MIT Industrial Liaison Program Faculty Knowledgebase Report

Manufacturing #3: Robotics

November 10, 2020 11:00 am - 1:00 pm

11:00am	Welcome and Introduction
11:05am	Enhancing Human Capability with Intelligent Machine Teammates Julie Shah Interactive Robotics Group Leader, MIT CSAIL H.N. Slater Professor, MIT Department of Aeronautics and Astronautics

Julie Shah
Interactive Robotics Group Leader, MIT CSAIL
H.N. Slater Professor
MIT Department of Aeronautics and Astronautics

Julie Shah is the H.N. Slater Professor of Aeronautics and Astronautics at MIT and leads the Interactive Robotics Group of the Computer Science and Artificial Intelligence Laboratory. Shah received her SB (2004) and SM (2006) from the Department of Aeronautics and Astronautics at MIT, and her PhD (2010) in Autonomous Systems from MIT. Before joining the faculty, she worked at Boeing Research and Technology on robotics applications for aerospace manufacturing. She has developed innovative methods for enabling fluid human-robot teamwork in time-critical, safety-critical domains, ranging from manufacturing to surgery to space exploration. Her group draws on expertise in artificial intelligence, human factors, and systems engineering to develop interactive robots that emulate the qualities of effective human team members to improve the efficiency of human-robot teamwork. In 2014, Shah was recognized with an NSF CAREER award for her work on “Human-aware Autonomy for Team-oriented Environments," and by the MIT Technology Review TR35 list as one of the world’s top innovators under the age of 35. Her work on industrial human-robot collaboration was also recognized by the Technology Review as one of the 10 Breakthrough Technologies of 2013, and she has received international recognition in the form of best paper awards and nominations from the International Conference on Automated Planning and Scheduling, the American Institute of Aeronautics and Astronautics, the IEEE/ACM International Conference on Human-Robot Interaction, the International Symposium on Robotics, and the Human Factors and Ergonomics Society.

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Every team has top performers — people who excel at working in a team to find the right solutions in complex, difficult situations. These top performers include nurses who run hospital floors, emergency response teams, air traffic controllers, and factory line supervisors. While they may outperform the most sophisticated optimization and scheduling algorithms, they cannot often tell us how they do it. Similarly, even when a machine can do the job better than most of us, it can’t explain how. In this talk I share recent work investigating effective ways to blend the unique decision-making strengths of humans and machines. I discuss the development of computational models that enable machines to efficiently infer the mental state of human teammates and thereby collaborate with people in richer, more flexible ways. Our studies demonstrate statistically significant improvements in people’s performance on military, healthcare and manufacturing tasks, when aided by intelligent machine teammates.

11:45am

Righthand Robotics: Autonomous piece-picking robots for online order fulfillment

Lael Odhner
Co-Founder
Righthand Robotics

12:00pm

AI Tools for Automating Design, Accelerating Discovery, and Redefining Manufacturing
Wojciech Matusik
Professor, Electrical Engineering and Computer Science , MIT Computer Science and Artificial Intelligence Laboratory

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Wojciech Matusik is a professor in MIT's Department of Electrical Engineering and Computer Science, and leads the Computational Fabrication Group at the Computer Science and Artificial Intelligence Laboratory. His research interests are in computer graphics, computational design and fabrication, computer vision, robotics and human-computer interaction. Before coming to MIT, he worked at Mitsubishi Electric Research Laboratories, Adobe Systems and Disney Research Zurich. He has received a Ruth and Joel Spira Award for Excellence in Teaching, a DARPA Young Faculty Award and a Sloan Foundation fellowship. He has been named one of the world's top 100 young innovators by MIT Technology Review and received a Significant New Researcher Award from ACM Siggraph. He earned a PhD in computer graphics at MIT.

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AI has a tremendous potential to influence how everything will be designed and manufactured in a near future. AI tools will also significantly speed up and automate the process of scientific discovery across many traditionally experimental disciplines. Despite these promises, many challenges still remain.

In this talk, I will present a formal setting for solving these challenges. First, I will describe how to structure a computational workflow for design and manufacturing. I will also discuss how we can bridge the gap between ‘digital’ and ‘real’ that typically occurs in every manufacturing process. Furthermore, I will outline how we can develop intelligent manufacturing hardware that allows us to solve this problem. Finally, I will describe how to build machine learning models for bridging the digital-reality gap using limited measurement data.

12:40pm

Inkbit: Additive Manufacturing Powered by Machine Vision

Davide Marini
Cofounder and CEO
Inkbit