
Institute for Data Science
Data Science Summit
Monday, November 6th, 2023
NJIT
New Jersey Institute
of Technology

Data Science Summit Agenda

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1:30 PM - 1:45 PM	**Welcome by David Bader** Distinguished Professor, NJIT Director, Institute for Data Science
1:45 PM - 2:15 PM	*AI for medical education and medical diagnosis* *Usman Roshan*, Ph.D. Associate Professor, NJIT
2:15 PM - 2:45 PM	*The Role of Data & Innovation to Support Global Supply Chain* Erez Agmoni, Ph.D. Global Head of Innovation (Logistics & Services), Maersk
2:45 PM - 3:15 PM	*Hyperbolic graph embedding for MEG brain network analysis* Mengjia Xu, Ph.D. Assistant Professor, NJIT
3:15 PM - 3:30 PM	**Break - Refreshments**
3:30 PM - 4:00 PM	*Advertising Analytics and Data Science* Sherry Marcus, Ph.D. Director, Titan labs AWS
4:00 PM - 4:30 PM	*Towards Trustworthy and Reliable Large Language Models* Mengnan Du, Ph.D. Assistant Professor, NJIT
4:30 PM - 5:00 PM	*Make HR systems Human: Reimaging employee experience with generative AI* Xiaojing Wang, PhD Distinguished Engineer, ADP, Inc.
5:00 PM - 6:00 PM	**Networking reception - light hors d'oeuvres**

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AI for medical education and medical diagnosis

Usman Roshan, Ph.D.
Associate Professor
The New Jersey Institute of Technology

As part of their training all medical students and residents have to pass basic surgical tasks such as knot tying and laparoscopic surgery. Their assessment is typically performed in the operating room by surgical faculty where mistakes and failure by the student increases the operation time and cost. This evaluation is quantitative and has a low margin of error. Simulation has emerged as a cost effective option but it lacks assessment or requires additional expensive hardware for evaluation. Apps that provide training videos on surgical training are available to students but none have evaluation and require manual oversight to determine pass fail. In this talk I will present vision based AI systems to automatically rate and give performative feedback on student performance in surgical knot tying and in fundamentals of laparoscopic surgery (FLS). We will first briefly review our work on surgical knot tying published recently in IEEE ICHI 2023. We will then look at our latest work on evaluating FLS training and demonstrate our model evaluating and giving feedback live in realtime on video feed of students doing FLS.

Usman Roshan is an Associate Professor in the Data Science Department at NJIT. His research is focused on robust AI modeling and on medical AI. Roshan has published widely in bioinformatics and machine learning conferences and journals. He also works with industry and is the recipient of several grants for his work in AI. More details can be found at https://web.njit.edu/~usman

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The Role of Data & Innovation to Support Global Supply Chain

Erez Agmoni, Ph.D.
Global Head of Innovation (Logistics & Services), Maersk

Supply chains are running the world we are living in, but yet very little has been done to dramatically improve them until Covid-19 shook our lives. Since then, billions of Dollars have been invested into start-up that aim to improve and fix supply chains but there is still a lot to do. Data and innovation based on data are the keys to tackle that. Dr. Erez Agmoni, the global head of innovation at Maersk will share how one of the largest ocean carrier and end-to-end integrated logistics is working on innovation and how you can be part of it.

Dr. Erez Agmoni is the Global Head of Innovation for Maersk and after many years in Israel, Asia, and Latin America he is now based in New Jersey, USA. In this current role, Erez is heading the Maersk Innovation Center which contains 4 pillars: R&D, Digital Innovation, Product Innovation, and Data Innovation. On top of that, the Innovation Center is building eco-systems that contain internal stakeholders, customers, academia, government, and venture capital players. Erez has a broad industry experience of more than 25 years in supply chain management, freight forwarding, logistics, engineering, and digital innovation which he utilized to develop complex solutions that improve end-to-end supply chains. Erez is holding a computer engineering bachelor's degree, a telecommunication science master's degree, and a Ph.D. in organization development. Erez is married with three children and enjoys traveling, hiking, and mountain biking in his spare time Erez enjoys meeting and learning new cultures and can speak Hebrew (native), English & Thai fluently and he is at a beginner level in Japanese.

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Hyperbolic graph embedding for MEG brain network analysis

Mengjia Xu, Ph.D.
Assistant Professor
The New Jersey Institute of Technology

An expansive area of research focuses on discerning patterns of alterations in functional brain networks from the early stages of Alzheimer's disease, even at the subjective cognitive decline (SCD) stage. Here, we developed a novel hyperbolic MEG brain network embedding framework for transforming high-dimensional complex MEG brain networks into lower-dimensional hyperbolic representations. Using this model, we computed hyperbolic embeddings of the MEG brain networks of two distinct participant groups: individuals with SCD and healthy controls. We demonstrated that these embeddings preserve both local and global geometric information, presenting reduced distortion compared to rival models, even when brain networks are mapped into low-dimensional spaces. In addition, our findings showed that the hyperbolic embeddings encompass unique SCD-related information that improves the discriminatory power above and beyond that of connectivity features alone. Notably, we introduced a unique metric—the radius of the node embeddings—which effectively proxies the hierarchical organization of the brain. Using this metric, we identified subtle hierarchy organizational differences between the two participant groups, suggesting reduced hierarchy in the dorsal attention, frontoparietal, and ventral attention subnetworks among the SCD group. Last, we assessed the correlation between these hierarchical variations and cognitive assessment scores, revealing associations with diminished performance across multiple cognitive evaluations in the SCD group. Overall, this study presents the first evaluation of hyperbolic embeddings of MEG brain networks, offering novel insights into brain organization, cognitive decline, and potential diagnostic avenues of Alzheimer's disease.

Mengjia Xu is currently an Assistant Professor at Department of Data Science, Ying Wu College of Computing, NJIT. She also holds a Research Affiliate position with the MIT NSF Center for Brains, Minds, and Machines (CBMM) at McGovern Institute for Brain Research. Prior to NJIT, she was a Research Assistant Professor in the Division of Applied Mathematics at Brown University, collaborating with Prof. George Em Karniadakis, Concurrently, she held a joint postdoctoral position at MIT's McGovern Institute for Brain Research, under the mentorship of Prof. Tomaso Poggio. Before her joint postdoc at MIT and Brown, she completed her PhD degree at the Department of Computer Science, Northeastern University (China) and two-year joint PhD at Brown University. Her current research focuses on the intersection of Computer Science, Medical Imaging and Neuroscience, including generalization in deep neural networks, spatio-temporal graph representation learning, uncertainty quantification and multimodal biomedical imaging data analysis for diverse applications.

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Advertising Analytics and Data Science

Sherry Marcus, Ph.D.
Director, Titan labs AWS

Sherry Marcus is Director of Titan Labs at AWS. Prior, she was a Managing Director and head of the Blackrock Artificial Intelligence (AI) Labs. Blackrock is one of the largest investment firms in the world with approximately $6.96 trillion in assets under management. Blackrock AI lab's major objective is to develop and inject large-scale data analytics artifacts and methods in key strategic areas of the firm. Prior to Blackrock, Sherry Marcus was Chief Data Analytics Officer at Millennium Partners (MLP) where she led the development of integration of the AWS public cloud initiative that integrated and resolved position, reference, and e-communication data sets in the delivery of next-gen analytic artifacts to the business. Prior to MLP, Sherry Marcus was Global Head of Big Data Analytics and created solutions that merged private banking, communication, and news data for client analytics, and developed solutions in support of prime services. In her previous positions, Sherry Marcus held mission-critical roles in the intelligence community and DoD while leading a series of highly successful scalable analytics solution in support of national missions in counter-terrorism, counter-narcotics, counter-intelligence, and naval surface warfare. Sherry Marcus is a member of the science board at the National Counter Terrorism Center. She has received the technical medal of excellence from the Central Intelligence Agency. She has authored over 40 papers in nationally recognized journals and is a recognized expert in large-scale graph analytics and learning. Sherry Marcus holds a Ph.D. from the Massachusetts Institute of Technology in Mathematics and an AB from Cornell University.

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Towards Trustworthy and Reliable Large Language Models

Mengnan Du, Ph.D.
Assistant Professor
The New Jersey Instiute of Technology

Large language models (LLMs) have shown impressive natural language processing capabilities, but raise concerns around reliability, fairness, and transparency. In this talk, I will present our recent research on developing more trustworthy LLMs that are robust, fair, and explainable. Through innovations in model training, evaluation, and interpretation, we aim to create LLMs that are dependable, unbiased, and interpretable when deployed. I will discuss our progress in overcoming key challenges in responsible LLM deployment.

Mengnan Du is Assistant Professor of Data Science at New Jersey Institute of Technology (NJIT). He earned his Ph.D. in Computer Science from Texas A&M University. He has previously worked/interned with Microsoft Research, Adobe Research, Intel, Baidu Research, Baidu Search Science and JD Explore Academy. His research interests lie within the extensive domain of trustworthy machine learning, with a particular emphasis on explainability, fairness, and robustness. Additionally, he is particularly intrigued by the intersection of trustworthy machine learning with large language models (LLMs). He has had more than 50 papers published in prestigious venues such as NeurIPS, AAAI, KDD, WWW, ICLR, and ICML. He received over 3,300 citations with an H-index of 18. He was the WSDM 2022 Registration Chair, and he has served on the senior program committees of IJCAI 2023, the program committees of conferences such as NeurIPS, ICML, and ICLR, as well as as the reviewer for journals such as Nature Machine Intelligence and Nature Communications. More detail can be found at https://mengnandu.com/

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Make HR systems Human: Reimaging employee experience with generative AI

Xiaojing Wang
Distinguished Engineer
ADP, Inc.

We live in an increasingly digitized world: 90% of the world population has a smartphone of some kind. Globally, people spend average 7 hours in front of a screen in 2023. How we cultivate human capabilities in this machine dominated world is more than just a philosophical question. The emerging consensus is that the ability to communicate complex and abstract ideas, and the ability to build culture to influence and regulate a large group/community are essential driver behind humanity's accomplishments. In ADP, we build our products around the goal to enhance communication and culture building at work. We leverage new development in generative AI to transform employee experience in every part of their journey at work. Nudge engine is one of the core capabilities to bring yet new level of personalized insights and recommendations at the moment it matters. It combines the power of LLMs with HCM knowledge base extracted from documents, legacy code and curated by human experts. The engine interacts with workflow engine to inject intelligence nuggets into worker's workflow, which lead to better decision, timely action, and eventually positive emotions, engagement, relationships, meaning and achievement. In this talk, we will explore the techniques and use cases in making employee experience human:
1. Event-driven personalized recommendations that assist employee going through a workflow as if there is a professional sitting next to them. For example, as part of onboarding process, nudge new hire with the tasks to complete at a given moment and invoke the corresponding agent to assist. For candidates who didn't get selected for applied job, nudge them with similar jobs available and courses they can take to enhance their skills required by the job they are interested. For people who needs to take medical leave and parental leave, proactively outline the documents needed, steps to take, and send coming-back nudges to make back-to-office process easier.
2. HCM writing assist: Leveraging multi-prompting techniques to generates communication snippets that not only consider the workflow context, job role and function of the audience, but also incorporate company recommended style guide with inclusive language.

Xiaojing Wang has dedicated the past two decades to building differentiating and impactful data products. In ADP, she is leading the effort building world-class HCM solutions combining ADP's rich HCM data with modern data infrastructure, machine learning and generative AI. The recent advancement in AI allows us to reimagine HCM and employee experience. We aim to bring HR services to employees at the moment that matters the most. Employees feel fully supported throughout their professional journey. Xiaojing is the founder of the data science and machine learning team for ADP DataCloud. Her team developed the award-winning benchmarking product, a data-driven, human-knowledge driven skills graph, and state-of-art MLOps platform. Before joining ADP, she spent 10 years in CNET, building its enterprise data warehouse and business intelligence infrastructure powering multi-national online media advertising platform. She led the team creating the first revenue generating data product and the first terabyte advertising data mart enabling advanced ad delivery and optimization. Xiaojing earned her BS in computer science and technology from the University of Science and Technology of China.

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