

Ahmed Mohamed Elnahhas

Education: **Stanford University, Stanford, CA**
Ph.D. in Mechanical Engineering (Expected August 2024)
Topic: Turbulent structure-inspired modeling of attached and separating flows
Advisor: Parviz Moin
GPA: 4.13/4.0

M.S. in Mechanical Engineering (September 2018 – June 2020)
Area: Fluid Mechanics
GPA: 4.09/4.0

Virginia Tech, Blacksburg, VA
B.S. in Mechanical Engineering, Summa Cum Laude (August 2014 – May 2018)
Honors Scholar, Engineering Science and Mechanics minor, Mathematics minor
GPA: 4.0/4.0
Dean's List with distinction every semester
First in Class

Research Experience / Interests: **Graduate Research Assistant** – April 2019 - Present
Center for Turbulence Research – Advisor: Parviz Moin
Interests: Wall-bounded turbulent flows, Large-eddy simulation, Direct numerical simulations, multiphase flows

- Studied the evolution of the velocity gradient tensor in laminar-to-turbulent boundary layer transition.
- Developed an angular momentum-based decomposition of the skin-friction coefficient and studied its properties in transitional and fully-turbulent boundary layers (Manuscript under review).
- Developed a multi-scale model for near-wall turbulence to predict the wall-shear stress fluctuations and non-equilibrium effects in wall-modeled large eddy simulations (Manuscript in preparation).
- Currently utilizing DNS / LES to study the structure of wall-bounded flows and develop structure-based wall-models.
- Currently utilizing DNS / LES to develop SGS models for multiphase flows.

Undergraduate Research Assistant – Summer 2016 – May 2018
MInDS lab, Advisor: Shima Shahab

- Aided in designing acoustic holographic lenses for directed energy transfer using both numerical methods and experimentation.
- Presented work at the **National Conference for Undergraduate Research (NCUR 2017 & 2018)**.

** The gap between the two positions is due to lab rotations during my first year at Stanford.*

Skills / Technology specialties:

• COMSOL 5.3	• Simulink	• Large-eddy simulations
• MATLAB	• Fortran	• Direct numerical simulations
• Mathematica	• MPI	• Numerical Analysis
• C++	• UNIX	• Fluent in Arabic

Journal Articles: **Ahmed Elnahhas**, Adrian Lozano-Durán, Parviz Moin, A near-wall patch wall model for large-eddy simulation in non-equilibrium flows, *Journal of Fluid Mechanics*, 2022 (Manuscript in preparation)

Ahmed Elnahhas, Perry L. Johnson, On the enhancement of boundary layer skin-friction by turbulence: an angular momentum approach, *Journal of Fluid Mechanics*, 2022 (Accepted)

Fatemeh Yazdandoost, Omidreza Sadeghi, Marjan Bakhtiari-Nejad, **Ahmed Elnahhas**, Shima Shahab, Reza Mirzaeifar, Energy dissipation of shock-generated stress waves through phase transformation and plastic deformation in NiTi alloys, *Mechanics of Materials*, 2019

Marjan Bakhtiari-Nejad, **Ahmed Elnahhas**, Muhammad R Hajj, Shima Shahab, Acoustic holograms in contactless ultrasonic power transfer systems: Modeling and experiment, *Journal of Applied Physics*, 2018

Proceedings of the Center for Turbulence Research: **Ahmed Elnahhas**, Adrian Lozano-Durán, Parviz Moin, A near-wall patch wall model for large-eddy simulation, *Annual Research briefs*, 2021

Ahmed Elnahhas, Adrian Lozano-Durán, Parviz Moin, Toward a flow-structure-based wall-modeled large-eddy simulation paradigm, *Annual Research briefs*, 2020

Ahmed Elnahhas, Perry Johnson, Adrian Lozano-Durán, Parviz Moin, On the evolution of the velocity gradient tensor in transitional boundary layers, *Annual Research briefs*, 2019

Talks / Conference Publications: Armin Kianfar, **Ahmed Elnahhas**, Perry Johnson, Quantifying How Turbulent Fluctuations Enhance Skin Friction and Surface Heat Transfer in Boundary Layers, *AIAA Scitech Forum*, 2022

Ahmed Elnahhas, Adrian Lozano-Durán, Parviz Moin, Near-wall patch wall-model for large eddy simulation, *74th Annual Meeting of the American Physical Society Division of Fluid Dynamics*, 2021

Ahmed Elnahhas, Adrian Lozano-Durán, Parviz Moin, A Flow-structure-based wall-modeled large eddy simulation paradigm, *73rd Annual Meeting of the American Physical Society Division of Fluid Dynamics*, 2020

Ahmed Elnahhas, Perry Johnson, Adrian Lozano-Durán, Parviz Moin, On the evolution of the velocity gradient tensor in transitional boundary layers, *72nd Annual Meeting of the American Physical Society Division of Fluid Dynamics*, 2019

Marjan Bakhtiari-Nejad, **Ahmed Elnahhas**, Muhammad R Hajj, Shima Shahab, Passive metamaterial-based acoustic holograms in ultrasound energy transfer systems, Proc. SPIE 10595, Active and Passive Smart Structures and Integrated Systems XII, 1059518 (2018/03/15)

Marjan Bakhtiari-Nejad, **Ahmed Elnahhas**, Sunghwan Jung, Shima Shahab, Ultrasound acoustic energy for microbubble manipulation, Proc. SPIE 10164, Active and Passive Smart Structures and Integrated Systems 2017, 101642H (04/11/2017)

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- Honors/Awards:**
- Timothy Francis Kennedy Memorial Scholarship, 2018-2019
 - Charles Lee Powell Fellowship, 2018-2019
 - **ΦΚΦ** College of Engineering **Most Outstanding Senior Medallion**, 2018
 - **David R. Shorb Memorial Honor Award** in Mechanical Engineering, 2018
 - Member of the honor society **ΦΚΦ**, 2017 - Present
 - Alfa Laval Inc ME Scholarship, 2017 – 2018
 - Monte Alan Marcum Scholarship, 2017 – 2018
 - ACC Creativity and Innovation Grant, 2017
 - Fralin Undergraduate Research Fellowship, 2016 – 2017
 - Edward H. Cahill Memorial Scholarship, 2016 – 2017
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- Teaching Experience:**
- Teaching Assistant (Stanford University)**
- ME 361 – Turbulence, Spring 2022, Prof. Parviz Moin
 - ME 461 – Advanced Turbulence, Autumn 2021, Prof. Sanjiva Lele
 - ME 361 – Turbulence, Spring 2020, Prof. Parviz Moin
 - ME 300A – Linear Algebra, Autumn 2019, Prof. Parviz Moin

- Teaching Assistant (Virginia Tech)**
- ME 3124 – Thermodynamics, Spring 2018, Prof. Zhiting Tian
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- Mentoring / Outreach Experience:**
- Galipatia Living learning community (2014-2016):**
- Mentored a total of 11 students through their first year in engineering school. Helped them in identifying majors, acclimating to engineering school workload, and monitoring their academic and professional progress.

- Stanford Mechanical Engineering ME-Ph.D mentoring program (2020-2022):**
- Mentored an incoming Ph.D. student. Responsibilities included helping choose academic and research advisors, acclimating to Stanford as an international student, and providing a two-year-long support system.

- Stanford SeeME (2020-Present):**
- Preparing a course to teach middle and high school students from under-represented communities in STEM about STEM related materials and the scientific process.
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- Relevant Coursework:**
- Stanford University**
- ME 300A/B/C – Linear Algebra / PDEs / Numerical Methods sequence
 - ME 408 – Spectral Methods in Computational Physics
 - ME 405 – Asymptotic Methods in Computational Engineering
 - ME 351A/B – Inviscid / Viscous Flows
 - ME 361/461 – Turbulence / Advanced Turbulence
 - CEE 363D – Topics in Fundamental Turbulence
 - ME 469 – Computational Fluid Mechanics
 - ME 451B – Flow Instabilities
 - ME 362A – Physical Gas Dynamics
 - ME 363 – Partially Ionized Plasmas and Gas Discharges
 - ME 371 – Fundamentals of Combustion
 - ME 356 – Hypersonic Aerothermodynamics
 - PHYSICS 230 – Quantum Mechanics
 - PHYSICS 223 – Stochastic and Nonlinear Dynamics
 - AA 218 – Symmetry Analysis
 - CEE 363F – Geophysical Fluid Dynamics
 - CHEMENG 442 – Suspension Mechanics
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Virginia Tech

- ESM 3334 – Fluid Mechanics II: Differential Analysis
 - ME 4974H – Independent Study (Hybrid vehicle control)
 - ESM 4994 – Undergraduate Research (Ultrasonic energy transfer)
 - ME 4984 – Special Study: Nano/Micromechanics of Materials
 - ESM 5734 – Introduction to Finite Element Analysis
 - ME 6744 – Chaos & Nonlinear Dynamics
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