Avijit Karmakar

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SUMMARY

- 5+ years of experience as a CFD researcher with a background in fluid dynamics and thermal sciences.
- Managed ARPA-E and NETL research projects by performing thermal system design optimization and CFD simulations.
- Timely delivered results and recommendations in technical reports for projects.
- Publications include five peer-reviewed journals, one book chapter, and three conference articles from research.
- Excellent academic achievements, learning ability, detail-orientated and multi-task handling skills.

EDUCATION

09/2016-08/2021 **ILLINOIS INSTITUTE OF TECHNOLOGY** Chicago, Illinois
Doctor of Philosophy in Mechanical and Aerospace Engineering
Thesis: Computational modeling of Falling Film Flow and Heat Transfer Over Horizontal Tubes
Advisor: Prof. Sumanta Acharya | GPA: 4.0/4.0

09/2015-08/2016 **UNIVERSITY OF MEMPHIS** Memphis, Tennessee
Doctor of Philosophy in Mechanical Engineering (Transfer)
Thesis: Computational modeling of Falling Film Flow and Heat Transfer Over Horizontal Tubes
Advisor: Prof. Sumanta Acharya | GPA: 4.0/4.0

08/2013-07/2015 **INDIAN INSTITUTE OF TECHNOLOGY, KANPUR** Kanpur, India
Master of Technology in Mechanical Engineering
Thesis: Numerical Study of Vortex-Induced Vibrations in Flow past a Square Cylinder close to a Free Surface
Advisor: Prof. Arun Kumar Saha | GPA: 4.0/4.0 (WES conversion)

08/2009-07/2013 **INDIAN INSTITUTE OF ENGINEERING SCIENCE AND TECHNOLOGY, SHIBPUR (FORMERLY: BESU)** Shibpur, India
Bachelor of Engineering in Mechanical Engineering
GPA: 3.88/4.0 (WES conversion)

SKILLS

Softwares: OpenFOAM, Tecplot, Paraview, Matlab.
Methodologies: Volume of Fluid, Porous Media, Phase Change Heat Transfer.
Program. Lang.: C++, Fortran, Python, HPC Parallelization (OpenMP and OpenMPI).
Machine Learning: Supervised learning (parametric/non-parametric algorithms, support vector machines, neural networks); Unsupervised learning (clustering, dimensionality reduction, recommender systems, deep learning)

WORK EXPERIENCE

09/2019-08/2021 **ILLINOIS INSTITUTE OF TECHNOLOGY** Chicago, Illinois
Research Assistant
- Developed steady-state design model of heat and mass exchanger for enhanced cooling tower technology. (Project Funding: NETL, DE-FE0031833)
- Utilized genetic algorithm to provide optimum system design variables to maximize cooling performance.
- Partnered with power industries for cost analysis and performed design optimizations resulting in 3% increase in plant efficiency and 20% reduction in makeup water.

09/2016-05/2019 **ILLINOIS INSTITUTE OF TECHNOLOGY** Chicago, Illinois
Research Assistant
- Developed thermal design model of encapsulated PCM heat exchanger for dry cooling systems. (Project Funding: ARPA-E, DE-AR0000572)
- Employed genetic algorithm to provide optimum design parameters with least capital cost.
- Collaborated with energy industries for techno-economic analysis and performed design optimizations based on cost performance trade-off resulting in 10% cost reduction and improved thermal performance of PCM based cooling system over state-of-the-art dry cooling system.
- Executed high-fidelity CFD studies (VOF, LES & Porous Media) resulting in thermofluidic correlations to predict EPCM heat exchanger performance.
- Improved water film containment on hydrophobic tube surfaces with tube structural modifications and CFD studies utilizing dynamic contact angle models (Kistler, Yokoi) in OpenFOAM.

- Implemented 3-phase evaporation model (liquid, liquid-vapor, and gas) in OpenFOAM framework and quantified water loss in EPCM heat exchanger within 10% to experimental predictions.
- Headed and coordinated research project with quarterly reports, presentations for review meetings with ARPA-E & communicated findings with program managers.

08/2015-08/2016 **UNIVERSITY OF MEMPHIS** Memphis, Tennessee
Research Assistant
- Executed preliminary high-fidelity CFD simulations (VOF) for design of encapsulated PCM heat exchanger.

05/2012-07/2012 **CESC LTD.** Kolkata, India
SUMMER INTERN
- Evaluated Free Air Delivery of compressor units and performed root cause failure analysis for compressor components to identify the health deterioration of compressors in plant.
- Proposed remedial action resulted in desired air quality and increase in Free Air Delivery by 30%.

TEACHING EXPERIENCE

01/2020-05/2020 **ILLINOIS INSTITUTE OF TECHNOLOGY** Chicago, Illinois
Lecturer
- Taught regular classes on "Design of Heat Exchangers" as a special topic for the course "Fundamentals of Heat Transfer (MMAE-525)"

PUBLICATIONS

Karmakar, A., Kanani, Y., Bhattacharya, A., Acharya, S., Taghizadeh, S., and Ling, K., 2019, "Optimization and Analysis of a Heat Exchanger with Encapsulated Phase Change Material," In AIAA Journal of Thermophysics and Heat Transfer, 2019. DOI:10.2514/1.T5720

Karmakar, A., and Acharya, S., "Heat Transfer Characteristics of Falling Film over Horizontal Tubes- A Numerical Study," In 55th AIAA Aerospace Sciences Meeting, Grapevine, Texas, 2017. DOI:10.2514/6.2017-0901

Karmakar, A., Kanani, Y., Bhattacharya, A., Acharya, S., Taghizadeh, S., and Ling, K., 2019, "Optimization and Analysis of a Heat Exchanger with Encapsulated Phase Change Material," In AIAA SciTech 2019 Forum, San Diego, California, 2019.
DOI: 10.2514/6.2019-0533

Karmakar, A., Acharya, S., " Wettability Effects on Falling Film Heat Transfer Over Horizontal Tubes in Jet Flow Mode" In ASME 2019 Heat Transfer Summer Conference, ASME, 2019. DOI:10.1115/HT2019-3532

Karmakar, A., and Acharya, S., 2019, "A review of computational models for falling liquid films" in "50 years of CFD in Engineering Sciences" - A commemorative Issue in honor of Prof. D. Brian Spalding, Springer Nature. DOI: 10.1007/978-981-15-2670-1

Karmakar, A., and Acharya, S., "Wettability Effects on Falling Film Flow and Heat Transfer Over Horizontal Tubes in Jet Flow Mode" In ASME Journal of Heat Transfer, 2020. DOI: 10.1115/1.4048088

Karmakar, A., and Saha, A. K., "Unsteady Flow Past a Square Cylinder Near a Free Surface" In Physics of Fluids, 2020. DOI:10.1063/5.0028101

Karmakar, A., and Acharya, S., "Numerical simulation of falling film-flow hydrodynamics over round horizontal tubes" In International Journal of Heat and Mass Transfer, 2021. DOI: 10.1016/j.ijheatmasstransfer.2021.121175

Kanani, Y., **Karmakar, A.**, and Acharya, S. "Phase Change Process Inside a Small-radii Cylinder Subjected to Cyclic Convective Boundary Conditions: A Numerical Study." ASME Journal of Heat Transfer, 2021. DOI: 10.1115/1.4052085

AWARDS AND CERTIFICATES

- Graduate Assistantship covering Ph.D. tuition cost and expenses, IIT and U of M
- Merit Scholarship in M.Tech Program at IIT Kanpur, May 2015
- Teaching Assistantship in M. Tech Program at IIT Kanpur, August 2013 – July 2015
- First Runner Up for project activities in Summer Internship program at CESC Ltd.
- Machine Learning by Stanford University, Coursera, Oct 2019
- Introduction to Computational Techniques for Multiphase flows at Univ. of Illinois Urbana Champaign, July 2017

INTERESTS AND ACTIVITIES

- New Technologies, Open-Source Programming, Cricket, Travelling