

Engineering & Scientific Consulting

Arin Hayrapetyan, Ph.D.

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Professional Profile

Dr. Hayrapetyan specializes in combustion and fluid dynamics, thermodynamics, heat transfer, compressible gas dynamics, and advanced experimental and computational methods. He offers highimpact solutions for clients in sectors such as aerospace, energy, defense, and industrial by applying his engineering expertise to complex thermal and flow-driven systems.

Dr. Hayrapetyan's work spans both experimental design and computational analysis, complemented by his technical skill sets which includes signal and image diagnostics, data interpretation, and the application of machine learning algorithms for enhanced data analytics and system modeling. 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 is a certified SolidWorks associate (CSWA) and is skilled in finite element analysis (FEA) with SolidWorks Simulation. His experience also involves designing and building drones and unmanned aerial systems (UAS). At Exponent, Dr. Havrapetyan leverages this multidisciplinary background to provide expert consulting services in performance assessment, root cause and failure mode analysis, risk and safety evaluation, and engineering forensic investigations across a range of industrial and advanced engineering environments.

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 and researchers advance the understanding and 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

SOLIDWORKS Certificate in Mechanical Design

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 multiport 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.