Exponent®
Engineering & Scientific Consulting

Arin Hayrapetyan, Ph.D.

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Professional Profile

Dr. Hayrapetyan specializes in combustion dynamics, fluid mechanics, thermodynamics, heat transfer, compressible gas dynamics, and advanced experimental methods for analyzing complex thermal and flow-driven systems. He has conducted extensive laboratory research on flame instabilities, with direct applications to industrial combustion technologies such as boilers, gas turbines, and rocket engines.

Dr. Hayrapetyan's technical skill set includes signal and image diagnostics, data interpretation, and the application of machine learning algorithms for enhanced signal recovery and experimental analysis. He also has experience in computational fluid dynamics (CFD) using ANSYS Fluent and COMSOL Multiphysics, including simulation and benchmarking of helicopter rotor blade aerodynamics using meshless methods. He has performed finite element analysis (FEA) using SolidWorks Simulation. At Exponent, Dr. Hayrapetyan leverages this multidisciplinary background to assess performance, failure modes, and safety risks in thermal-fluid systems across a range of industrial and high-performance engineering environments.

Prior to joining Exponent, Dr. Hayrapetyan was a graduate researcher in the Energy and Propulsion Research Laboratory at UCLA, where he performed experimental studies on acoustically coupled combustion dynamics. His research identified transition boundaries in complex flame-acoustic behavior across wide parametric ranges, contributing to improved experimental techniques, custom data acquisition and processing codes, and deeper understanding of instability mechanisms that drive real-world combustion system design.

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

Prior Experience

Graduate Student Researcher, Energy & Propulsion Research Laboratory, University of California, Los Angeles (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. 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, 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. 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.