupled combustion dynamics. His research identified transition boundaries in complex flame-acoustic instabilities across wide parametric ranges, with direct applications to industrial combustion technologies such as boilers, gas turbines, and rocket engines, helping industry partners advance the design of robust, efficient combustion systems.

Academic Credentials & Professional Honors

Ph.D., Aerospace Engineering, University of California, Los Angeles (UCLA), 2025

M.S., Aerospace Engineering, University of California, Los Angeles (UCLA), 2022

B.S., Aerospace Engineering, University of California, Los Angeles (UCLA), 2020

Outstanding M.S. Recipient in Aerospace Engineering, UCLA, 2022

Licenses and Certifications

Certified Forklift Operator for Sit-Down Counterbalanced Forklifts (CA)

SOLIDWORKS Certificate in Mechanical Design

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FAA Part 107 Certified Commercial Drone Pilot (CA)

Fire Investigation 1A (Cause and Origin), California Office of State Fire Marshal (CA)

Prior Experience

Graduate Student Researcher, Energy & Propulsion Research Laboratory, UCLA, 2021-2025

Teaching Assistant, University of California, Los Angeles (UCLA), 2023-2024

Intern, Applied Scientific Research, Inc., 2020

Professional Affiliations

American Society of Mechanical Engineers (ASME)

National Fire Protection Association (NFPA)

Publications

Journal Publications:

Hayrapetyan A, Vargas A, Karagozian AR. Effects of injector geometry on acoustically coupled flame dynamics. Journal of Fluid Mechanics. 2025; 1021:A2.

Hayrapetyan A. Acoustically coupled gaseous combustion dynamics, PhD Thesis, UCLA (2025).

Hayrapetyan A, Vargas A, Karagozian AR. Denoising neural network for low-light imaging of acoustically coupled combustion. Experiments in Fluids 2025; 66(59).

Vargas A, Hayrapetyan A, Karagozian AR. Dynamics of acoustically excited coaxial laminar jet diffusion flames. Combustion and Flame 2025; 274.

Vargas A, Kiani S, Hayrapetyan A, Karagozian AR. Dynamics of acoustically coupled single and multi-port jet diffusion flames. Journal of Fluid Mechanics 2023; 972(A2).

Conference Proceedings:

Hayrapetyan A, Vargas A, Karagozian AR. Low-light image denoising for acoustically coupled combustion. 13th U.S. National Combustion Meeting, Paper 180LF-0161, 2023.

Vargas A, Hayrapetyan A, Karagozian AR. Dynamics of acoustically excited coaxial laminar jet diffusion flames. 13th U.S. National Combustion Meeting, Paper 180LF-0160, 2023.

Presentations

Hayrapetyan A, Vargas A, Karagozian AR. Acoustically coupled single and coaxial fuel jet combustion at a pressure antinode. American Physical Society/Division of Fluid Dynamics Meeting, Salt Lake City, UT, November 2024.

Hayrapetyan A, Vargas A, Rodriguez B, Karagozian AR. Acoustically coupled fuel jet combustion near pressure nodes and antinodes. American Physical Society/Division of Fluid Dynamics Meeting, Washington DC, November 2023.

Hayrapetyan A, Vargas A, Karagozian AR. Low-light image denoising for acoustically coupled combustion. 13th U.S. National Combustion Meeting, Texas A&M University, March 2023.

Hayrapetyan A, Vargas A, Karagozian AR. Image denoising for acoustically coupled combustion using neural networks and a convolutional autoencoder. American Physical Society/Division of Fluid Dynamics Meeting, Indianapolis, IN, November 2022.

Hayrapetyan A, Vargas A, Karagozian AR. Low-light image denoising for flame studies using neural networks, 15th Southern California Flow Physics Symposium, April 2022.