Swetaprovo Chaudhuri

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Research interests

Aerospace propulsion, turbulent combustion, droplets and aerosols

Education and training

2010 – 2013 Princeton University – Mechanical and Aerospace Engineering
Postdoc and Associate Research Scholar
Mentor: Professor C. K. Law

2006 – 2010 University of Connecticut – Mechanical Engineering
PhD in Energy and Thermal Sciences, *GPA: 3.992/4.000*
Advisor: Professor B. M. Cetegen

2002 – 2006 Jadavpur University – Mechanical Engineering
BE with Honors, *GPA: 8.610/10.000*

Honors and awards

2025 Connaught Innovation Award – University of Toronto

2024 Teaching award – Division of Engineering Science, University of Toronto, for excellence in teaching Aerospace Propulsion

2021 Associate Fellow – American Institute of Aeronautics and Astronautics

2019 Heuckroth Distinguished Faculty Award in Aerospace Engineering – University of Toronto Institute for Aerospace Studies

2017 Young Scientist Medal – Indian National Science Academy

2016 Associate – Indian Academy of Sciences

2010 Graduate Research Fellowship Award, First Prize – Department of Mechanical Engineering, University of Connecticut

2009 Doctoral Dissertation Fellowship – University of Connecticut

2009 ASME Foundation Scholarship – American Society of Mechanical Engineers

2009 Graduate Pre-doctoral Fellowship – Department of Mechanical Engineering, University of Connecticut

2008 Graduate Research Fellowship Award, Second Prize – Department of Mechanical Engineering, University of Connecticut

Appointments

2025 – present **University of Toronto** – Institute for Aerospace Studies
Professor

2019 – 2025 **University of Toronto** – Institute for Aerospace Studies
Associate Professor with tenure

University of Toronto – Institute for Aerospace Studies
Aerospace Option Chair (Interim) for Fall 2023

2022 – 2023 **Indian Institute of Technology Madras** – Department of Aerospace Engg.
Visiting Faculty Fellow

2018 – 2019 **Indian Institute of Science** – Department of Aerospace Engg.
Associate Professor with tenure

2013 – 2018 **Indian Institute of Science** – Department of Aerospace Engg.
Assistant Professor

2014 – 2014 **Princeton University** – Department of Mechanical and Aerospace Engg.
Visiting Associate Research Scholar

2011 – 2013 **Princeton University** – Department of Mechanical and Aerospace Engg.
Associate Research Scholar

2010 – 2011 **Princeton University** – Department of Mechanical and Aerospace Engg.
Postdoctoral Research Associate

2006 – 2010 **University of Connecticut** – Department of Mechanical Engineering
Research Assistant

Contributions

- **Flame blowoff mechanism**: Applying laser diagnostics and high-speed imaging in a laboratory burner as well as in a prototypical afterburner, we proposed and experimentally validated a mechanism of lean blowoff of bluff body stabilized turbulent premixed flames. The generality of the blowoff

mechanism have subsequently been demonstrated by many groups around the world not only for bluff body flames but even for initial stages of interacting swirl flame blowoff. The series of papers on blowoff serve as powerful examples where laser-based diagnostics have been used to solve a fundamental combustion problem of industrial relevance and scale.

- **Turbulent flame speed of expanding flames**: Using theory and experiments we obtained and validated a model for turbulent flame speed, a self-similar scaling relation for turbulent expanding flames over a large range of fuels, pressure, and turbulence Reynolds number. Once again, several groups around the world have corroborated this scaling.

- **Flame Particle Tracking**: We developed Forward Flame Particle Tracking (FFPT), as well as its back in time variant, Backward Flame Particle Tracking (BFPT): computational diagnostics for turbulent combustion. Applying BFPT-FFPT on DNS datasets, we have found how the turbulent premixed flames generate at the leading points to evolve and eventually annihilate at the trailing regions of the corresponding surfaces. Development and application of these techniques on in-house computed DNS datasets have provided unprecedented, causal insights into flame surface generation, annihilation, flame element dispersion, ignition, and extinction in turbulent flows.

- **Local flame speed in turbulence**: Recently, we have shown that in both moderate or intensely turbulent conditions, large enhancement of local flame displacement speed from their standard laminar values result from flame-flame interactions at large negative curvatures. We have derived an analytical model for such local flame propagation rate as a function of curvature and validated the model using Direct Numerical Simulations of hydrogen-air flames. Developing a new conditionally averaged flame structure, we have also shown how differential diffusion combined with mixing induced by flame-flame interaction enhance flame propagation rates at most probable zero-curvature locations of ultra-lean hydrogen-air flames.

- **Mitigating instability by actuating the swirler in a combustor**: We were the first to show that in a laboratory combustor the otherwise static swirler when actuated to a rotary motion, the higher intensity turbulence and higher swirl number generated can assist in mitigating thermoacoustic instabilities. A new synchronization model for flamelet oscillators has been proposed that can reproduce the intermittent dynamics en route to mitigation. This experimental setup also offers a controlled environment where instability to noise transition, or vice versa, could be effectively investigated.

- **Optically accessible supersonic combustion facility**: At IISc, we conceptualized, designed, and developed a Mach 2.2, 1kg/s, 1600K stagnation temperature, direct connect supersonic combustion facility, ab-initio. This optically accessible facility is the first of its kind in India and has been commissioned and tested.

- **Modeling COVID-19 disease dynamics from aerosol dispersion**: We derived an analytical probability density function that could describe the real-world features of overdispersion in Covid-19 infections. A disease spread model based on aerosol and droplet dynamics was also developed from first principles. Based on these works I was invited to the Ontario Modeling Consensus Table, as the only member with non-public health background.

These contributions are reflected in our inclusion, from 2021 onward, in the top 2% of scientists listed in the "science-wide author databases of standardized citation indicators" https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/6

Published/accepted journal papers

[1] A. Mukerjee, S. Mishra, K. Murty, and S. Chaudhuri, "Analysing the distribution of sars-cov-2 infections in schools: comparing model predictions with real-world observations," *Accepted for publication Proceedings of the Royal Society A*, 2025.

[2] Yuvraj, H. Im, and **S. Chaudhuri**, "How "mixing" affects propagation and structure of intensely turbulent, lean, hydrogen-air premixed flames," *Combustion and Flame*, vol. 273, p. 113903, 2025.

[3] K. S. Akojwar, S. A. Pawar, and **S. Chaudhuri**, "Performance analysis of a self-decarbonizing combustor," *Journal of Engineering for Gas Turbine and Power*, vol. 47, p. 011013, 2025.

[4] D. D. Rathod, S. Kumar, S. Chaudhuri, P. Panda, and S. Basu, "Isothermal flow field characterization of a full-scale sector combustor at elevated pressures," *Journal of Engineering for Gas Turbines and Power*, vol. 147, no. 4, 2025.

[5] S. Singh, R. Bhavi, P. R. Midhun, A. Bhaskarana, P. Mishra, **S. Chaudhuri**, and R. Sujith, "Intermittency transition to azimuthal instability in a turbulent annular combustor," *International Journal of Spray and Combustion Dynamics*, 2024.

[6] J. Bae, Y. Naderzadeh, P. Vena, and **S. Chaudhuri**, "Effect of swirler spin on flame shape and combustion dynamics," *Proceedings of the Combustion Institute*, vol. 40, p. 105663, 2024.

[7] K. S. Akojwar, S. A. Pawar, and **S. Chaudhuri**, "Mitigating co2 emission of methane based thermal power using a self-decarbonizing combustor," *Proceedings of the Combustion Institute*, vol. 40, p. 105689, 2024.

[8] J. Bae, S. Yun, **S. Chaudhuri**, and P. Canteenwalla, "Combustion characteristics of sustainable aviation fuels at a scaled-down afterburner test rig," *The Aeronautical Journal*, vol. 40, p. 1429–1449, 2024.

[9] S. Singh, A. Roy, J. M. Dhadphale, **S. Chaudhuri**, and R. Sujith, "Mean-field synchronization model of turbulent thermoacoustic transitions," *AIP Advances*, vol. 14, p. 065106, 2024.

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[12] **S. Chaudhuri** and B. Savard, "Turbulent flame speed based on mass flow rate: theory and DNS," *Combustion and Flame*, vol. 252, p. 112735, 2023.

[13] **S. Chaudhuri**, P. Kasibhatla, A. Mukherjee, W. Pan, G. Morrison, S. Mishra, and V. K. Murty, "Analysis of overdispersion in airborne transmission of Covid-19," *Physics of Fluids*, vol. 34, no. 5, p. 051914, 2022.

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[18] S. Majee, A. Saha, **S. Chaudhuri**, D. Chakravortty, and S. Basu, "Two-dimensional mathematical framework for evaporation dynamics of respiratory droplets," *Physics of Fluids*, vol. 33, no. 10, 2021.

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[27] S. Kumar, S. Malavalli, **S. Chaudhuri**, and S. Basu, "Spray characteristics and flow topologies of high shear injector at high primary swirl," *International Journal of Multiphase Flow*, vol. 131, 2020.

[28] **S. Chaudhuri**, S. Basu, P. Kabi, V. Unni, and A. Saha, "Modeling the role of respiratory droplets in covid-19 type pandemics," *Physics of Fluids*, vol. 32, no. 6, 2020.

[29] G. Ramachandran, A. Dutta, H. Durairaj, and **S. Chaudhuri**, "On the interaction of swirling flames in a lean premixed combustor," *Journal of Engineering for Gas Turbines and Power*, vol. 142, no. 3, 2020.

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[36] R. Vishwanath, P. Tilak, and **S. Chaudhuri**, "An experimental study of interacting swirl flows in a model gas turbine combustor," *Experiments in Fluids*, vol. 59, no. 3, 2018.

[37] P. Kabi, **S. Chaudhuri**, and S. Basu, "Micro to nanoscale engineering of surface precipitates using reconfigurable contact lines," *Langmuir*, vol. 34, no. 5, pp. 2109–2120, 2018.

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[40] **S. Chaudhuri**, H. Kolla, H. Dave, E. Hawkes, J. Chen, and C. Law, "Flame thickness and conditional scalar dissipation rate in a premixed temporal turbulent reacting jet," *Combustion and Flame*, vol. 184, pp. 273–285, 2017.

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[46] H. Uranakara, **S. Chaudhuri**, H. Dave, P. Arias, and H. Im, "A flame particle tracking analysis of turbulence-chemistry interaction in hydrogen-air premixed flames," *Combustion and Flame*, vol. 163, pp. 220–240, 2016.

[47] **S. Chaudhuri**, "Pair dispersion of turbulent premixed flame elements," *Physical Review E - Statistical, Nonlinear, and Soft Matter Physics*, vol. 91, no. 2, 2015.

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Book chapters

[73] A. Mukherjee, S. Basu, S. Sharma, and S. Chaudhuri, "Modeling airborne disease dynamics: progress and questions," *Mathematics for Public Health*, p. 129–159, 2023.

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Patents

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Conference publications

[83] C. Chelem Mayigue, T. Taddesse, I. Jahncke, C. Groth, A. Roy, R. Sawani, O. Gulder, S. Chaudhuri, and Y. Rajan, "Contrail formation simulation via fans-based turbulence modelling combined with two-equation soot/ice particle transport modelling," in *AIAA SCITECH 2025 Forum*, p. 0600, 2025.

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[104] N. Thakor, C. Miranda, and S. Chaudhuri, "Flame stabilization in high enthalpy supersonic flows: Experiments and simulations," *AIAA Scitech 2020 Forum*, vol. 1 PartF, 2020.

[105] S. Kumar, S. Chaudhuri, and S. Basu, "On effect of the flare angle on the behaviour of the flow field of twin-radial swirlers/high shear injector," *ASME 2019 Gas Turbine India Conference, GTINDIA 2019*, vol. 2, 2019.

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[110] H. Dave, M. Abinesh, and S. Chaudhuri, "Genesis and evolution of premixed flames in turbulence," *11th Asia-Pacific Conference on Combustion, ASPACC 2017*, vol. 2017-December, 2017.

[111] A. Dutta, R. Gopakumar, B. Rahul, J. Singh, and S. Chaudhuri, "On the dynamics of instability mitigation by actuating the swirler in a combustor," *11th Asia-Pacific Conference on Combustion, ASPACC 2017*, vol. 2017-December, 2017.

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[115] N. Thakor, B. Biradar, and S. Chaudhuri, "A computational study of supersonic combustion with detailed and reduced chemical kinetics," in *1st National Conference on Aerospace Propulsion*, (IIT-Kanpur), 2017.

[116] H. A. Uranakar, A. Dutta, S. Chaudhuri, and K. N. Lakshmisha, "Flammability limit analysis of igniting kernels in near isotropic turbulence," in *1st National Conference on Aerospace Propulsion*, (IIT-Kanpur), 2017.

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[118] H. Im, P. Arias, S. Chaudhuri, and H. Uranakara, "Direct numerical simulations of statistically stationary turbulent premixed flames," *ASPACC 2015 - 10th Asia-Pacific Conference on Combustion*, 2015.

[119] K. Kumar and S. Chaudhuri, "Lagrangian analysis of persistence of curvature and tangential strain rate on propagating level set surfaces forced by turbulence," *ASPACC 2015 - 10th Asia-Pacific Conference on Combustion*, 2015.

[120] S. Chaudhuri, "Pair dispersion of turbulent premixed flame elements," in *9th US Combustion Meeting*, (Cincinnati, Ohio), 2015.

[121] H. A. Uranakar, S. Chaudhuri, P. Arias, and H. Im, "Turbulence-transport-chemistry interaction in statistically planar premixed flames interacting with near isotropic turbulence," in *9th US Combustion Meeting*, (Cincinnati, Ohio), 2015.

[122] H. Uranakar, S. Chaudhuri, and K. Lakshmisha, "Turbulence-transport-chemistry interaction in statistically planar premixed flames and ignition kernels in near isotropic turbulence," *ASME 2014 Gas Turbine India Conference, GTINDIA 2014*, 2014.

[123] S. Yang, S. Chaudhuri, D. Zhu, and C. Law, "Dynamics and morphology of colliding spherical flames," *Fall Technical Meeting of the Eastern States Section of the Combustion Institute 2013*, pp. 143–148, 2013.

[124] A. Saha, S. Chaudhuri, and C. Law, "Flame surface statistics of expanding turbulent flame," *Fall Technical Meeting of the Eastern States Section of the Combustion Institute 2013*, pp. 21–26, 2013.

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[126] V. Akkerman, S. Chaudhuri, and C. Law, "Self-similar acceleration of expanding turbulent flames and explosion triggering," in *8th US National Technical Meeting of the Combustion Institute*, (Salt Lake City, UT), 2013.

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[128] S. Chaudhuri, F. Wu, D. Zhu, and C. Law, "Turbulent flame speed and self-similar propagation of expanding premixed flames," in *Fall Technical Meeting, Eastern States Section of the Combustion Institute*, October 2011.

[129] S. Woo, S. Chaudhuri, P. Zhang, D. Zhu, and C. Law, "Response of spherical diffusion flames subjected to rotation: microgravity experimentation and computational simulation," in *7th US National Technical Meeting of the Combustion Institute*, (Atlanta, GA), 2011.

[130] V. Akkerman, S. Chaudhuri, and C. Law, "Modification of regime diagrams and turbulent flame speed by darrieus-landau instability," in *7th US National Technical Meeting of the Combustion Institute*, (Atlanta, GA), 2011.

[131] S. Chaudhuri, S. Basu, A. Saha, S. Biswas, and B. Cetegen, "On scalar mixing in the field of closely interacting vortex pairs and couples," in *7th US National Technical Meeting of the Combustion Institute*, (Atlanta, GA), 2011.

[132] S. Tuttle, S. Chaudhuri, K. Kopp-Vaughan, T. Jenson, B. Cetegen, and M. Renfro, "Blowoff dynamics of asymmetrically-fueled bluff body flames," in *49th AIAA Aerospace Sciences Meeting*, (Orlando, FL), 2011. AIAA-2011-235.

[133] S. Chaudhuri, S. Kostka, S. Tuttle, M. Renfro, and B. Cetegen, "Blowoff dynamics of 2d bluff stabilized turbulent premixed flames in a practical scale rig," in *48th AIAA Aerospace Sciences Meeting*, (Orlando), January 2010.

[134] S. Tuttle, S. Kostka, S. Chaudhuri, B. Cetegen, and M. Renfro, "Blowoff dynamics of bluff body stabilized flames in vitiated flow," in *48th AIAA Aerospace Sciences Meeting*, (Orlando), January 2010.

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[136] S. Tuttle, S. Kostka, S. Chaudhuri, B. Cetegen, and M. Renfro, "Instantaneous and time-resolved blowoff transition measurements for two-dimensional bluff body-stabilized flames in vitiated flow," in *Fall Technical Meeting, Eastern States Section of the Combustion Institute*, October 2009.

[137] S. Chaudhuri, S. Kostka, M. Renfro, and B. Cetegen, "Fluid dynamics of conical premixed flames with and without upstream mixture gradients near and away from blowoff," in *U.S. Combustion Meeting*, (University of Michigan, Ann Arbor, MI), May 17-20 2009. Paper No. 11D4.

[138] S. Chaudhuri, S. Basu, D. Lambe, B. Cetegen, and A. Saha, "Computational study of scalar mixing in the field of interacting laminar vortices," in *U.S. Combustion Meeting*, (University of Michigan, Ann Arbor, MI), May 17-20 2009. Paper No. 13D2.

[139] S. Chaudhuri, S. Kostka, S. Tuttle, M. Renfro, and B. Cetegen, "Near blowoff dynamics of bluff body stabilized partially premixed turbulent flames," in *U.S. Combustion Meeting*, (University of Michigan, Ann Arbor, MI), May 17-20 2009. Paper No. 13D4.

Edited Book

[140] S. De, A. K. Agarwal, S. Chaudhuri, and S. Sen, *Modeling and simulation of turbulent combustion*. Springer, 2018.

Research Funding

2025 – 2026 Connaught Innovation Award - Developing a self-decarbonizing micro-gas turbine for clean power generation [C$ 100k]
University of Toronto

2024 – 2028 Hydrogen as a Sustainable Aviation Fuel – Combustion Research to Remove Impediments to Adoption in Gas Turbine Engines [C$ 2M]
Ontario Research Fund - Research Excellence Award - INSAT Pratt & Whitney, Canada
Principal Investigator: C. P. T. Groth (UofT)
co-Principal Investigators: S. Chaudhuri, O. L. Gulder (UofT), C. Devaud (Waterloo)
Partners: Pratt & Whitney Canada

2024 – 2027 High Pressure Hydrogen Micromix Combustion for Gas Turbines [C$ 5M]
Natural Sciences and Engineering Research Council of Canada, Alliance Mission Grant, Siemens Energy Canada Ltd., CRIAQ
Principal Investigator: B. Savard (École Polytechnique de Montréal)
co-Principal Investigators: S. Chaudhuri (UofT), E. Roberts (École Polytechnique de Montréal), J. Bergthorson (McGill University)
Partners: P. Vena (National Research Council Canada), M. Furi, S. Jella D. May (Siemens)

2024 – 2024 Market Assessment of a Self-Decarbonizing Micro Gas Turbine [C$ 15k]
NSERC-idea to innovation grant
Principal Investigator: S. Chaudhuri

2023 – 2024 Predicting outbreaks in shelters: development and data-driven testing of a computational model of airborne SARS-CoV-2 spread [C$ 30k]
Institute for Pandemics, UofT
Principal Investigator: S. Chaudhuri
co-Principal Investigators: S. Mishra (UofT), S. Huang (Unity Health), V. K. Murty (UofT, Fields)

2022 – 2024 Developing a carbon capturing combustor-reactor powered by hydrogen generated in-situ from thermally coupled pyrolysis of natural gas [C$ 50k]
Climate Positive Energy Institute, UofT
Principal Investigator: S. Chaudhuri

2022 – 2025 Transitioning to hydrogen based power generation through a novel, fuel-flex, gas turbine injector concept [C$ 790k]
Natural Sciences and Engineering Research Council of Canada, Alliance Mission Grant
Principal Investigator: S. Chaudhuri
co-Principal Investigators: B. Savard, E. Roberts (École Polytechnique de Montréal), J. Bergthorson (McGill University)
Partners: P. Vena (National Research Council Canada), G. Bourque, M. Furi, S. Jella P. Versailles (Siemens Energy Canada)

2022 – 2025 Reducing aviation's impact on climate change - understanding effects of fuel and engine characteristics on formation of contrails [C$ 900k]
Natural Sciences and Engineering Research Council of Canada, Alliance Mission Grant
Principal Investigator: Ö . Gülder
co-Principal Investigators: S. Chaudhuri, C. Groth
Partners: C. Bretta, R. Stratton (Pratt & Whitney, Canada) F. Liu, A. Brown (National Research Council, Canada)

2022 – 2025 Actively controlled acoustic dampening in a hydrogen fueled model aircraft combustor [C$ 100k]
National Research Council Canada
Principal Investigator: S. Chaudhuri

2021 – 2022 Investigating the effects of alternative fuels on the combustion instabilities of two staged combustion system [C$ 63k]
National Research Council Canada
Principal Investigator: S. Chaudhuri

2021 – 2026 Structure, propagation, and stabilization of turbulent flames at aircraft engine conditions [C$ 160k]
Natural Sciences and Engineering Research Council of Canada, Discovery Grant
Principal Investigator: S. Chaudhuri

2021 – 2023 Direct numerical simulations of turbulent reacting and multiphase flows (HPC time allocation worth [C$ 62k (2021), C$68k (2022), C$135k (2024)])
Compute Canada, Resource Allocation Competitions
Principal Investigator: S. Chaudhuri

2021 – 2026 Kinetics-transport interaction towards deposition of carbon particulates in mesochannel: supercritical fuel flows [C$ 220k]
Canada Foundation for Innovation, John R. Evans Leaders Fund
Principal Investigator: S. Chaudhuri
Co-Principal Investigator: O. L. Gulder

2021 – 2022 Mathematics for Public Health and Variants of Concern [C$ 100k]
Canadian Institutes of Health Research
Principal Investigator: V.K. Murty

2016 – 2022 Next generation low-emission combustor technologies for high-efficiency compact aviation gas turbine engines [C$ 3104k]
Ontario Research Fund
Principal Investigator: O. L. Gulder

2019 – 2022 Heuckroth Distinguished Faculty Award in Aerospace Engineering [C$ 200k]
University of Toronto Institute for Aerospace Studies

2013 – 2019 Funding secured as Principal Investigator at Indian Institute of Science ≈ INR 100 million

Research supervision: Current PhD students

2023 – present **Saifullah**, DNS of lean hydrogen flames at engine relevant conditions
University of Toronto Institute for Aerospace Studies

2021 – present **Kartikeya Akojwar**, Self-decarbonizing combustor
Direct transfer from MASc program
University of Toronto Institute for Aerospace Studies

2020 – present **Yazdan Naderzadah**, Stabilization mechanisms in micromix-premix fuel-flex combustor
University of Toronto Institute for Aerospace Studies

2020 – present **Arnab Mukherjee**, Large scale disease dynamics from flow physics of airborne transmission
University of Toronto Institute for Aerospace Studies

Research supervision: Graduated PhD students

2019 – 2024 **Yuvraj**, Enhancement of flame speeds of hydrogen-air premixed flames in turbulence
University of Toronto Institute for Aerospace Studies
Present affiliation: University of Toronto Institute for Aerospace Studies

2015 – 2023 **Ankit Dutta**, Synchronization and combustion dynamics in lean premixed combustors
Indian Institute of Science
Present affiliation: Honeywell International Inc.

2014 – 2020 **Gopakumar R**, Dynamics of actuated and interacting swirl premixed flames in model gas turbine combustors
Indian Institute of Science
Present affiliation: Sandia National Laboratories

2013 – 2020 **Prasenjit Kabi**, A study of internal transport mechanisms in evaporating sessile droplets leading to dynamic self-assembly
Indian Institute of Science, co-supervised with S. Basu
Present affiliation: University College London

2014 – 2019 **Himanshu L. Dave**, Structure and propagation of premixed flames in turbulence
Indian Institute of Science
Present affiliation: GE Vernova

2013 – 2018 **Harshavardhana Uranakara**, Flame Particle Tracking analysis of turbulence-premixed flame interaction
Indian Institute of Science
Present affiliation: ANSYS

Research supervision: Current MASc students

2024 – present **Matthew He**, Direct contact Self-Decarbonizing Combustor
University of Toronto Institute for Aerospace Studies

2024 – present **Owen Zeyl**, Stabilization of micromix hydrogen flames at elevated pressure
University of Toronto Institute for Aerospace Studies

2024 – present **Raghu Alluri**, High speed turbulent flames
University of Toronto Institute for Aerospace Studies

2023 – present **Scott Watson**, Stabilization of lean hydrogen flames
University of Toronto Institute for Aerospace Studies

Research supervision: Graduated MASc students

2017 – 2021 **Vishal Singh**, Spray interaction with supersonic crossflow
Indian Institute of Science

2017 – 2019 **Mallikarjuna Tilak**, Analysis of interacting swirling flows
Tata Advanced Systems

2017 – 2019 **Abinesh Mohan**, Lagrangian flame element analysis of turbulence-premixed flame interactions
Indian Institute of Science

MEng project supervision

2022 – 2023 **Alisa Nitu**
University of Toronto

2021 – 2022 **Vlad Vasylyev**
University of Toronto

2018 – 2019 **Nitin Chandy Joseph**
Indian Institute of Science

2018 – 2019 **Nithin Somasekharan**
Indian Institute of Science

2017 – 2018 **Mehul Kumar**
Indian Institute of Science

2017 – 2018 **Harish S.**
Indian Institute of Science

2016 – 2017 **Mohammad Anwar**
Indian Institute of Science

2016 – 2017 **Abhijit Kalbhor**
Indian Institute of Science

2016 – 2017 **Lakshmi Ganesh Shankar**
Indian Institute of Science

2013 – 2014 **Kaladasi Dileep Kumar**
Indian Institute of Science

Postdoc supervision

2024 – present **Dr. Yuvraj**
UTIAS

2022 – present **Dr. Amitesh Roy**
UTIAS

2022 – present **Dr. Samadhan Pawar**
UTIAS

2021 – 2023 **Dr. Jinhyun Bae**
UTIAS

2017 – 2018 **Dr. Mahesh S.**
present position: faculty at Indian Institute of Space Science and Technology

Teaching

Fall 2021 **AER 1324: Introduction to Turbulence**
Fall 2022 University of Toronto
Fall 2023
Fall 2024
Fall 2025

Winter 2025 **AER 510: Aerospace Propulsion**
Winter 2024 University of Toronto
Winter 2023
Winter 2022
Winter 2021
Winter 2020

Fall 2017 **AE 245: Mechanics and Thermodynamics of Propulsion**
Fall 2015 Indian Institute of Science

Spring 2016 **AE 250: Advanced Combustion**
Spring 2015 Indian Institute of Science
Spring 2014

Fall 2018 **AE 276: Experimental Techniques** (few lectures)
Fall 2016 Indian Institute of Science
Fall 2014

Summer 2017 **Combustion in Air Breathing Aero Engines (NPTEL)** 30 hours MOOC
https://nptel.ac.in/courses/101/108/101108068/

Invited Talks

June 2025 Analyzing conditionally averaged structures to decipher and model mixing-chemistry interaction in high Ka, lean H2 flames
2nd Combustion DNS Workshop, Corfu

June 2025 Three faces of hydrogen: its generation, injection, and flame structure in turbulence
Delft University of Teachnology, Delft

July 2024 Introducing two novel combustors: fuel-flex combustor and self-decarbonizing combustor
Joint PTF-TNF workshop, Milan

July 2024 How “mixing" affects propagation and structure of intensely turbulent, lean, hydrogen-air premixed flames
PTF workshop, Milan

March 2023 Multiscale complexities of turbulent reacting flows: from faster hydrogen air flames to superspreading events
Combustion Webinar
https://www.youtube.com/watch?v=8jC24dNwv5k&t=2616s

January 2023 Turbulent reacting flow dynamics: some advances and applications
IIT-Madras, Chennai

August 2022 Turbulent flame speed based on mass flow rate: theory and DNS
Turbulent combustion workshop, Vancouver

October 2021	Hydrogen in aerospace propulsion, part 1: Ignition and extinction *Pratt & Whitney mini conference on hydrogen*
September 2021	Hydrogen in aerospace propulsion, part 2: Flame propagation, interaction, and dynamics *Pratt & Whitney mini conference on hydrogen*
July 2021	Turbulent Combustion II: Structure and propagation of turbulent flames *Princeton Combustion Institute Summer School 2021*
July 2021	Local Structure and Propagation of Turbulent Premixed Flames *Pratt & Whitney Canada Seminar Series*
June 2021	Estimating overdispersion from turbulent diffusion of infectious aerosols *Ontario Science Table*
June 2021	Analyzing overdispersion from turbulent diffusion of infectious aerosols *Modeling Consensus Table*
March 2021	Propagation and structure of premixed flames in turbulence *Guest lecture in graduate course on Combustion: Princeton University*
March 2021	Genesis and evolution of premixed flames in turbulence *Pratt & Whitney Canada Seminar Series*
February 2021	Constructing an ab-initio disease spread model to decipher Covid-19 type pandemics *Department of Mechanical Engineering, University of Connecticut*
February 2021	Constructing a disease spread model from the flow physics of infectious droplets and aerosols *The Fields Institute, Toronto*
December 2020	Analyzing the dominant SARS-CoV-2 transmission routes towards an ab initio disease spread model *Complex Fluids Conference, IIT Bombay*
March 2019	How Swirl Flames Interact in a Multi Nozzle Model Gas Turbine Combustion *International Workshop on Energy Power and Environment, Kurukshetra*
November 2018	Evolution of Flame Speeds in Turbulence at Different Pressures *International Conference on Combustion and Energy Utilization, Sendai, Japan*
May 2018	Autoignition of Hydrogen in Shear Flows *ASeT 2018: Future Directions in Propulsion Conference, LPSC ISRO*
April 2018	Genesis, Evolution and Annihilation of Premixed Flames in Turbulence *Taiwan Annual National Conference on Energy and Combustion*
March 2018	Turbulent Combustion Dynamics in Aero Engine Combustors *University of Toronto Institute for Aerospace Studies*
March 2018	Genesis, Evolution and Annihilation of Premixed Flames in Turbulence *KAUST Research Conference on Combustion in Extreme Environments*

February 2018	Genesis and Evolution of Premixed Flames in Turbulence *Prof. P. J. Paul Memorial Meet, Hyderabad*
December 2016	Dispersion, Propagation and Extinction of Flame Elements in Turbulence *International Discussion Meeting on Chemical Kinetics for Aerospace Applications, IISc*
February 2016	Mitigating Instability by Actuating the Swirler in a Combustor *Prof. P. J. Paul Memorial Meet at VSSC, Trivandrum*
February 2016	Lagrangian Investigations of Turbulent Premixed Flames *Complex System Approach to Self-Organization, IIT Madras*
August 2015	Local and Global Viewpoints in Turbulent Combustion *IISc Astrophysics Seminar*
August 2015	Lagrangian Viewpoint of Turbulent Premixed Combustion *Prof. P. J. Paul Memorial Meet, Mahabalipuram*
January 2015	Local and Global Viewpoints in Turbulent Combustion: Turbulent Flame Speed and Flame Particle Tracking *International Workshop on Sustainable Energy Power and Propulsion, organized by Jadavpur University, IITK, University of Maryland, University of Illinois and Chicago*
March 2014	Turbulent Combustion at NCCRD, IISc *Pan India Combustion Workshop IITM*
February 2014	Two Problems in Turbulent Combustion: Experiments and DNS *Prof. P. J. Paul Memorial Meet, Jain University*
February 2014	Blowoff Dynamics and its Measurements *Thermo-acoustic and Aero-acoustic nonlinearities in green combustors with orifice structures Workshop, Indian Institute of Technology, Madras*
July 2013	Turbulent Combustion: Flame Speed and Flame Blowoff *Vikram Sarabhai Space Center, ISRO*
July 2013	Two Problems in Turbulent Combustion: Flame Propagation and Stabilization *Indian Institute of Technology, Madras*
July 2013	A Brief Journey with Turbulent Reacting Flows *Jadavpur University*
January 2012	Two Problems in Turbulent Combustion: Flame Propagation and Stabilization *Indian Institute of Science, Bangalore*
December 2011	Propagation and Stabilization of Turbulent Premixed Flames *Imperial College London*
November 2009	Dynamics and Diagnostics of Turbulent Premixed Flames *Max Planck Institute for Dynamics and Self Organization, Göttingen*

August 2009 — Blowoff Mechanism and Forced Response of Bluff Body Stabilized Turbulent Premixed Flames
Princeton University

University Service

2023 – 2023	UTIAS EngSci Aerospace Option Chair (Acting)
2020 – 2022	UTIAS Curriculum Committee
2020 – present	UTIAS Seminar Committee (Chair)
2020 – present	UTIAS Planning Committee
2017	IISc AE Department Review Committee
2017	IISc AE Department Review Committee
2014	IISc AE Department Development Committee
2013	GATE Examination Committee
2013 – 2019	IISc ICER Research Student Admission
2013 – 2019	IISc AE Research Student Admission
2013 – present	Doctoral and Masters evaluation committees at UTIAS and at IISc

Academic service

Colloquium Co-Coordinator of the Energy and material conversion and heating processes colloquium of the 41st International Symposium on Combustion 2026; WiPP Co-Chair of the 39th International Symposium on Combustion 2022.

Served as reviewer for the following journals and conferences
1. Combustion and Flame 2. Progress in Energy and Combustion Science 3. Proceedings of the Combustion Institute 4. Journal of Fluid Mechanics 5. AIAA Journal 6. AIAA Journal of Propulsion and Power 7. International Journal of Spray and Combustion Dynamics 8. Physics of Fluids 9. Combustion Science and Technology 10. International Journal of Hydrogen Energy 11. Experimental Thermal and Fluid Sciences 12. Chinese Journal of Aeronautics, Elsevier 13. Sadhana, Indian Academy of Sciences, Springer 14. Physics Letters A 15. Chaos: An Interdisciplinary Journal of Nonlinear Science 16. PLOS One 17. International Journal of Heat and Mass Transfer 18. International Symposium in Combustion 19. ASME Turbo Expo 20. ASME GT India Conference 21. ILASS Asia 22. International Heat Transfer Conference 23. Asia Pacific Conference on Combustion 24. International Conference on Computational Methods in Thermal Problems 25. Journal of Aerospace Technology and Management 26. Atmospheric Chemistry and Physics 27. Science of the Total Environment 28. Current Science 29. Springer Books 30. Applications in Energy and Combustion Science

Served as reviewer for the following funding agencies

1. Science and Engineering Research Board, Government of India. 2. ISRO-IISc Space Technology Cell 3. Natural Science and Energy Research Council of Canada 4. Mitacs

Professional memberships

2021 – Present **Climate Positive Energy, UofT**

2023 – Present **Institute for Pandemics, UofT**

2021 – 2022 **Modeling Consensus Table for Covid-19 advisory, Ontario**

2019 – Present **AIAA Propellants and Combustion Technical Committee**

2006 – Present **American Society of Mechanical Engineers**

2006 – Present **Combustion Institute**