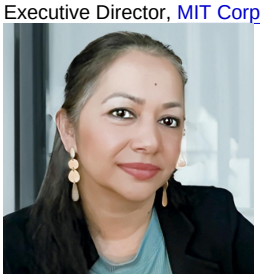
MIT Industrial Liaison Program Faculty Knowledgebase Report

Generative AI and Its Business Impact

March 14, 2024 10:00 am - 12:00 pm

10:00 AM

Welcome & Introduction
Gayathri Srinivasan
Executive Director, MIT Corporate Relations



Gayathri Srinivasan
Executive Director
MIT Corporate Relations

Dr. Srinivasan is a distinguished scientist who received her PhD in Microbiology from The Ohio State University in 2004, where she contributed to the discovery of the 22nd amino acid, Pyrrolysine (2002). She first came to MIT as an NIH Postdoctoral Fellow in Prof. Tom Rajbhandary's lab, where her research focused on understanding protein synthesis mechanisms in Archaea.

Dr. Srinivasan subsequently moved into the business development and technology licensing space, serving in MIT's Technology Licensing Office, where she helped commercialize technologies in medical devices and alternative energies. She then moved to UMass Medical School's Office of Technology Management in 2009 and to Emory University in Atlanta in 2014 as the Director of Public and Private Partnerships for the Woodruff Health Sciences Center. In 2019, Dr. Srinivasan joined Emory's Office of Corporate Relations as Executive Director, and in 2021, she led the Office of Corporate and Foundation Relations.

Graham Rong
Program Director, MIT Industrial Liaison Program

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Dr. Rong is a Program Director of Corporate Relations at MIT. He currently supervises a group of ILP program directors who promote and manage the interactions and relationships between the research at MIT and companies worldwide to help them stay abreast of the latest developments in technology and business practices.

Previously, Dr. Rong founded IKA, LLC. He has led corporate development and product innovation and provided strategic advice to companies in corporate strategy, IT leadership, digital transformation, AI, enterprise content management, and customer relationships. He held senior roles in Harte-Hanks and Vignette Corporation. He held an EU postdoctoral research fellowship at the University of Edinburgh in Scotland where he started global collaborative research.

Dr. Rong is on the board of multiple organizations, including the MIT Sloan Alumni Association of Boston from 2009 to 2012. He chaired MIT Sloan CIO Symposium from 2009-2011. He is a senior expert invited by international organizations.

Dr. Rong holds an M.B.A. in global and innovation leadership from the MIT Sloan School of Management and a Ph.D in numerical computing from the University of Guelph in Canada.

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10:05 AM

Applied Generative AI for Digital Transformation
John Williams
Professor of Information Engineering, MIT Department of Civil and Environmental Engineering

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Professor of Information Engineering
MIT Department of Civil and Environmental Engineering

John Williams holds a BA in Physics from Oxford University, a MS in Physics from UCLA, and a Ph.D. in Numerical Methods from University of Wales, Swansea. His research focuses on the application of large-scale computation to problems in cyber-physical security and energy. He is director of MIT's Geospatial Data Center and from 2006-2012, was Director of the MIT Auto-ID Laboratory, where the Internet of Things was invented. He is author or co-author of over 250 journal and conference papers, as well as the books on Rock Mechanics and RFID Technology. He contributed to the 2013 report for the UK Office for Science Foresight Project- The Future of Manufacturing. Alongside Bill Gates and Larry Ellison, he was named as one of the 50 most powerful people in Computer Networks. He consults to companies including Accenture, Schlumberger, Shell, Total, Exxon, SAP Research, Microsoft Research, Kajima Corp, US Lincoln Laboratory, Sandia National Laboratories, US Intelligence Advanced Research Projects Activity, Motorola, Phillip-Morris Inc., Ford Motor Company, Exxon-Mobil, Shell, Total, and ARAMCO. His international collaborations include Oxford and Cambridge Universities, HKUST, KACST, Alfaisal University, PolyU Hong Kong, Imperial College of Science and Technology UK, Malaysia University of Science and Technology (MUST), and Masdar Institute of Science and Technology Abu Dhabi. He organized the first Cyber-Physical Security Conference in the UK (2011), and along with Dr. Sanchez, he runs the MIT Applied Cyber Security Professional Education summer course. At MIT, he teaches courses Architecting Software Systems (MIT 1.125) and Engineering Computation and Data Science (MIT 1.00/1.001). .

In data engineering and data science, early work included simulation of Ford's global network, and analysis of SAP smart grid billing system. For Altria, he analyzed the performance of item level tagging and also their implementation of an anti-counterfeiting system using the Electronic Product Code (EPC)

In password security, Dr. Williams was a PI that developed the algorithms for a negative password authentication system for the Intelligence Advanced Research Projects Activity (IARPA) agency.

Dr. Williams advises companies in the Americas, Europe, the Middle East, and Asia.

Dr. Williams affiliations include:

- MIT Department of Civil and Environmental Engineering
- MIT Center for Computational Science and Engineering (CCSE)
- MIT Geospatial Data Center (GDC)
- MIT Auto-ID Laboratory
- MIT Center for Complex Engineering Systems (CCES)
- MIT Consortium for Improving Critical Infrastructure Cybersecurity (IC3)

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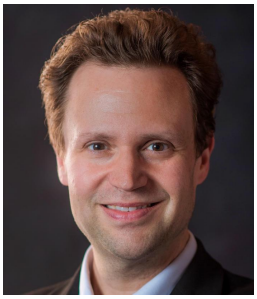
Generative AI is transforming how businesses approach problem-solving by automating creative processes, such as strategy development, software coding and generating creative images and videos. As we look to the future, the application of generative AI is expected to streamline data operations, automate white-collar workflows, foster innovation, and personalize customer experiences at an unprecedented scale. We will examine some of the issues and innovative solutions of present LLMs, particularly with respect to their handling of large data, such as document libraries, images, and videos and document retrieval using RAGs. Furthermore, while generative AI may displace certain tasks, it also creates opportunities for new job categories, emphasizing the need for human-AI collaboration, and the necessity for rethinking and how work is done.

10:40 AM

Generative AI for Modeling and Designing New Materials: Connecting Disciplines, Scales, and Modalities

Markus J. Buehler

Jerry McAfee Professor of Engineering, MIT Department of Civil and Environmental Engineering and MIT Department of Mechanical Engineering



Markus J. Buehler

Jerry McAfee Professor of Engineering, MIT Department of Civil and Environmental Engineering and MIT Department of Mechanical Engineering

Dr. Markus J. Buehler, Jerry McAfee Professor of Engineering at MIT, is a leading researcher in computational modeling across domains, from materials to biology to physics. Markus' expertise bridges AI to multi scale materials modeling. He recently co-developed a method that uses artificial intelligence to generate new protein designs with specific strengths, mimicking natural materials like silk. This approach, which uses computer simulations for testing, allows the creation of proteins with desired mechanical properties, such as strength and flexibility, beyond what is naturally available. Markus earned a Ph.D. at the Max Planck Institute for Metals Research at the University of Stuttgart and held post-doctoral appointments at both Caltech and MIT. Buehler has received many awards, including the Feynman Prize, the Drucker Medal, and the Washington Award. He is a member of the National Academy of Engineering.

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In this talk, Prof. Buehler will explore the cutting-edge intersection of materials science, biology, and artificial intelligence. Generative AI models have the potential to revolutionize the way we understand, analyze, and design new materials. However, many AI models struggle to understand physical concepts, causing the models to "hallucinate," producing unreliable or even erroneous results. This talk discusses research that addresses these challenges by blurring the boundary between physics-based and data-driven modeling through a series of physics-inspired multimodal graph-based generative AI models set in a hierarchical multi-agent mixture-of-experts framework. We apply this new generation of models in the analysis and design of materials to mimic and improve upon biological materials. Focusing specifically on protein engineering, this talk discusses case studies covering distinct scales, from silk to collagen to biomineralized materials, as well as applications for medicine, food, and agriculture where materials design is critical to achieving performance targets. By harnessing AI's creative power for designing novel proteins, Prof. Buehler's research has opened new avenues in biomedicine, construction, and sustainability. This talk will journey into the future of materials science, demonstrating how generative AI's potential to solve complex challenges is just beginning to be unlocked.

11:15 AM

Industry Panel
Jim Flynn
Program Director, MIT Industrial Liaison Program

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Program Director
MIT Industrial Liaison Program

Before MIT, Jim was the assistant dean of research business development at the UMass Amherst College of Information and Computer Sciences. Jim founded, built, and sold multiple technology companies in fintech and online media. He has bootstrapped startups and closed venture capital, angel, and private equity funding rounds. Jim also served as the Chief Operating Officer of a public company and a subsidiary of Pitney Bowes. He began his career at AT&T as a software developer, hardware engineer, and national account manager. Jim has authored patents and wrote one of the first books on Java programming. Out of all the roles he's held, Jim's favorite job title by far is dedicated dad of four. He earned a BS from Manhattan College and an MBA with concentrations in finance and international business from New York University.

Faez Ahmed
ABS Career Development Assistant Professor, MIT Department of Mechanical Engineering

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MIT Department of Mechanical Engineering

Prof. Faez Ahmed is the ABS Career Development Assistant Professor in the Department of Mechanical Engineering at the Massachusetts Institute of Technology (MIT). He leads the Design Computation and Digital Engineering (DeCoDE) lab, with a research focus on the synergy of machine learning and engineering design. His recent work addresses the synthesis of designs tailored to real-world constraints and promotes the collaborative potential between human designers and machines. Prior to his appointment at MIT, Prof. Ahmed was a postdoctoral fellow at Northwestern University and earned his Ph.D. in Mechanical Engineering from the University of Maryland. He has industrial experience in Australia's railway and mining sectors, where he championed data-driven predictive maintenance initiatives. Prof. Ahmed's vision is to create a world where humans and AI design together to solve our biggest challenges.

Noel Crawford
Innovation & Research Engineer, IT Innovation & Research
BMW Group

Nick Holda
Vice President Technology Business
IBM

12:00 PM

Closing Remarks and Adjournment