HIMAKAR GANTI, Ph.D.

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Google Scholar

HIGHLIGHTS

- ❖ Experience from academia and industry research and development environments.
- ❖ Expert in hypersonics, supersonics, fluid-structure interactions, multiphase flows, and combustion.
- ❖ Pioneered application of Machine Learning to computational and experimental multiphase flows.
- ❖ Strong publication record with multiple peer-reviewed publications in high impact journals.

EDUCATION

Ph.D., Aerospace Engineering, University of Cincinnati, May 2023
Dissertation: *Data Driven Surrogate Modelling of Two-Phase Flows*; Advisor: Prashant Khare, Ph.D.
M.S., Mechanical Engineering, Oregon State University, Jun 2017
M.S., Mechanical Engineering, University of Dayton, Dec 2007
B.S., Mechanical Engineering, Osmania University, May 2004

PROFESSIONAL & RESEARCH EXPERIENCE

Post Doctoral Fellow **May 2023 to Present**
University of Cincinnati, Cincinnati, OH, USA

- **Hypersonics**
  - ❖ Conduct numerical simulations to explore and improve state-of-the-knowledge of aeroelastic and aerothermodynamic non-equilibrium physics in supersonic and hypersonic flows.
  - ❖ Conduct high-fidelity numerical simulations for enhancing existing knowledge and understanding of Fluid-Structure Interactions (FSI) in supersonic and hypersonic flow regimes.
  - ❖ Adapt, develop and couple fluid-flow-solvers, solid-solvers and associated adaptors to conduct FSI for high-speed flow regimes.
- **Machine Learning**
  - ❖ Surrogate modelling for experimental and computational multiphase fluid flows.
  - ❖ Apply machine learning techniques for design space exploration, surrogate modeling, uncertainty, and sensitivity analysis.
  - ❖ Apply machine learning for predicting spatiotemporally varying multiphase fluid flows.
- Build and develop reduced order models (ROM), theories, data-driven models, and surrogate models for laminar and turbulent flows.
- Conduct Direct Numerical Simulation (DNS) studies with turbulence resolution and modeling to improve the state-of-knowledge for non-reacting and reacting flows.
- Conduct CPU and GPU numerical simulations of multiphase flows and combustion dynamics.
- Publish peer-reviewed articles in reputed journals and conferences.
- Mentor team members in computational multiphysics and combustion simulations and modeling for High Performance Computing (HPC) applications.

Research Assistant **Aug 2017 to Apr 2023**
University of Cincinnati, Cincinnati, OH, USA

- **Machine Learning**
  - ❖ Pioneered surrogate modelling with Machine Learning for experimental and computational multiphase fluid flows, with Gaussian Process (GP), Deep Learning/ Deep Neural Networks (DNN), and Physics Informed Neural Networks (PINNS) approaches.
  - ❖ Pioneered Machine Learning frameworks for accurate predictions with large speedups of time-varying, statistically stationary and steady-state single and multiphase flows.
  - ❖ Pioneered application of Machine Learning techniques for design space exploration, surrogate modeling, uncertainty and sensitivity analysis.

- ❖ Pioneered application of Machine Learning for predicting spatiotemporally varying multiphase fluid flows.
- Conduct High Fidelity & Direct Numerical Simulation (DNS) studies with turbulence resolution and modeling to improve the state-of-knowledge for non-reacting and reacting multiphase flows.
- Built and developed reduced order models (ROMs), data-driven models, and surrogate models for laminar and turbulent flows for machine learning applications.
- Conducted modelling and numerical simulations of sub, super and hypersonic multiphase flows for improving the state-of-knowledge, performance and efficiency improvements of aerospace vehicles and engineering power and flow devices.
- Conducted DNS studies to enhance state-of-knowledge of turbulence and flame interaction.
- Built and developed Reduced Order Models (ROMs) for spatiotemporally varying multiphase flows.
- Mentored team members for conducting computer numerical simulations for multiphysics, multiphase flows and combustion applications in High Performance Computing (HPC) environments.
- Supported the Advanced Research Computing Cluster (ARCC) team at the University of Cincinnati.

Systems Engineer **Aug 2016 to May 2017**

BeachBody, Santa Monica, CA, USA

- Administered, configured, and maintained operating systems on application and data cluster-servers, physical and virtual machines.
- Worked on server network modifications, management, and maintenance with support for multiple networking protocols.
- Built virtual machines and allocated resources for guest OS specifications.
- Analyzed security requirements and contributed to design patching of systems, and installation of security patches and configuration changes.
- Automated patch management and reporting processes.
- support and administered production systems, while troubleshooting for issues and providing support to engineering teams.
- Continuous Development and Continuous Integration (CD, CI) for capacity and architecture planning.

Research Assistant **Sep 2014 to Aug 2016**

Oregon State University, Corvallis, OR, USA

- **Project:** Investigation of Stiffness Metrics for Chemical Kinetic Simulations
- Developed a Dynamic-Solver-Selector based on stiffness detection for improved solver efficiency and reduced computational cost.
- Conducted numerical experiments and simulations for solver validation.
- Developed novel bimodal natural gas engine for performance as a compression device to significantly reduce natural gas-fill times.
- Conducted chemical kinetics and combustion modeling to predict natural gas engine performance under varying fuel conditions.
- Performed thermal fluids analysis and simulation of a microchannel heat exchanger for performance and efficiency improvements.
- Conducted modeling and simulation of physical processes as boiling and condensation of a thermosyphon for performance and efficiency of phase change heat exchange process.
- Performed experimental validation and modeling of hot-wire anemometry, phase change heat transfer and high-pressure flow measurements with uncertainty quantification.

Systems Engineer **Mar 2013 to Aug 2014**

iRUS InfoTech Pvt. Ltd. Hyderabad, Telangana, India

- Administered, configured, and maintained operating systems on application and data cluster-servers, physical and virtual machines.
- Worked on server network modifications, management, and maintenance with support for multiple networking protocols.
- Implemented software configuration management with for system enhancements.

- Built virtual machines and allocated resources for guest OS specifications.
- Performed analysis of security requirements and contributing to design patching systems, and installation of security patches and configuration changes.
- Automated patch management and reporting processes.
- Maintained and administered production systems, while troubleshooting for issues and providing support to engineering teams.
- Experienced in securing systems, including firewalls, intrusion detection, authentication systems, and log management.

Air Systems Engineer **May 2010 to Jan 2013**

Caterpillar, Inc., Peoria, IL, USA

- Trained, mentored and supervised newer team members for flow testing, measurements, and instrumentation of engine air components for internal customers.
- Ran, maintained, and scheduled two hot and one cold air flow test cells for flow testing of air system components as per customer requirements.
- Product development of engine air system components, including turbochargers, inlet and exhaust manifolds, engine cylinder heads, aftertreatment modules, fire suppressors, etc. through hot and cold flow testing.
- Conducted design of experiments, instrumentation, and setup of high-speed data acquisition systems for performance estimation and enhancement of high-speed rotating machinery (turbochargers), critical air flow components (manifolds, cylinder heads) and aftertreatment modules.
- Streamlined testing and validation procedures for hot flow testing of turbochargers as per customer and application specific requirements.
- Improved and enhanced instrumentation techniques for increased reliability, repeatability, and accuracy of experimental measurements, effectively reducing product development times.
- Conducted uncertainty quantification and sensitivity analysis on experimental measurements, acquired and post processed data from test cell instrumentation and systems for accurate error estimation for customers, leading to enhancements of prototype components and reduced development costs.
- Programmed and built LabView data acquisition system for cold flow measurements from sensors to ensure accuracy, reliability, and repeatability.
- Reduced prototype development and warranty replacement costs of failed production components by detecting flow issues with improved measurement techniques, resulting in timely corrections for design and production schedules.

Fuel Systems Engineer **Oct 2008 to May 2010**

Continental Automotive, Columbia, SC, USA

- Developed Common-Rail-Diesel-Injection (CRDI) fuel system with piezo-electric injectors for fulfillment of Model Year 2010-11 (MY-2010/11) Environmental Protection Agency (EPA) Motor Vehicle Emissions and Fuel Standards.
- Calibrated and validated CRDI fuel system through bench, dyno and vehicle integration and testing for functionalities, performance stability and reliability with Programmable Logic Control (PLC) for hardware level and Supervisory Control and Data Acquisition (SCADA) for software level.
- Calibrated and validated engine and powertrain functionalities through bench, dyno and vehicle integration and testing for performance, stability and reliability.
- Calibrated and validated fuel maps for injection timing and fuel quantity delivered for torque generation on demand.
- Calibrated and validated combustion strategies and multiple injection modes to support various after-treatment processes and strategies.

Research Assistant **Aug 2005 to Aug 2007**

University of Dayton, Dayton, OH, USA

- **Project:** Auto-Ignition Characteristics of a Hydrocarbon Fuel-Methyl Heptane at High Pressures

- Conducted low- and high-pressure shock tube combustion experiments for ignition and combustion characteristics of hydrocarbon fuels for aviation applications.
- Conducted qualitative and quantitative analysis of combustion products from shock tube experiments using chemical post-treatment and Gas Chromatography (GC) analysis.
- Chemical kinetic and combustion modeling of select candidate fuels for ignition and combustion characteristics and products.
- Performed design analysis, construction and testing of a Heated-Shock-Tube and Pesticide-Destruction system.

Mechanical Design Engineer **May 2004 to Jul 2005**

Vani Engineering Works, Hyderabad, Telangana, India

- Applied Computer Aided Design (CAD) and manual drafting tools to the design process for metal components to streamline machining processes with machine tools.
- Designed metal components of precision electronics for machining processes within dimensional tolerances.
- Supervised machining process for metal components within specified tolerances as per client/ customer specifications.

AWARDS, HONORS & SCHOLARSHIPS

- Editors Pick for Physics of Fluids Special Edition – Hydrogen Flame and Detonation Physics, Jul, 2023, Scilight: https://doi.org/10.1063/10.0020574. "*Direct Numerical Simulation of Premixed Syngas-Air Mixtures with High Hydrogen Content*", H. Ganti, P. Khare, and L. Bravo.
- 1st Prize, Art in Science Competition, "*Shock Droplet Interactions"*, M. Tripathi, H. Ganti, and P. Khare. Video Presentation, 47th Dayton Cincinnati Aerospace Sciences Symposium, Dayton, OH, Mar, 2022.
- *Professor Kirti "Karman" Ghia Endowed Graduate Student Scholarship* 2021, Department of Aerospace Engineering & Engineering Mechanics, CEAS, University of Cincinnati.
- *Professor R. T. Davis Memorial Scholarship Award for Academic Performance* 2020, Department of Aerospace Engineering & Engineering Mechanics, CEAS, University of Cincinnati.
- 2nd Prize, *Commonwealth Computational Summit* (CCS), Poster Presentation, University of Kentucky – Oct 2018.
- Student Travel Award, *14th Triennial International Conference on Liquid Atomization and Spray Systems (ICLASS)* – July 2018.
- '*Move the Mountain'* award for outstanding dedication towards achievement of objectives, Caterpillar – Sep 2012.
- Received scholarships by *Defense Associated Graduate Student Innovators* (*DAGSI)* for:
  - Research Scholarship Award for Summer 2007.
  - Enhancement Scholarship for Fall 2007.

PUBLICATIONS

Peer Reviewed

1. H. Ganti, P. Khare, and L. Bravo, "*Direct Numerical Simulation of Premixed Syngas-Air Mixtures with High Hydrogen Content*", Physics of Fluids Special Edition – Hydrogen Flame and Detonation Physics (2023). doi: https://doi.org/10.1063/5.0156537.
2. Tripathi M, Ganti H, Khare P., *"Interaction between Shock Waves and Droplet Clusters: Interfacial Physics"*, ASME Journal of Fluids Engineering (2022),. doi: https://doi.org/10.1115/1.4054181.
3. Tripathi M, Ganti H, Khare P., *"Interaction between Shock Waves and Droplet Clusters: Interfacial Physics and Fragmentation Behavior"*, Institute for Liquid Atomization and Spray Systems, ILASS Americas 2021 Virtual Conference, May 2021.
4. H. Ganti, M. Kamin, P. Khare, *"Design Space Exploration of Turbulent Multiphase Flows Using Machine Learning-Based Surrogate Model"* Energies (2020), 13 (17), pp 1-23. doi: https://doi.org/10.3390/en13174565.

5. H. Ganti, P. Khare, *"Data-Driven Surrogate Modeling of Multiphase Flows Using Machine Learning Techniques"*, Computers and Fluids (2020), 211 (104626), pp. 1-13. doi: https://doi.org/10.1016/j.compfluid.2020.104626.
6. H. Ganti, P. Khare, and L. Bravo, *"Binary collision of CMAS droplets — Part I: Equal sized droplets"*. Journal of Materials Research, Focus Issue - Sandphobic Thermal/Environmental Barrier Coatings for Gas Turbine Engines (2020), 35 (17), pp. 2260–2274. doi: https://doi.org/10.1557/jmr.2020.138.
7. H. Ganti, P. Khare, and L. Bravo, *"Binary collision of CMAS droplets — Part II: Unequal sized droplets".* Journal of Materials Research, Focus Issue - Sandphobic Thermal/Environmental Barrier Coatings for Gas Turbine Engines (2020), 35 (17), pp. 2275–2287. doi: https://doi.org/10.1557/jmr.2020.153.
8. Ganti H, Khare P., *"Prediction of Liquid Jet Atomization Using Gaussian Process Based Machine Learning Techniques".* 14th Triennial International Conference on Liquid Atomization and Spray Systems (ICLASS), Jul 2018.
9. S. Menon, H. Ganti, K. Niemeyer, and C. Hagen, *"Effects of oil and water contamination on natural gas engine combustion processes."* Journal of Natural Gas Science & Engineering, (2017), 41, pp. 30-39. doi: https://doi.org/10.1016/j.jngse.2017.02.038.

Non-Peer Reviewed

1. H. Ganti, L. Bravo, A. Ghosal, P. Khare, "*Mutual Interactions Between a Thin Flexible Panel and Supersonic Flows*", arXiv 2501.08875, Jan, 2025. Doi: https://doi.org/10.48550/arXiv.2501.08875
2. H. Ganti, L. Bravo, A. Ghosal, P. Khare, "*Fluid-Structure-Interactions of Flexible Panels in Hypersonic Flow*", AIAA SciTech Forum & Exposition, Jan, 2025. doi: https://doi.org/10.2514/6.2025-0339.
3. J. Redding, N. Plewacki, H. Ganti, L. Bravo, P. Khare, *"Analysis of Thermochemical Non-Equilibrium Hypersonic Flow over a Waverider with Uncertainty Quantification"*, JANNAF Conference, May, 2024. doi: https://doi.org/10.48550/arXiv.2405.15875
4. Ganti H, "*Data-Driven Surrogate Modeling of Two-Phase Flows*", PhD Thesis, 2023. http://rave.ohiolink.edu/etdc/view?acc_num=ucin1684772398259224
5. Ganti H, Kamin M, Khare P., *"Design Space Exploration for Liquid Jet Vaporization in Air Crossflow using Machine Learning".* AIAA SciTech Forum & Exposition, Jan, 2019. doi: https://doi.org/10.2514/6.2019-2211.
6. Ganti H, Khare P., *"Spatio-Temporal Prediction of Gaseous and Liquid Spray Fields using Machine Learning*". Jul, 2018 Joint Propulsion Conference, AIAA. doi: https://doi.org/10.2514/6.2018-4760.
7. Menon, S, H Ganti, K Niemeyer, and C Hagen. 2015. *"Effect of Natural Gas Conditions on Combustion Characteristics and Overall Performance of a Novel Bimodal Internal Combustion Engine."* 9th U.S. National Combustion Meeting, Combustion Institute, 2015.
8. Menon, S, Ganti, H, Wang, H, and C Hagen. 2015. *"Development and Analysis of Micro-Channel Heat Exchangers for Natural Gas Cooling,"* International Conference of Nano, Micro and Mini Channels (ICNMM) ASME 2015.

Manuscripts in Progress

1. H. Ganti, L. Bravo, A. Ghosal, P. Khare, "*Mutual Interactions Between a Thin Flexible Panel and Supersonic Flows*", to be submitted to Physics of Fluids.
2. H. Ganti, L. Bravo, A. Ghosal, P. Khare, "*Fluid-Structure-Interactions of Flexible Panels in Hypersonic Flow*", Under preparation – to be submitted to Physics of Fluids.
3. H. Ganti, P. Khare, *"A Comparative Analysis of Supervised Machine Learning Algorithms for Surrogate Modeling of Fluid Flows"*, Under Preparation.

WORKSHOPS CONDUCTED

1. "*Linux: Paradigms & Practices for High-Performance-Computing (HPC)*" H. Ganti, Data and Computational Science Series, University of Cincinnati, Nov, 2019.
2. "*Introduction to Gaussian Process based Data-Driven Surrogate Modeling Techniques for Complex Fluid Dynamics*", H. Ganti, and P. Khare, U.S. Army Research Laboratory, Aberdeen Proving Ground, MD, Jun, 2019.

SKILLS

- Aerothermodynamics, Fluid-Structure Interactions, Hypersonics, Supersonics, Direct-Numerical-Simulations (DNS), High-Fidelity Numerical Simulations and Computational Fluid Dynamics (CFD) with both open-source and commercial software packages in a High Performance Computing (HPC) environment.
- Machine Learning Application to Fluid Flows: Spatiotemporally Varying, Statistically Constant and Steady State; Laminar and Turbulent; Single Phase and Multiphase, High-Speed Flows.
- High Performance Computing (HPC): Experienced with software applications like ANSYS, Converge CFD, Star-CCM, Pointwise, Tecplot, Paraview, Cantera.
- Proficient in programming languages as Fortran, C/C++, MATLAB, MPI & Python, Tensorflow.

TEACHING EXPERIENCE

Guest Lectures

1. Course: ENAE457 Space Power and Propulsion, University of Maryland, Jun 2024. Introduced Computational Fluid Dynamics and Numerical Simulations as tools for studying combustion phenomenon.
   a. Lecture: Liquid Propellant Combustion and Stability,
   b. Presentation: DNS of Turbulence Flame Interactions for Premixed SynGas Mixtures.

Adjunct Professor

University of Cincinnati — Aug 2023 to Dec 2023

AEEM 5011/ 6011 Combustion, (Fall 2023, Class Size 40)

Responsible for preparation of course material, class lectures, presentations and guidance to students with course topics, with further evaluation and examination of their understanding. Introduced usage of open-source software packages for chemical kinetic calculations of combustion phenomena.

Teaching Assistant

University of Cincinnati — Aug 2017 to May 2023

Combustion (Fall 2022, Class Size 30), Compressible Flow (Fall 2017-Class Size 30, Fall 2018, Class Size 30), Gas Dynamics (Fall 2019, Class Size 30, Fall 2021, Class Size 30), Solid Mechanics (Fall 2021, Class Size 80)

Assisted through course presentation and evaluation of homework and examinations.

Oregon State University — Jan 2016 to Mar 2016

Numerical Methods (Spring 2016, Class Size 80)

Assisted through course discussions and evaluation of homework and examinations.

University of Dayton — Aug 2005 to Dec 2005

Heat Transfer (Fall 2005, Class Size 40)

Assisted instructor through evaluation of homework and examinations of students.