Roshith Mittakolu

Roshith Mittakolu | ✉ mroshith@umd.edu | ☎ +1 2409216885

SUMMARY

Mechanical engineer specializing in thermal-fluid systems, computational methods, and scientific simulation tools development for energy-efficient cooling solutions for high power density and sustainable data centers.

WORK EXPERIENCE

Graduate Research Assistant Aug 2022 - present

- Lead for ARPA-E MOSTCOOL project: modular simulation software for next-generation data center design integrating thermal, energy, reliability, and cost analysis.
- Managing agile development cycles, planning project deliverables, and coordinating with industry and national labs collaborators.
- Collaborating with University of Florida (UF) advanced two-phase cooling system design for high power density and sustainable data center racks.
- Collaborating with Northrop Grumman for augmenting the heat capacity of dielectric fluids using encapsulated phase change materials for electronics cooling applications.

Research Assistant Jul 2019 - March 2022

- Developed higher-order implicit shock-capturing schemes for compressible flow simulations
- Created numerical solvers for Euler and Navier-Stokes equations with validation against benchmark problems.

SELECTED PROJECTS

Two-Phase Flow Network Modeling Tool (MOSTCOOL, ARPA-E) Sole Developer

- Developing next-generation steady state solver for modeling two-phase flows for data center cooling system design
- Invented Branch-First Adaptive tearing methodology to minimize sensitivity to initial guesses and achieved 25x improvement in solver robustness in two-phase flow modeling.
- Enabling design of next-generation data centers through component-based modular steady-state simulation tool.

Membrane Assisted Cold Plate Cooling System Design (UF, ARPA-E) Modeling Lead

- Designed and simulated cooling architecture for extreme power density data center racks up to 1 MW for next generation hydrophobic membrane-based cold plates.
- Delivered design specifications: manifold sizing, condenser sizing, pump requirements, flow rates.
- Proposed distributed condenser architecture to limit vapor velocity and enable system scalability.

Encapsulated Phase Change Slurry Cooling (Northrop Grumman) Modeling Lead

- Defined two novel quantities enabling design and optimization of Encapsulated Phase Change Slurry Cooling (EPCM) slurry cooling systems.
- Demonstrated utility using dielectric fluids in micro-channel cold plates; established general comparison framework for entire thermal engineering community to better design EPCM slurry systems.
- Proposed distributed condenser architecture to limit vapor velocity and enable system scalability.

EDUCATION

University of Maryland, College Park Aug 2022 – Present
Ph.D., Mechanical Engineering GPA: 3.83/4.0

Indian Institute of Technology (IIT), Gandhinagar Jul 2019 – Jun 2021
M.Tech, Mechanical Engineering CPI: 8.6/10

National Institute of Technology (NIT), Calicut Jul 2014 – May 2018
B.Tech, Mechanical Engineering CGPA: 7.46/10

PUBLICATIONS

[1] R. Mittakolu, V. V. Manepalli, Y. Kim, A. Ateş, C. Pullins, M. T. Barako, S. Graham, P. McCluskey, and D. Agonafer, "Augmenting the heat capacity of dielectric liquids using encapsulated phase change materials," *Applied Thermal Engineering*, 2026, **Under review**. DOI: http://dx.doi.org/10.2139/ssrn.6292442.

[2] R. Mittakolu, I. Gandikota, D. Agonafer, P. McCluskey, and S. Moghaddam, "Towards 1 MW data center racks: System-level modeling of a membrane-assisted two-phase cooling architecture," in *ITherm – Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems*, **Accepted, Final submission pending**, 2026.

[3] R. Mittakolu, S. L. Rani, and D. S. Sundaram, "Higher-order implicit shock-capturing scheme based on linearization of implicit fluxes for the Euler equations," *International Journal of Numerical Methods for Heat & Fluid Flow*, vol. 33, no. 5, pp. 1900–1938, 2023.

[4] A. M. Randriambololona, A. Ateş, Y. Kim, R. Mittakolu, K. Guye, A. P. Sarmiento, P. McCluskey, S. Graham, M. Ohadi, and D. Agonafer, "A comprehensive review of machine learning for pool boiling heat transfer and reliability: Enabling advanced cooling, real-time monitoring and control, and predictive maintenance," *International Journal of Heat and Mass Transfer*, 2026, **Under review**.

[5] A. Dave, V. V. Manepalli, R. Mittakolu, C. Pullins, M. T. Barako, S. Graham, and D. Agonafer, "Design of herringbone microchannels for enhanced mixing in augmented cooling slurries," *IEEE Transactions on Components, Packaging and Manufacturing Technology*, 2026, **Under review**.

[6] I. Gandikota, R. Mittakolu, V. Raavi, and P. McCluskey, "Physics of failure approach for reliability analysis of liquid cooled data centers," *Journal of Electronic Packaging*, 2026, **Under review**.

[7] S. P. Phansalkar, R. Mittakolu, B. Han, and T. Kim, "Enhanced DMA test procedure to measure viscoelastic properties of epoxy-based molding compound: Multiple oscillatory strain amplitudes and monotonic loading," *Micromachines*, vol. 16, no. 4, p. 384, 2025.

[8] S. P. Phansalkar, R. Mittakolu, and B. Han, "Time-dependent bulk behavior of cured epoxy molding compound," in *IEEE 73rd Electronic Components and Technology Conference (ECTC)*, 2023, pp. 2093–2100.

TECHNICAL SKILLS

CFD & Simulation	Ansys Fluent, Ansys Icepak, PyAnsys, PyFluent, SolidWorks, Reduced Order Modeling (ROMs).
Scientific Computing	Python (Expert), Object-Oriented Design (OOP), MATLAB, Machine Learning, ReliaSoft.
Software Ops	Docker, Git/GitHub, Linux, VS Code.
Experimental	Data Acquisition (DAQ), DMA, DSC.

LEADERSHIP & SERVICE

Presentations	ARPA-E Energy Innovation Summit (2024, 2025), InterPACK (2025), ECTC (2025) Professional Development Course (Instructor), Open Compute Project (2025).
Peer Review	ASME Journal of Electronic Packaging, IEEE TCPMT, ITherm Conference.
Innovation	**Vicinity Ideation Program (1st Place):** Developed the thermodynamic calculations and pitch deck for the winning data center waste heat recovery concept; commercialization discussions ongoing (Presented by Prof. Damena Agonafer).

Last updated: March 27, 2026