

# Anubhav Dwivedi, Ph.D.

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## INTERESTS

Computational aerothermodynamics  
Transition modeling and flow control  
Uncertainty quantification  
Large scale and distributed optimization

## EDUCATION

<b>Ph.D. in Aerospace Engineering</b> University of Minnesota Twin Cities, Minneapolis (USA)	Aug. 2020
<b>M.Tech. in Aerospace Engineering</b> Indian Institute of Technology, Kanpur (India)	May 2015
<b>B.Tech. in Aerospace Engineering</b> Indian Institute of Technology, Kanpur (India)	May 2015

## RESEARCH EXPERIENCE

<b>Postdoctoral Research Associate</b> , University of Southern California Mentor: Prof. Mihailo R. Jovanović — Research on analysis and control of transitional and turbulent compressible boundary layers — Developed nonlinear reduced order models for transitional separated hypersonic flows	Aug. 2020 - present
<b>Graduate Research Assistant</b> , University of Minnesota Twin Cities Mentors: Prof. Graham V. Candler, Prof. Joseph W. Nichols & Prof. Mihailo R. Jovanović — Designed novel computational framework for instability growth in complex hypersonic geometries — Identified new mechanisms for predicting 3D thermal loads in flows with shock-wave-boundary-layer interactions — Developed high-fidelity DNS based models of of shock dominated unsteady flows	Aug. 2015 - 2020

<b>Visiting researcher</b> , University of Southern California Mentor: Prof. Mihailo R. Jovanović — Investigated baroclinic effects on external disturbance amplification in cold wall hypersonic boundary layers — Data-driven stochastic models for turbulence closure	Jan-Jun 2019
<b>Research Assistant</b> , Indian Institute of Technology, Kanpur (India) Mentor: Prof. Sanjay Mittal — Absolute and convective instabilities in spatially developing shear flows — Finite element methods in instability analysis	May. 2014 - 2015
<b>Visiting undergraduate researcher</b> , RWTH Aachen (Germany) Mentor: Prof. Marek Behr — Finite element method based modeling of aeroelastic deformations in airplane wing	May-Aug 2013
<b>Summer undergraduate researcher</b> , Indian Institute of Technology, Kanpur (India) Mentor: Prof. Abhishek — Vibration absorption for sensor placement in coaxial micro air vehicles ( <i>MAVs</i> )	May. 2012 - 2012

## MEMBERSHIPS IN PROFESSIONAL ORGANIZATIONS

<i>American institute of Aeronautics and Astronautics (AIAA)</i> ,	Jul. 2016-present
<i>American Physical Society (APS)</i> , Division of Fluid Dynamics	Jul. 2016-present
<i>Institute of Electrical and Electronics Engineers (IEEE)</i> , Control Systems Society	Jan. 2019-present

## AWARDS, HONORS & RECOGNITION

<b>John A. &amp; Jane Dunning Copper Fellowship in Aerospace Engineering &amp; Mechanics</b> — For exceptional academic record and outstanding performance in graduate written exam	2016
<b>Academic Excellence Award of IIT Kanpur</b> — For exceptional academic record	2013
<b>Boeing Abhyast Scholarship</b> — Awarded by the Boeing company and IIT Kanpur for autonomous rover building competition	2013
<b>Summer Undergraduate Research Grant for Excellence</b> — Awarded for best research proposal by undergraduate students at IIT Kanpur	2012

## ACADEMIC SERVICE

Journal reviewer

*Journal of Fluid Mechanics*

*Journal of Zhejiang University*

*IEEE Control Systems Society  
Conference and Journals*

## REFEREED JOURNAL ARTICLES

- Dwivedi, A.**, Sidharth, G., and Jovanović, M. R., “Oblique transition in hypersonic double-wedge flow,” *J. Fluid Mech.*, Vol. 948, 2022, pp. A37 (37 pages) 2022
- Dwivedi A.**, Hildebrand, N., Nichols, J. W., Candler, G. V., and Jovanović, M. R., “Transient growth analysis of oblique shock wave/boundary-layer interactions at Mach 5.92,” *Phys. Rev. Fluids*, Vol. 5, No. 6, June 2020, pp. 063904 (20 pages) 2020
- Dwivedi, A.**, Sidharth, G. S., Nichols, J. W., Candler, G. V., and Jovanović, M. R., “Reattachment streaks in hypersonic compression ramp flow: an input-output analysis,” *J. Fluid Mech.*, Vol. 880, December 2019, pp. 113–135 2019
- Sidharth, G., **Dwivedi, A.**, Candler, G. V., and Nichols, J. W., “Onset of three-dimensionality in supersonic flow over a slender double wedge,” *Phys. Rev. Fluids*, Vol. 3, No. 9, 2018, pp. 093901 2018
- Hildebrand, N., **Dwivedi, A.**, Nichols, J. W., Jovanović, M. R., and Candler, G. V., “Simulation and stability analysis of oblique shock-wave/boundary-layer interactions at Mach 5.92,” *Phys. Rev. Fluids*, Vol. 3, 2018, pp. 013906 2018
- Mittal, S. and **Dwivedi, A.**, “Local and biglobal linear stability analysis of parallel shear flows,” *Comp. Modeling in Eng. & Sci.*, Vol. 113, No. 2, 2017, pp. 219–237 2017

## REFEREED CONFERENCE ARTICLES

- Dwivedi, A.** and Jovanović, M. R., “Energy amplification of stochastically-forced hypersonic blunt body flows,” *Proceedings of the 2023 American Control Conference*, San Diego, CA, 2023, In review 2023
- Dwivedi, A.** and Jovanović, M. R., “A weakly nonlinear analysis of responses of a hypersonic flow over a double-wedge to oblique disturbances,” *Proceedings of the 2022 American Control Conference*, Atlanta, GA, 2022, pp. 4325–4330 2022
- Sidharth, G., **Dwivedi, A.**, Nichols, J., Jovanović, M., and Candler, G., “Global Linear Stability and Sensitivity of Hypersonic Shock-Boundary Layer Interactions,” *IUTAM Laminar-Turbulent Transition*, Springer, 2022, pp. 489–498 2022
- Melander, L., **Dwivedi, A.**, and Candler, G. V., “Nose Bluntness Effects on the Amplification of External Disturbances in Hypersonic Flows,” *AIAA SciTech Forum 2022*, 2022, AIAA 2022-0948 2022

- Dwivedi A.**, Candler, G. V., and Jovanović, M. R., “A frequency domain analysis of compressible linearized Navier-Stokes equations in a hypersonic compression ramp flow,” *Proceedings of the 2020 American Control Conference*, Denver, CO, 2020, pp. 4325–4330 2020
- Dwivedi, A.**, Broslawski, C. J., Candler, G. V., and Bowersox, R., “Three-dimensionality in shock/boundary layer interactions: a numerical and experimental investigation,” *AIAA Aviation 2020 forum*, 2020, AIAA 2020-3011 2020
- Dwivedi, A.**, Sidharth, G. S., Hollender, C., and Candler, G. V., “Linear analysis of high-speed axisymmetric flows,” *AIAA Aviation 2020 forum*, 2020, AIAA 2020-2987 2020
- Hollender, C., **Dwivedi, A.**, and Candler, G. V., “Görtler instability analysis of Mach 6 flow on a flared axisymmetric cone with and without suction,” *AIAA Aviation 2019 Forum*, 2019, AIAA 2019-3219 2019
- Reinert, J. D., **Dwivedi, A.**, and Candler, G. V., “Verification of a conjugate heat transfer tool with US3D,” *AIAA Scitech Forum*, 2019, AIAA 2019-1892 2019
- Dwivedi, A.**, Sidharth, G. S., Candler, G. V., Nichols, J. W., and Jovanović, M. R., “Input-output analysis of shock boundary layer interaction,” *2018 Fluid Dynamics Conference*, 2018, AIAA 2018-3220 2018
- Thome, J., Reinert, J. D., **Dwivedi, A.**, and Candler, G., “Effects of Variable Wall Temperature Distributions on 3D Boundary Layers,” *22nd AIAA International Space Planes and Hypersonics Systems and Technologies Conference*, 2018, AIAA 2018-5271 2018
- Thome, J., Reinert, J. D., **Dwivedi, A.**, and Candler, G. V., “Computational Study of Flow on a Sliced Cone-Flap Geometry,” *2018 Fluid Dynamics Conference*, 2018, AIAA 2018-3397 2018
- Dwivedi, A.**, Nichols, J. W., Jovanović, M. R., and Candler, G. V., “Optimal spatial growth of streaks in oblique shock/boundary layer interaction,” *8th AIAA Theoretical Fluid Mechanics Conference*, 2017, AIAA 2017-4163 2017
- Sidharth, G., **Dwivedi, A.**, Candler, G. V., and Nichols, J. W., “Global linear stability analysis of high speed flows on compression ramps,” *47th AIAA Fluid Dynamics Conference*, 2017, AIAA 2017-3455 2017
- Hildebrand, N. J., **Dwivedi, A.**, Nichols, J. W., Candler, G. V., and Jovanovic, M. R., “Sensitivity analysis for the control of oblique shock wave/laminar boundary layer interactions at Mach 5.92,” *47th AIAA Fluid Dynamics Conference*, 2017, AIAA 2017-4312 2017
- Shrestha, P., Hildebrand, N. J., **Dwivedi, A.**, Nichols, J. W., Jovanovic, M. R., and Candler, G. V., “Interaction of an oblique shock with a transitional Mach 5.92 boundary layer,” *46th AIAA Fluid Dynamics Conference*, 2016, AIAA 2016-3647 2016
- Srivastava, S., **Dwivedi, A.**, Verma, A., and Abhishek, “Characterization of Vibration Absorber for Mounting Sensors on Micro Air Vehicle,” *Proceedings of International Conference on Intelligent Unmanned Systems*, Vol. 8, 2012 2012

## PRESENTATIONS AND MEDIA

- A weakly nonlinear analysis of transition in hypersonic flows, 2022 American Control Conference, Atlanta, GA, June 2022.
- Oblique transition in high-speed separated boundary layers, In Wall bounded turbulence: beyond current boundaries, Isaac Newton Institute of Mathematical Sciences, Cambridge, UK, March 2022
- Frequency domain analysis of linearized compressible Navier-Stokes equation, 2020 American Control Conference, Denver, CO (held virtually), July 2020.
- An experimental and numerical investigation of three-dimensionality in shock boundary layer interactions, AIAA 2020 Aviation Forum, Virtual event, June 2020.
- Input-output analysis for Görtler-type instability in axisymmetric hypersonic boundary-layers, AIAA 2020 Aviation Forum, Virtual event, June 2020.
- Toward data-driven stochastically forced turbulence closure models, 72nd Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Seattle, WA, November 2019
- Hypersonic boundary layer transition over curved-walls: A mechanism based on Görtler vortices, 72nd Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Seattle, WA, November 2019
- Steady suction based control of transition in cone-flare geometry, AIAA 2019 Aviation Forum, Dallas, TX, June 2019.
- Reattachment streaks in hypersonic shock boundary layer interactions, 13th Southern California Flow Physics Symposium, Santa Barbara, CA, April 2019.
- Input-output analysis of compressible boundary layer flows, AIAA 2018 Aviation Forum, Atlanta, GA, June 2018.
- Identification of spatially-localized initial conditions via sparse PCA, 70th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Denver, CO, November 2017
- Emergence of three-dimensional flow structures in shock boundary layer interactions, 70th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Denver, CO, November 2017
- Optimal spatial growth of streaks in oblique shock/boundary layer interaction, 8th AIAA Theoretical Fluid Mechanics Conference, Denver, CO, June, 2017
- Transition in hypersonic oblique shock/boundary layer interactions, 69th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Portland, OR, November 2016
- Design of automatic take-off and landing system using optical sensors for coaxial MAVs, 11th International Conference on Intelligent Unmanned Systems, Singapore, October 2012.

## TEACHING, MENTORSHIP, AND OUTREACH EXPERIENCE

**Teaching assistant, Aerospace Engineering,**  
Indian Institute of Technology Kanpur

- Boundary Layer Theory Fall 2014
  - Graded home assignments throughout the course
  - Graded and discussed midterm exam solutions
- Finite Element Methods for Fluid Dynamics Spring 2015
  - Graded home assignments for the graduate level course

**Mentorship experience, Aerospace Engineering and Mechanics,**  
University of Minnesota

- Master's Student Mentor 2018-2019
  - Taught stability methods in fluid flows and their computational implementation on parallel high-performance computational architecture

**Outreach experience, Electrical and Computer Engineering,**  
University of Southern California

- 12<sup>th</sup> MHI ECE Research Festival Judge 2022
  - Evaluated graduate student poster presentations across a wide range of applications in control theory, dynamical systems, signal processing, and optimization.