Carnegie Mellon University
Computer Science Department

GRAPHICS FACULTY

Abhinav Gupta

Ioannis Gkioulekas

Jessica Hodgins

Keenan Crane

Levent Burak Kara

Jim McCann

Matthew O'Toole

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Abhinav Gupta, Associate Professor (RI & ML)
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My research focuses on developing representation and reasoning approaches for deeper understanding of the scene. I am interested in formulating the scene understanding problem in terms of the underlying 3D scene and develop reasoning approaches based on physical, functional and causal relationships between the different elements in the scene. The key idea is to have a qualitative representation and yet have a meaningful grounding in the physical scene.
I am interested in exploring how declarative information and other linguistic information can be harnessed to efficiently learn how the world works (structural information). I am also interesting in exploring how we can obtain such linguistic information. I also have been focusing on studying how do humans interact with their environment and how does their perception of visual world depend on these interactions and their abilities. Building upon Gibson's idea of affordances, we have recently proposed the concept of human centric scene understanding.

Ioannis Gkioulekas, Assistant Professor (RI)
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I'm interested in computational imaging, which can be broadly described as coming up with systems that combine imaging (optics, sensors, and illumination) and computation (physics-based modeling and rendering, inverse algorithms, and learning) in innovative, unexpected, and of course meaningful ways. Particular problems I am interested in include: imaging around walls or through skin; lightweight depth sensing; material acquisition; task-specific optimal and adaptive imaging; efficient rendering of coherent and incoherent light; and creating end-to-end trainable pipelines that combine physics-based simulation, learning, and cameras. If you like cameras and imaging, rendering, physics, or solving inverse problems, let me know!

Jessica K. Hodgins, Professor (CSD & RI)
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I am a Professor in the Robotics Institute and Computer Science Department at Carnegie Mellon University. She is also VP of Research, Disney Research, running research labs in Pittsburgh, Los Angeles and Boston. Prior to moving to Carnegie Mellon in 2000, I was an Associate Professor and Assistant Dean in the College of Computing at Georgia Institute of Technology.
I received her Ph.D. in Computer Science from Carnegie Mellon University in 1989. My research focuses on computer graphics, animation, and robotics with an emphasis on generating and analyzing human motion.

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Keenan Crane, Assistant Professor (CSD, RI)
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I am an Assistant Professor at Carnegie Mellon University, in the Computer Science Department and Robotics Institute. My research draws on insights from differential geometry and computer science to develop fundamental algorithms for working with real-world geometric data. I received my bachelor's degree from UIUC and was a Google PhD Fellow at the California Institute of Technology. My most recent work was supported by a NSF Mathematical Sciences Postdoctoral Fellowship at Columbia University. I advise four terrific students: Nick Sharp, Chris Yu Katherine Ye, and Rohan Sawhney. This spring I am teaching a course on Discrete Differential Geometry (15-869J at CMU).

Levent Burak Kara, Associate Professor (ME & RI)
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My research develops new computational techniques and software to support product design and user interaction with design tools. His research interests include CAD/CAE, product design and styling, geometric modeling, shape analysis, design for additive manufacturing, user interfaces for design, pen computing and artificial intelligence. While founded in mechanical engineering, his research draws upon several related disciplines including computer graphics, machine learning and human-computer interaction.

One of my recent research projects involves developing a sketch-based 3D geometric modeling tool. This work aims to help designers construct, modify, and fluidly interact with 3D geometry through a 2D sketch-based interface. The techniques enable a rapid creation and manipulation of 3D shapes, and are particularly effective for concept development and styling design. Other ongoing projects include shape abstraction, study of aesthetic product forms, design for additive manufacturing, free-form surface feature modeling, data-driven shape design.

Jim McCann, Assistant Professor (RI)
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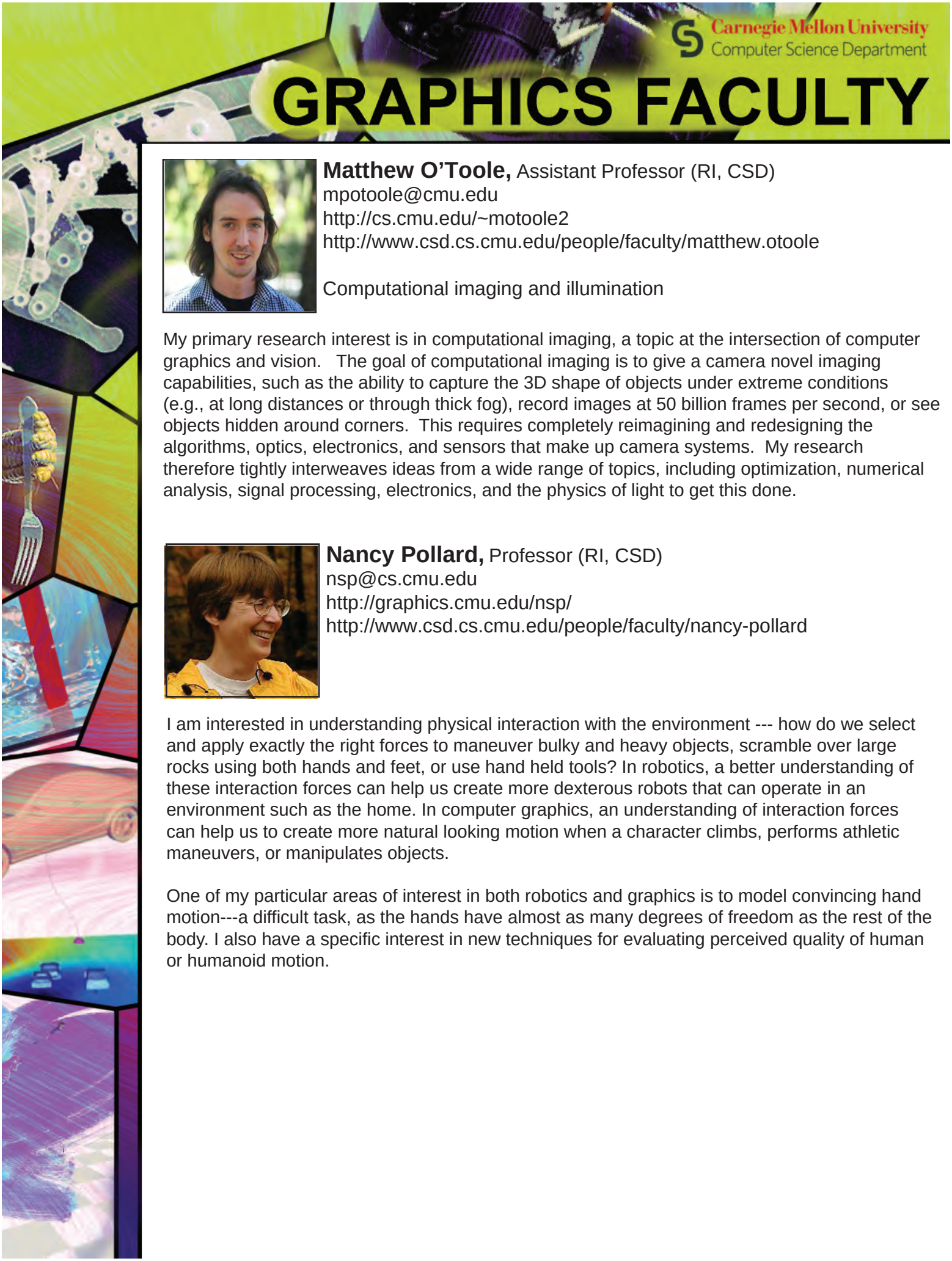
https://textiles-lab.github.io/

I'm interested in systems and interfaces that operate in real-time and build user intuition; lately, I've been applying these ideas to textiles fabrication and machine knitting as the leader of the Carnegie Mellon Textiles Lab. More broadly, I enjoy research that asks how graphics tools and techniques can help people make things of all sorts -- physical and digital.



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Computational imaging and illumination

My primary research interest is in computational imaging, a topic at the intersection of computer graphics and vision. The goal of computational imaging is to give a camera novel imaging capabilities, such as the ability to capture the 3D shape of objects under extreme conditions (e.g., at long distances or through thick fog), record images at 50 billion frames per second, or see objects hidden around corners. This requires completely reimagining and redesigning the algorithms, optics, electronics, and sensors that make up camera systems. My research therefore tightly interweaves ideas from a wide range of topics, including optimization, numerical analysis, signal processing, electronics, and the physics of light to get this done.

Nancy Pollard, Professor (RI, CSD)
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I am interested in understanding physical interaction with the environment --- how do we select and apply exactly the right forces to maneuver bulky and heavy objects, scramble over large rocks using both hands and feet, or use hand held tools? In robotics, a better understanding of these interaction forces can help us create more dexterous robots that can operate in an environment such as the home. In computer graphics, an understanding of interaction forces can help us to create more natural looking motion when a character climbs, performs athletic maneuvers, or manipulates objects.

One of my particular areas of interest in both robotics and graphics is to model convincing hand motion---a difficult task, as the hands have almost as many degrees of freedom as the rest of the body. I also have a specific interest in new techniques for evaluating perceived quality of human or humanoid motion.

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The ILIM Laboratory at the Robotics Institute is dedicated to the study of light transport and the development of novel illumination and imaging technologies. The laboratory is part of the broader imaging, computer vision and computer graphics groups at Carnegie Mellon. Our research is motivated by applications in the areas of digital imaging, computer vision, computer graphics and robotics. Please visit the official website for the lab for detailed information about research projects and publications. The sponsors for these research projects include the Office of Naval Research (ONR), Defense Advanced Projects Research Agency (DARPA), National Science Foundation (NSF), NASA, Department of Energy, Department of Agriculture, Department of Transportation, Army Research Laboratory, the Okawa Foundation, Siemens Corporate Research, Princeton (SCR), Samsung Advanced Institute of Technology (SAIT), Adobe, Ford, Tonbo Imaging, Intel Science and Technology Center in Embedded Computing (ISTC-EC), Chemimage, Heinz Foundation, National Wine and Grape Industry and Highmarke Disruptive Health Technologies Institue (DHTI).

Jun-Yan Zhu Assisstant Professor (CSD, MLD, RI)
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Our lab studies the connection between Data, Humans, and Generative Models, with the goal of building intelligent machines, capable of recreating our visual world and helping everyone tell their visual stories. We focus on three directions: (1) We design new generative models to help humans create visual content more easily. Our models can synthesize photorealistic outputs (e.g., images, videos, 3D data, multimodal data) given humans' simple instructions. (2) We build user interfaces and algorithms for humans to visualize, customize, and create generative models. (3) We use generative models and neural rendering to create synthetic training data for computer vision and robotics applications.

Prior to joining CMU, I was a Research Scientist at Adobe Research and a postdoc at MIT CSAIL. I obtained my Ph.D. from UC Berkeley and my B.E. from Tsinghua University. My Ph.D. research was awarded the Facebook Fellowship, ACM SIGGRAPH Outstanding Doctoral Dissertation Award, and UC Berkeley EECS David J. Sakrison Memorial Prize for outstanding doctoral research. My co-authored work received NVIDIA Pioneer Research Award, and SIGGRAPH 2019 Real-time Live! “Best of Show Award” and “Audience Choice Award”, and “The 100 Greatest Innovations of 2019” by Popular Science.