



Multi-scale Thermal Management Challenges in Microsystems

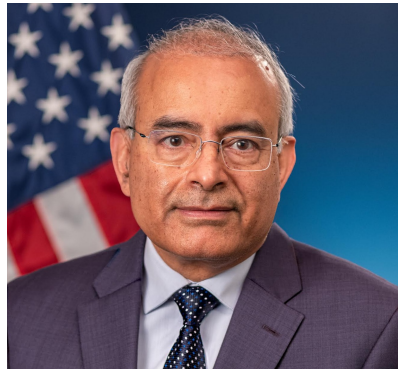
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Tuesday, April 1st, 2025

4:00 PM to 5:00 PM

Room 2540 GGB

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Abstract:

For the past three decades DARPA has played a key role in enabling advances in thermal management of microsystems. Demand for innovative high performance, compact, energy efficient thermal technologies has been driven by the rapid evolution of semiconductor devices for computing, communications, optical, and transportation applications. Some of the technologies developed under DARPA support have already become commercial products. Many others have seen continued development under follow on efforts. This talk will provide an overview of the past DARPA thermal management programs, and their technical achievements. Current initiatives driven by needs for three-dimensional heterogeneous integration, and high power radio-frequency devices will be described next. A relentless push towards feature size reduction and integration requires multi-scale, multi-physics modeling and design tools. An ongoing initiative in this area will be discussed. Emerging areas of interest including cryogenic thermal packaging, and control of radiative thermal transport will also be described. The talk will also provide an overview of speaker's research at Georgia Tech on embedded evaporative thermal management of microsystems.

Bio:

Dr. Yogendra Joshi joined DARPA in July 2022 as a Program Manager in the Microsystems Technology Office (MTO), and currently manages a portfolio of programs on thermal management. He is a professor and the John M. McKenney and Warren D. Shiver Distinguished Chair at Georgia Institute of Technology's G.W. Woodruff School of Mechanical Engineering, with a courtesy appointment in the School of Electrical and Computer Engineering. His research interests are in multi-scale thermal management. Joshi is the author or co-author of more than 450 publications, including more than 225 journal articles. He received his Bachelor of Technology in mechanical engineering from the Indian Institute of Technology (Kanpur) in 1979, Master of Science in mechanical engineering from the State University of New York at Buffalo in 1981, and doctorate in mechanical engineering and applied mechanics from the University of Pennsylvania in 1984. He has served as the principal investigator for multiple DARPA programs, and for the Office of Naval Research-led Consortium for Optimally Resource-Secure Outposts. He also previously was Site Director for the National Science Foundation Industry/University Cooperative Research Center on Energy Efficient Electronic Systems. Joshi is an elected fellow of the American Society of Mechanical Engineers (ASME), IEEE, the American Association for the Advancement of Science, and American Society for Heating refrigeration and Air Conditioning. He has been recognized for his contributions through the Inventor Recognition Award from the Semiconductor Research Corporation (2001), IBM Faculty Award (2008), the IIT Kanpur Distinguished Alumnus Award (2011), ASME Heat Transfer Memorial Award (2013), the AIChE Donald Q. Kern Award (2018), and multiple honors from IEEE.