

Curriculum Vitæ

Somesh Prasad Roy

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Academic Positions

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| Aug, 2016 – | Assistant Professor
Department of Mechanical Engineering, Marquette University, Milwaukee, WI. |
| 2014 – 2016 | Postdoctoral Scholar
PI: Prof. Michael Modest, University of California, Merced CA. |

Education

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| 2014 | Ph. D., Mechanical Engineering with Graduate Minor in Computational Science, The Pennsylvania State University, University Park, PA. USA. 16802 |
| 2004 | M. Tech, Thermal, Energy and Environmental Engineering
Indian Institute of Technology, Kharagpur, INDIA. 721302 |
| 2004 | B. Tech (Hons), Mechanical Engineering
Indian Institute of Technology, Kharagpur, INDIA. 721302 |

Honors and Awards

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| May 2021 | Outstanding Teacher in Mechanical Engineering 2020-21,
Mechanical Engineering Industrial Advisory Board, Marquette University. |
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External Grants (as **PI** and **Co-PI/I**)

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| May, 2022 –
April, 2027 | CAREER: Novel techniques for improving convergence and scalability of a Monte Carlo radiation solver for large-scale combustion simulations. (PI)
Agency: National Science Foundation (NSF) |
| May, 2021 –
Apr, 2022 | Grit and Self-regulation in Engineering Education: An Intervention via Community of Practice. (PI)
Agency: Wisconsin Space Grant Consortium
Co-I: Dr. Amber Young-Brice, College of Nursing; Ms. Jenna Lassila, College of Engineering, Marquette University |
| Oct, 2020 –
Jan, 2021 | Can Anyone Hear Me? Assessing the Transactional Distance for Engineering Students during COVID-19. (Co-I)
Agency: Wisconsin Space Grant Consortium
PI: Dr. Allison Murray, Mechanical Engineering, Marquette University |
| Jan, 2019 –
May, 2019 | R&D Engineering Internship Program. (Co-PI)
Agency: Education Research Agreement with CIMCO Marine AB. Angelholm, Sweden.
Co-PI: Dr. Casey Allen, Mechanical Engineering, Marquette University |

Sept, 2018 – Sept, 2023	Connecting Experiments and Simulations while Designing Functionality into the Dynamic Behavior of Surrogate Energetic Systems. (Co-I) Agency: Air force Office of Scientific Research (AFOSR) PI: Dr. John Borg, Mechanical Engineering, Marquette University
March, 2018 – Aug, 2021	CRII:OAC: Novel techniques for improving convergence and scalability of a Monte Carlo radiation solver for large-scale combustion simulations. (PI) Agency: National Science Foundation (NSF)

Invited Talks

- I1. “From Atoms to Atmosphere: From Atoms to Atmosphere: The Mystery of Soot aka Black Carbon” at St. Norbert College (virtual), De Pere, WI. Feb 2022.
- I2. “From Atoms to Atmosphere: Computational Modeling of Formation and Evolution of Soot at Different Scales” at Calvin University, Grand Rapids, MI. Oct 2019.
- I3. “Computational Modeling of Pollutant Emission from Combustion” in Discovery Conference, Wisconsin Society of Professional Engineers, Waukesha, WI. April 2019.

Publications: Peer-reviewed Journals (since joining Marquette)

- J1. M. Galtier , W. Woelffel , F. André , V. P. Solovjov , B. W. Webb , and **S. Roy**, “Assessment of narrow-band and full spectrum gas radiation methods in a real industrial glass furnace configuration”. *Applied Thermal Engineering*, 216 (2022) 119020 (9 Pages).
DOI: 10.1016/j.applthermaleng.2022.119020. IF: 6.456
- J2. Khaled Mosharraf Mukut, Eirini Goudeli , and **Somesh P. Roy**, “Molecular Arrangement and Fringe Identification and Analysis from Molecular Dynamics (MAFIA-MD): A Tool for Analyzing the Molecular Structures Formed during Reactive Molecular Dynamics Simulation of Hydrocarbons”. *Computer Physics Communications*, 276 (2022) 108325 (16 pages).
DOI: 10.1016/j.cpc.2022.108325. IF: 4.717
- J3. Akaash Sharma , Khaled Mosharraf Mukut, **Somesh P. Roy**, and Eirini Goudeli , “The Coalescence of Incipient Soot Clusters”. *Carbon*, 180 (2021) 215-225.
DOI: 10.1016/j.carbon.2021.04.065. IF: 11.307
- J4. F. R. Coelho , A. Ziemniczak , **S. P. Roy**, and F. H. R. Franca , “A New Line-by-line Methodology Based on the Spectral Contributions of the Bands”. *International Journal of Heat and Mass Transfer*, 164 (2021) 120423 (15 pages).
DOI: 10.1016/j.ijheatmasstransfer.2020.120423 IF: 5.431
- J5. L. Bosman , **S. P. Roy**, W. McDonald , and C. Ababei , “Using Online Discussions to Connect Theory and Practice in Core Engineering Undergraduate Courses”. *Computer Applications in Engineering Education. Computer Applications in Engineering Education*, 28 (2020), 675–691.
DOI: 10.1002/cae.22238 IF: 2.109
- J6. K. M. Mukut and **S. P. Roy**, “Effect of O₂ Concentration in Ambient Mixture and Multiphase Radiation on Pollutant Formation in ECN Spray-A”. *Combustion Theory and Modelling*, 24 (2020), 549–572.
DOI: 10.1080/13647830.2020.1721561. IF: 1.644
- J7. B. Wu , **S. P. Roy**, and X. Zhao , “Detailed modeling of a small-scale turbulent pool fire”. *Combustion and Flame*, 214 (2020), 224–237.
DOI: 10.1016/j.combustflame.2019.12.034 IF: 5.767

- J8. J. Farmer and **S. Roy**, “A quasi-Monte Carlo solver for thermal radiation in participating media”. *Journal of Quantitative Spectroscopy and Radiative Transfer*, 242 (2020), 106753 (16 pages).
DOI: 10.1016/j.jqsrt.2019.106753 IF: 2.342
- J9. C. Paul , S. Ferreyro-Fernandez , D. Haworth , **S. Roy**, and M. Modest , “A Detailed Modeling Study of Radiative Heat Transfer in a Heavy-duty Diesel Engine”. *Combustion and Flame*. 200 (2019). 325-341.
DOI: 10.1016/j.combustflame.2018.11.032 IF: 5.767
- J10. S. Ferreyro-Fernandez , C. Paul , A. Sircar , A. Imren , D. Haworth , **S. Roy**, and M. Modest , “Soot and Spectral Radiation Modeling for High-pressure Turbulent Spray Flames”. *Combustion and Flame*. 190 (2018). 402-415.
DOI: 10.1016/j.combustflame.2017.12.016 IF: 5.767
- J11. Tao Ren , Michael F. Modest , and **Somesh P. Roy**, “Monte Carlo Simulation for Radiative Transfer in a High-pressure Industrial Gas Turbine Combustion Chamber”. *Journal of Engineering for Gas Turbines and Power*. 140 (2017) 051503 (10 pages).
DOI: 10.1115/1.4038153 IF: 1.732
- J12. **Somesh P. Roy**, Jian Cai , and Michael F. Modest , “Development of a Multiphase Photon Monte Carlo Method for Spray Combustion and Its Application in High-pressure Conditions”. *International Journal of Heat and Mass Transfer*. 115 (2017) 453-456.
DOI: 10.1016/j.ijheatmasstransfer.2017.07.046 IF: 5.431
- J13. Bifen Wu , **Somesh P. Roy**, Xinyu Zhao , and Michael F. Modest , “Effect of Multiphase Radiation on Coal Combustion in a Pulverized Coal Jet Flame”. *Journal of Quantitative Spectroscopy and Radiative Transfer*. 197 (2017) 154-165
DOI: 10.1016/j.jqsrt.2017.03.017 IF: 2.342
- J14. Jian Cai , **S. P. Roy**, and M. F. Modest , “A Comparison of Specularly Reflective Boundary Conditions and Rotationally Invariant Formulations for Discrete Ordinate Methods in Axisymmetric Geometries”. *Journal of Quantitative Spectroscopy and Radiative Transfer*. 182 (2016), 75-86.
DOI: 10.1016/j.jqsrt.2016.05.005 IF: 2.342
- J15. **Somesh P. Roy** and D. C. Haworth , “A Systematic Comparison of Detailed Soot Models and Gas-phase Chemical Mechanisms in Laminar Premixed Flames”. *Combustion Science and Technology*. 188 (2016) 1021-1053. IF: 1.730
- J16. W. Ge , M. F. Modest , **S. P. Roy**, “Development of High Order P_N Models for Radiative Heat Transfer in Special Geometries and Boundary Conditions”. *Journal of Quantitative Spectroscopy and Radiative Transfer*. 172 (2015) 98-109. IF: 3.047
- J17. P. G. Arias, V. R. Lecoustre, **S. P. Roy**, D. C. Haworth, H. G. Im, A. Trouvé, “Dynamics of Flow–Soot Interaction in Wrinkled Nonpremixed Ethylene-Air Flames”. *Combustion Theory and Modeling*. 19 (2015), 568-586. IF: 2.076
- J18. W. Ge, R. Marquez, M. F. Modest, **S. P. Roy**, “Implementation of High Order Spherical Harmonics Methods for Radiative Heat Transfer on OpenFOAM”. *Journal of Heat Transfer*. 137 (2014), 052701. IF: 1.787
- J19. **S. P. Roy**, P. G. Arias, V. R. Lecoustre, D. C. Haworth, H. G. Im, A. Trouvé, “Development of High Fidelity Soot Aerosol Dynamics Models using Method of Moments with Interpolative Closure”. *Aerosol Science and Technology*. 48 (2014), 379-391. IF: 2.34
- J20. V. R. Lecoustre, P. G. Arias, **S. P. Roy**, H. G. Im, T. F. Lu, D. C. Haworth, A. Trouvé, “Direct Numerical Simulations of Non-premixed Ethylene-Air Flames: Local Flame Extinction Criterion”. *Combustion and Flame*. 161 (2014), 2933-2950 IF: 4.570

Publications: Peer-reviewed Conference Proceedings

- P1. M. Galtier , W. Woelffel , F. André , V. P. Solovjov , B. W. Webb , and **S. Roy**, “Assessment of engineering gas radiation methods in an industrial glass furnace configuration”. 8th European Thermal Sciences Conference (EUROTHERM 2021), 20-22 September 2021, VIRTUAL. 4 pages.
DOI: 10.1088/1742-6596/2116/1/012067
- P2. Chloe David, Wenjun Ge , **Somesh P. Roy**, Michael F. Modest , and Ramanan Sankaran , “Comparison of Radiation Models for a Turbulent Piloted Methane/Air Jet Flame: A Frozen-Field Study”. ASME 2021 Summer Heat Transfer Conference, SHTC - 2021. Paper HT2021-62417, V001T10A002, June, 2021. 11 pages.
DOI: 10.1115/HT2021-62417
- P3. J. Farmer and **S. Roy**, “A Photon Monte Carlo Solver Utilizing a Low Discrepancy Sequence for Thermal Radiation in Combustion Systems”. Proceedings of the 9th International Symposium on Radiative Transfer, RAD-19. June, 2019. Athens, Greece. 8 pages.
DOI: 10.1615/RAD-19.10
- P4. B. Wu , X. Zhao , and **S. P. Roy**, “A Numerical Study of Radiation in a Small-scale Pool Fire”. Proceedings of the 9th International Symposium on Radiative Transfer, RAD-19. June, 2019. Athens, Greece. 8 pages.
DOI: 10.1615/RAD-19.40
- P5. J. Farmer and **S. Roy**, “An Efficient Monte Carlo-based Solver for Thermal Radiation in Participating Media”. Proceedings of 4th Thermal and Fluids Engineering Conference, TFEC - 2017. April, 2019. Las Vegas, NV, USA. 1565–1573.
DOI: 10.1615/TFEC2019.rad.027584
- P6. T. Ren , M. F. Modest , **S. Roy**, “Monte Carlo Simulation for Radiative Transfer in a High-pressure Industrial Gas Turbine Combustion Chamber”. ASME 2017 Summer Heat Transfer Conference, SHTC - 2017. June, 2017. Bellevue, WA, USA. 10 pages.
DOI: 10.1115/HT2017-4819
- P7. W. Ge , T. Ren , M. F. Modest , **S. Roy**, and D. C. Haworth , “Application of High-order Spherical Harmonics Methods for Radiative Transfer in Simulation of a Turbulent Jet Flame”. 7th ICHMT International Symposium on Advances in Computational Heat Transfer. May, 2017. Napoli, Italy.
DOI: 10.1615/ICHMT.2017.CHT-7.550
- P8. **S. P. Roy**, W. Ge , J. Cai , and M. F. Modest , “Multiphase Radiative Heat Transfer Calculations in High-pressure Spray Combustion”. 8th International Symposium on Radiative Transfer, RAD-16. June, 2016. Cappadocia, Turkey.
- P9. B. Wu , **S. P. Roy**, M.F. Modest , and X. Zhao , “Monte Carlo Modeling of Radiative Transfer in a Pulverized Coal Jet Flame”. 8th International Symposium on Radiative Transfer, RAD-16. June, 2016. Cappadocia, Turkey.
- P10. **S. P. Roy**, J. Cai , and M. F. Modest , “Photon Monte Carlo Method for Radiation Calculations in Spray Combustion”. 6th ICHMT International Symposium on Advances in Computational Heat Transfer. May, 2015. Piscataway, NJ, USA.
- P11. **S. P. Roy**, J. Cai , W. Ge , and M. F. Modest , “Computational Cost and Accuracy Comparison of Radiation Solvers with Emphasis on Combustion Simulations”. 6th ICHMT International Symposium on Advances in Computational Heat Transfer. May, 2015. Piscataway, NJ, USA.

Publications: Not-peer Reviewed

- N1. A. Murray , **S. Roy**, M. Hahn, and P. Voglewede , “Did the Student-Instructor and Peer-to-Peer Divide Widen with Instructional Changes during COVID-19?”. EdArXiv (2021) 17 pages.
DOI: 10.35542/osf.io/fkw32

Research Software

- R1. K. M. Mukut and **Somesh Roy**. (2022). “Molecular Arrangement and Fringe Identification and Analysis from Molecular Dynamics (MAFIA-MD)”. **Peer-reviewed**. DOI: 10.17632/s7dsk553fh.1
- R2. K. M. Mukut and **Somesh Roy**. (2020). “RingDetection (v1.01): A tool to detect aromatic rings from molecular dynamics”. DOI: 10.5281/zenodo.4283067
- R3. J. Mika, J. Moens, U. Nevarez, C. David, R. Povinelli , and **S. Roy** (2020) “1DRTEsolv: One dimensional RTE solver for gray medium” . <https://epublications.marquette.edu/odrte/1>

Recent Non-referred Conferences Presentations

- C1. K. M. Mukut, Anindya Ganguly , Eirini Goudeli , and **Somesh Roy**, “Analysis of Nascent Soot Particles from Acetylene Pyrolysis: A Molecular Modeling Perspective”. American Association of Aerosol Research (AAAR), Raleigh, NC. October, 2022.
- C2. **S. P. Roy**, A. Young-Brice , and J. Lassila , “A Community of Practice focused on grit and self regulation in engineering education”. Wisconsin Space Grant Consortium Annual Conference 2022, Waukesha, WI. August, 2022.
- C3. K. M. Mukut, A. Sharma , E. Goudeli , and **S. P. Roy**, “A Reactive Molecular Dynamics-based Exploration of Soot Inception Pathways in Combustion”. American Association of Aerosol Research (AAAR), Virtual. October, 2021.
- C4. K. M. Mukut, A. Sharma , E. Goudeli , and **S. P. Roy**, “A Closer Look into the Formation of Soot Particles: A Molecular Dynamics Study” 12th US National Combustion Meeting. May, 2021. Virtual.
- C5. Alec Tauer, Otito Onwuzurike, **Somesh Roy**, “Comparing CFD and Regulatory Modeling of Pollutant Dispersion Under Different Thermal Stabilities”. 73rd Annual Meeting of the American Physical Society–Division of Fluid Dynamics. November, 2020. Virtual.
- C6. A. Sharma , K. M. Mukut, E. Goudeli , and **S. P. Roy**, “A Molecular Dynamics Study of Inception and Growth of Soot during Combustion”. American Association of Aerosol Research (AAAR), Raleigh, USA. October, 2020.
- C7. A. Sharma , **S. P. Roy**, and E. Goudeli , “Incipient soot formation and growth by reactive molecular dynamics”. European Aerosol Conference, Aachen, Germany. September, 2020.
- C8. K. M. Mukut and **S. P. Roy**, “Effect of EGR and radiation on soot morphology in ECN Spray-A combustion chamber”. 17th International Conference on Numerical Combustion, NC19. May, 2019. Aachen, Germany.
- C9. B. Wu , X. Zhao and **S. P. Roy**, “Detailed modeling of a small-scale turbulent pool fire”. 11th US National Combustion Meeting. March, 2019. Pasadena, CA, USA.
- C10. K. M. Mukut and **S. P. Roy**, “An Investigation of Soot Evolution in High-pressure Spray Combustion”. 11th US National Combustion Meeting. March, 2019. Pasadena, CA, USA.
- C11. K. M. Mukut and **S. P. Roy**. “Sensitivity Study on Soot and NO_x Formation in High Pressure Combustion System”. 2018 Spring Technical Meeting of Central States Section of the Combustion Institute. Minneapolis, MN, USA. May, 2018. Minneapolis, MN, USA.

Professional Service: Organizer/Co-organizer

- S1. Co-organizer: COVID Innovation Contest, Opus College of Engineering, Marquette University, Oct. 2020.
- S2. Mini-symposium Organizer: “Progress in Radiation Modeling in Combustion Systems” in 17th International Conf. on Numerical Combustion, Aachen, Germany. May, 2019.

Professional Service: Session Chair

- S3. Session Chair: Annual Meeting of American Assoc. of Aerosol Research (AAAR 2021), (Virtual). September 2021
- S4. Session Chair: European Aerosol Conference (EAC 2020), Aachen, Germany (Virtual). Sept. 2020
- S5. Session Chair: 9th Intl. Symp. on Radiative Transfer, RAD-19, Athens, Greece. June 2019
- S6. Session Chair: 16th International Conf. on Numerical Combustion, SIAM, Orlando, USA. April, 2017

Professional Service: Reviewer

Journals	Aerosol Science and Technology Applied Mathematical Modelling Combustion and Flame Combustion Science and Technology Combustion Theory and Modelling Engineering Applications of Computational Fluid Mechanics Experimental Thermal and Fluid Science Fire Safety Journal Fuel Fuel Processing Technology Journal of the Brazilian Society of Mechanical Sciences and Engineering Journal of Heat Transfer Journal of Quantitative and Spectroscopy Radiative Transfer Journal of Thermal Science and Engineering Application International Journal of Thermal Sciences
Funding proposal	Department of Energy (DOE)

Professional Service: Membership

Member	American Association for Aerosol Research (AAAR). American Physical Society (APS). American Society of Mechanical Engineers (ASME). American Society of Thermal and Fluids Engineers (ASTFE). The Combustion Institute. Society of Automotive Engineers (SAE) International. Society of Industrial and Applied Mathematics (SIAM).
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