Carnegie Mellon Graphics Colloquium

Thursday, 5 September 2024

4:30–5:30pm

Rashid Auditorium, Gates Hillman 4401

Sampling and Signal-Processing for High-Dimensional Visual Appearance in Computer Graphics and Vision

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Many problems in computer graphics and vision, such as acquiring images of a scene to enable synthesis of novel views from many directions for virtual reality, computing realistic images by integrating lighting from many different incident directions across a range of scene pixels and viewing angles, or acquiring and modeling the appearance of realistic materials like fur or skin, require sampling and signal-processing on high-dimensional visual appearance spaces involving changes in lighting, viewpoint, spatial location and other parameters. Over my career, my group has developed a number of novel mathematical and signal-processing tools to address these challenges, significantly reducing the cost of acquisition and computation. In this talk, we describe significant theoretical and practical advances in real-time high quality precomputed rendering, Monte Carlo rendering with orders of magnitude fewer samples, and realistic novel view synthesis. In all cases, the methods are now widely deployed in production, and we discuss new computational and signal-processing tools we have developed, including reflection as convolution, sheared and multiple axis-aligned filtering, plenoptic light field sampling and neural radiance fields.

Bio: Ravi Ramamoorthi is the Ronald L. Graham Professor of Computer Science at UCSD and founding director of the UC San Diego Center for Visual Computing. He earlier held tenured faculty positions at UC Berkeley and Columbia University, in all of which he played a key leadership role in building multi-faculty research groups recognized as leaders in computer vision and graphics. He has authored more than 200 refereed publications in computer graphics and vision, including 100+ ACM SIGGRAPH/TOG papers. He has consulted with Pixar and startups in computational imaging, and currently holds a part-time appointment as a Distinguished Research Scientist at NVIDIA. Prof. Ramamoorthi has received about twenty major honors including the ACM SIGGRAPH Significant New Researcher Award for his research in computer graphics, and the Presidential Early Career Award for Scientists and Engineers for his work on physics-based computer vision. He is a fellow of IEEE, ACM and the SIGGRAPH Academy, received two inaugural Frontiers of Science Awards, and has twice been honored with the edX Prize certificate for exceptional contributions in online teaching and learning. He has graduated more than 30 postdoctoral and Ph.D. students, whose theses have been recognized by the ACM Dissertation Award honorable mention, the SIGGRAPH outstanding dissertation award and the UCSD Chancellor's Dissertation Medal.

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