

COMPTENCIES

Combined experience in both academic and industrial research environments.

- Demonstrated experience in team building and team integration encompassing multidisciplinary teams including experimental groups, leadership of multi-disciplinary teams.
- Demonstrated expertise in obtaining government and corporate funding at large scale.
- Peer mentoring and professional growth of the team.
- Strong publication record with co-authorship of two graduate-level textbooks & 14 refereed publications.
- Led 14-member working group, organized panel discussion and technical sessions, training sessions.
- Aerospace community engagement.

EDUCATION

- Ph. D, Mechanical Engineering -- The Pennsylvania State University, 2004-2008
- Ph. D (minor), High Performance Computing--The Pennsylvania State University, 2004-2008
- M.S., Mechanical Engineering -- The Pennsylvania State University, 2001-2004
- B.S. (Honors) Mechanical Engineering-- Indian Institute of Technology-BHU (IIT-BHU), 1996-2000

PROFESSIONAL EXPERIENCE

Director, Hypersonics CFD Research Corporation, Huntsville, AL

Jan 2019-
Current

- Hypersonics and advanced propulsion concepts. Leading a working group of 14 members. Supervises PhD and MS level employees and interviews relevant candidates company wide.
- Leading integration of software-based model development efforts with experimental testing, fabrication and prototyping for Hypersonics and advanced propulsion concepts.
- Principal Investigator and Team Integrator with over 15 subcontractors of Army Missile Technology Consortium (AMTC) proposal on Hypersonic Vehicle Modeling and Simulation worth \$41.88 million to support AMRDEC in their Hypersonic Efforts.
- Successfully led and won a Defense Ordinance Technology Consortium (DOTC) proposal on Thermal Protection Systems and Integrated Seekers worth \$41 million to support AMRDEC with over 20 subcontractors
- Leading proposals on Hypersonic Missile Defense, Hypersonic Signature Modeling and Detection, Hardware-in-the-loop to support Missile Defense Agency and SMDC.
- Program management, interfacing with management and customer, leadership of multi-disciplinary projects.

Sep 2016-
Dec 2018

Sr. Principal Scientist, CFD Research Corporation, Huntsville, AL

• **Technical Experience**

- Reacting boundary-layer flows, ballistic modeling
- Hypersonic boundary-layer transition
- Scramjet inlet modeling and uncertainty quantification

• **Leadership and Management**

- Established Hypersonics group at CFD Research Corporation.
- Project Leader and Principal Investigator on Hypersonic boundary-layer transition, Uncertainty Quantification for operability of Hypersonic Vehicles including dual-mode scramjets and boost-to-glide missiles, reduced-dimensional modeling for supersonic combustion, Gas-turbine combustor-high pressure turbine interaction, and hostile fire signature modeling, worth \$4.1 million.

- Led collaborative technology development with several universities including Virginia Tech, Texas A&M, University of Tennessee Space Institute, University of Connecticut-Storrs, Stanford University, and University of Illinois-Chicago.
- Hired and mentored multiple PhD employees

Nov 2010-
Aug 2016

Sr. Research Scientist, United Technologies Research Center, CT

• **Technical Experience**

- *Modeling Framework Development, Code Verification and Model Validation*
 - Ablation Modeling for Hypersonic and Supersonic Applications
 - Surface Chemistry Modeling and Coupling with reacting CFD
 - Pyrolysis Modeling & Gas-phase Extinction Modeling
 - Inlet Turbulence Modeling, Boundary-Layer Stability and Transition Physics
 - Computational Code Coupling
- *High Performance Computing & Hi-Fidelity Computational Fluid Dynamics*
 - Large Eddy Simulation, Spectral Methods, Direct Numerical Simulation, RANS

❖ **Management and Service Experience**

- Project development and planning, engagement with direct and indirect customers, resource management
- Innovation, capability development and enhancement, and business development (received ~\$1 million from DARPA DSO for development of ablation modeling framework for a new hypersonic aeroshell)
- Team leadership & development as well as briefing to the executive leadership
- Participation in review boards of various technical societies such as AIAA, The Combustion Institute
- Representation at various technical conferences and workshops.

Post-Doctoral Research Associate, The Pennsylvania State University

Jan 2009-Nov 2010

- ❖ Performed active research that led to several technical publications in solid rocket nozzle erosion modeling and two textbooks
- ❖ Mentored a graduate and an undergraduate student
- ❖ Collaborated with various researchers including experimentalists
- ❖ Co-solicited 4 research proposals to NASA, ONR, DARPA, and Army.

AWARDS & HONORS

- Elected American Institute of Aeronautics and Astronautics (AIAA) **Associate Fellow**
- AIAA Huntsville Section Council Elected STEM Outreach Director
- Nominated for UTC-wide corporate award the **Mead Medal** for work on the solid rocket modeling for United Technologies Aerospace Systems
- 6 performance awards at UTRC from 2011-2016.
- A medallion of acknowledgement from the U.S. Office of Naval Research for significant contribution to a MURI project on solid rocket nozzle erosion minimization in 2010.
- Member of the Air Breathing Propulsion Integration Technical Committee at AIAA.
- **Best Paper Award** in 7th International Symposium in Chemical Propulsion (7-ISICP) held in Kyoto, September 2007 for Interior Ballistics Processes in a Flash Tube.
- **Invited Speaker** for Ninth DOE Crosscut Workshop on Lean Emissions Reduction Simulation, May 2- 4, 2006, University of Michigan – Dearborn.
- 2 Best Paper Awards in 24th Rocket Nozzle Technology Subcommittee Meeting, November 2005 for Nozzle Analysis and Modeling.

BOOKS

1. "Fundamentals of Turbulent and Multiphase Combustion," John Wiley and Sons. Co-authored with Kenneth Kuo, John Wiley & Sons. April 2012
2. Applications of Turbulent and Multiphase Combustion," John Wiley and Sons. Co-authored with Kenneth Kuo, John Wiley & Sons. August 2012.

RESEARCH FUNDING

Hypersonic Vehicle Modeling and Simulation – Customer: AMTC OTA	Project Agreement, ceiling \$41.88 million	PI (2019-2022)
Hypersonic Boundary-Layer Transition Customer: AEDC	\$750 K	PI (2016-2020)
Uncertainty quantification for dual-mode scramjets Customer: NASA LaRC	\$875K	PI (2017-2020)
High-pressure combustion-turbulence interaction - Customer: AFOSR	\$750 K	PI (2019-2021)
Uncertainty quantification for Hypersonic Flight - Customer: MDA	\$100 K	PI (2019-)
Ultrasonically Absorptive Aeroshell Materials for Hypersonic Boundary Layer Transition (BLT) Delay Customer: ONR	\$150 K	Co-PI (2019-)
Nosecone Design for Hypersonic Cruise Missile - Customer: Systima	\$98K	PI (2018-2019)
Integrated software for environment and material modeling for gas turbines. Customer: NASA-GRC	\$250 K	Co-PI (2017-2020)
Solid Rocket Motor Modeling - Customer: UTAS	\$600K	PI (2014-2016)
Ablation modeling for hypersonic boost-to-glide – Customer: DARPA DSO	\$1250 K	PI (2014-2017)
Coupled Combustor-Turbine Interactions – Customer: UTC/P&W	\$150 K	PI (2013-2015)
Boundary-layer transition control – Customer: UTC/P&W	\$50 K	PI (2014-2014)
Uncertainty quantification for gas-turbine combustors – Customer: UTC/P&W	\$75 K	PI (2015-2016)
Solid fuel scramjets – Customer: DARPA TTO	\$225 K	Co-PI (2014-2015)

JOURNAL PUBLICATIONS

1. R. Acharya and K. K. Kuo, "Implementation of approximate Riemann solver to two-phase flows in mortar systems," *Journal of Applied Mechanics*, September 2010, Vol. 77, pp. 051401-1-051401-9
2. R. Acharya and K. K. Kuo, "Effect of chamber pressure & propellant composition on erosion rate of graphite rocket nozzle," *Journal of Propulsion and Power*, 23, 6, pp.1242-1254, 2007.
3. R. Acharya and K. K. Kuo, "Graphite rocket nozzle erosion rate reduction by boundary-layer control using ablative materials at high pressures," *International Journal of Energetic Materials and Chemical Propulsion*, Vol. 7, pp. 402, 2008.
4. R. Acharya and K. K. Kuo, "Finite element simulation of interior ballistic processes in 120-mm mortar systems," *Proceedings of International Symposium on Ballistics*, Vol. 1, pp. 343-350, 2007.
5. R. Acharya and K. K. Kuo, "Effect of different flash-tube vent-hole patterns on interior ballistic processes of ignition cartridge of 120-mm mortar system," *International Journal of Energetic Materials and Chemical Propulsion*, Vol. 7, pp. 387, 2008.
6. K. K. Kuo, R. Acharya, P.J. Ferrara, and J. D. Moore, "Method of characteristics simulation of interior ballistic processes of m1020 ignition cartridge in a 120-mm mortar system," *International Journal of Energetic Materials and Chemical Propulsion*, Vol. 6, 5, pp. 629-650, 2007.

7. J. D. Moore, K. K. Kuo, R. Acharya, and P. J. Ferrara, "Effect of flash-tube vent-hole patterns on the combustion product discharge rate", *International Journal of Energetic Materials and Chemical Propulsion*, Vol. 7, pp. 746, 2008.
8. K. Kuo, R. Acharya, E. Boyd and S. Thynell, "Succinic acid/poly-vinyl acetate pyrolysis study for boundary layer control in high-pressure graphite rocket nozzles," *Journal of Propulsion and Power*, 25, 3, pp.801-807, 2009.
9. R. Acharya and K. K. Kuo, "Effect of reaction kinetic schemes on graphite rocket nozzle erosion rates," *International Journal of Energetic Materials and Chemical Propulsion*, 9, 1, pp. 71-90, 2010
10. R. Acharya, J. Pitt, B. Evans, F. Constanzo, and K. K. Kuo, "Coupling of transient heating and induced stresses computations in graphite nozzle materials," by *International Journal of Energetic Materials and Chemical Propulsion*.
11. J. Essel, R. Acharya, J. Sabourin, K. K. Kuo, R. Yetter, "Study of phase transformation of graphite at high temperatures," *International Journal of Energetic Materials and Chemical Propulsion*, 9, 3, pp. 205-218, 2010.
12. R. Acharya, M. Colket, V. Sankaran, "Enhanced Gas-Phase Flame-Extinction Model for Fires," *Proc. of the Seventh International Seminar on Fire & Explosion Hazards (ISFEH7)*, pp. 302–311.
13. R. Acharya, M. Alam, and A. L. Boehman, "Fuel and System Interaction Effects on Urea-SCR Control of NOx in Diesel Exhaust Aftertreatment", *Diesel Exhaust*, SP-2022, ISBN Number: 978-0-7680-1757-1, April 2006
14. M. Alam, J. Song, R. Acharya, and A. L. Boehman, "Combustion and Emissions Performance of Low Sulfur, Ultra Low Sulfur and Biodiesel Blends in a DI Diesel Engine," *SAE Transactions: Journal of Fuels and Lubricants*, Vol. 113, Issue 4, pp.1986-1997.

SELECTED CONFERENCE PUBLICATIONS

15. R. Acharya, M. Colket, P. Papas, and J. Senecal, "Impact of an Oxidative Pyrolysis Model for Charring Wood in Fire Simulations," 8th US National Meeting of the Combustion Institute, Utah, May 19-22, 2013
16. R. Acharya, M. Colket, and V. Sankaran, "Enhanced Gas-Phase Flame-Extinction Model for Fires," presented at the 7th International Seminar on Fire & Explosion Hazards, Rhode Island, 2013
17. R. Acharya and G. Poncia, "Dynamics of Interactions of a Watermist Spray with a Buoyant Plume" presented at Fall Technical Meeting of the Eastern States Section of the Combustion Institute Hosted by the University of Connecticut, Storrs, CT Oct 9-12, 2011.
18. R. Acharya, "Numerical Simulations of Watermist Injection and Its Interaction with a Buoyant Plume" presented at FM Global Open Source CFD Workshop, Norwood, MA, May 23-24, 2011.
19. R. Acharya, "Training on Three Dimensional Interior Ballistics Code" presented at ARDEC, NJ as a 3-part lecture series to Army Engineer, from May-September, 2010.
20. R. Acharya, "Modeling and Simulation of Multiphase Reacting Flows and Its Applications," invited presentation at Oak Ridge National Laboratory, August 2010, Oak Ridge, TN
21. R. Acharya and K. K. Kuo, "Numerical Simulation of Graphite Nozzle Erosion with Parametric Analysis", 46th Joint Propulsion Conference, July 22-28, 2010, Nashville, TN.
22. R. Acharya, "Modeling and Numerical Simulations of Multi-physics and Multi-scale Turbulent Reacting Flows," invited talk at Vanderbilt University, Nashville, TN in December 2009.
23. R. Acharya and K. K. Kuo, "Effect of Reaction Kinetic Schemes on Graphite Rocket Nozzle erosion rates" presented at the 8th-International Symposium of Chemical Propulsion (8-ISICP), November 2-6 2009, Cape Town, South Africa.
24. R. Acharya, R. Acharya, J. Pitt, B. Evans, F. Constanzo, and K. K. Kuo, "Coupling of Transient Heating and Induced Stresses Computations in Graphite Nozzle Materials," presented at the 8th-International Symposium of Chemical Propulsion (8-ISICP), November 2-6 2009, Cape Town, South Africa.
25. R. Acharya, K. K. Kuo, P. Ferrara, H. Rand, and J. Nimphius, "Comprehensive Three Dimensional Mortar Interior Ballistics Model for 120mm Mortar System with Experimental Validation," 45th Joint Propulsion Conference, August 2-5, 2009, Denver, CO
26. R. Acharya, K. K. Kuo, P. Ferrara, H. Rand, and J. Nimphius, "Comprehensive Modeling and Numerical Simulation of Interior Ballistic Processes in 120-mm Mortar with Systematic Experimental Validation," 26th Army Science Conference, December 1-4, 2008, Orlando, FL
27. R. Acharya and K. K. Kuo, "Graphite Rocket Nozzle Erosion Rate Reduction by Boundary-Layer Control Using Ablative Materials at High Pressures" presented at the 7th-International Symposium of Chemical Propulsion (7-ISICP), September 17-21 2007, Kyoto, Japan
28. R. Acharya and K. K. Kuo, "Finite Element Simulation of Interior Ballistic Processes in 120-mm Mortar Systems," presented at the 23rd International Ballistics Symposium (ISB), April 16-22 2007, Tarragona, Spain
29. R. Acharya and K. K. Kuo, "Graphite Rocket Nozzle Erosion Rate Reduction by Boundary-Layer Control Using Ablative Materials," 45th Aerospace Sciences Meeting & Exhibit 8-11 January 2007, Reno, Nevada
30. R. Acharya, "Fuel and System Interaction Effects on Urea-SCR Control of NOx in Diesel Exhaust Aftertreatment," at Ninth DOE Crosscut Workshop on Lean Emissions Reduction Simulation, May 2nd-4th, 2006 University of Michigan – Dearborn (Invited Lecture).
31. R. Acharya and K. K. Kuo, "Effect of Chamber Pressure & Propellant Composition on Erosion Rate of Graphite Rocket Nozzle," 44th Aerospace Sciences Meeting & Exhibit 9-12 January 2006, Reno, Nevada

32. R. Acharya, M. Alam, and A. L. Boehman, "Fuel and System Interaction Effects on Urea-SCR Control of NOx in Diesel Exhaust Aftertreatment," SAE World Congress, April 3-6, 2006 Cobo Center, Detroit, Michigan.

SKILLS

- Aerothermodynamics, Ablation Physics, Hypersonic Boundary-Layer Transition, Uncertainty Quantification, Hi-Fidelity CFD, System Level Requirement Definition for High-Speed Propulsion, Wind-Tunnel Nozzle Design
- **Applications:** Hypersonic Flows, High-speed thermo-chemistry, Airbreathing Propulsion, Solid Rockets, Granular and porous media, Reacting Boundary Layer Flows, High Pressure Turbines – Boundary Layer Transition, Alternative Fuels and Emissions
- **High performance computing with super-computing:** Hands-on experience with all phases of software cycle: model development, code verification, validation, testing. Experience with open source reacting CFD codes as well as commercial packages such as ANSYS Fluent, etc. Proficient in programming languages: Fortran 90, MPI, Matlab, Python
- **Languages: English (expert), French (working knowledge)**

PEER REVIEWER & SESSION CHAIR

- Journal of Propulsion and Power
- Journal of Applied Mechanics
- International Journal of Advancements in Energetic Materials and Chemical Propulsion
- ASME TurboExpo
- International Seminar on Fire & Explosion Hazards
- Combustion Institute
- Combustion and Flame

TEACHING EXPERIENCE

Course Name	Title	Semester(s)	Course Level & Enrollment
Introduction to thermodynamics (ME 023)	Instructor	Fall 2006, and Spring 2007	Undergraduate, Non-major Course, class enrollment 85-90
I was responsible for preparation of the course material, class lectures, presentation, providing extra guidance to students with the subject, and examination and evaluation of their understanding.			
Combustion in Propulsion Systems (ME 516)	Guest Lecturer and Co-Instructor (Instructor: Dist. Prof. Kenneth K. Kuo)	Spring 2004, Spring 2005, and Spring 2009	Graduate, class enrollment 10-15
I provided assistance in preparation of course material, home works, exams, presentation of specific topics as class lectures, and evaluation of exams.			
Turbulent and Two-phase Combustion (ME 532)	Teaching Assistant (Instructor: Dist. Prof. Kenneth K. Kuo)	Fall 2006, and Fall 2007	Graduate, class enrollment 10-15
I provided assistance in preparation of course material, presentation of specific topics as class lectures, and evaluation of exams.			