Don Bosco Binghamton Big Data Online International Conference

DB3D 2021

19 – 21 October 2021

Title & Abstracts of Keynote Speakers

Name of Speaker: Hiroki Sayama, Ph.D.

Title of Talk: Understanding Diversity, Innovation and Social Evolution: Theoretical and Experimental Approaches

Abstract of Talk:

In this talk, I will provide an overview of our four recent studies on the effects of "diversity" on complex social processes. Multidisciplinary methodologies are used, combining mathematical/computational modeling, human-subject experiments, and social media data analysis. The first study investigates through agent-based simulation how diversities of individuals' knowledge and behavior may affect the performance of collective decision-making taking place in a social network. The second study experimentally tests the effects of individuals' background diversity on collaborative design and innovation using machine-learning-based text analysis. The third study systematically analyzes large-scale social media data using machine learning to reveal the process by which eccentric (potentially innovative or harmful) ideas spontaneously arise and become promoted in an adaptive social network. The fourth study elucidates through adaptive network simulation the importance of behavioral diversity of individuals on the maintenance of cultural (informational) diversity and social connectivity. Through these interrelated studies, we illustrate how different forms of diversity of social constituents can have different, nontrivial implications for collective social dynamics.

Name of Speaker: Ben Amaba, PhD, PE, CPIM®, LEED®AP

Title of Talk: The Process and Approach for Data Analytics, Machine Learning, and Artificial Intelligence becomes Critical for the Future

Abstract of Talk:

Data analytics and artificial intelligence (AI) are revolutionizing industrial and engineering approaches, techniques, and outcomes. As professional engineers, scientists, and practitioners, we apply classic systems engineering methodologies, fundamental laws from physics, thermodynamics, statistics and probabilities. We use artificial intelligent and machine learning to solve problems that traditionally would have taken years and proved costly. New applications will use larger amounts of data, combining telemetry, signals, observations, historical events, and behaviours; it will require key process components to ensure integrity, quality, and accuracy. "Quality experts including Drs. Joseph M. Juran and W. Edwards Deming stress that the vast majority (85 to 94 percent) of the time, the answer is found in the processes or systems in place are not up to the task of handling all the variations that exist in today's business climate, and as a result, customer expectations are not met." If AI software projects are impacted the same way as earlier software projects according to the Standish Group report, then we need to apply lessons learned and best practices to increase success. The strategy is emerging and existing technologies should integrate the best processes to produce maximum positive results. Technology coupled with process advances can improve productivity by 20%. Industrial Engineering applies DMAIIC (Design, Measure, Analyze, Improve, Implement, Control), Systems Engineering applies the V-Model, Software Engineers apply the software engineering principles, and the Job Task Analysis is becoming popular. These methods can be integrated and enable a successful software-driven AI project.

Name of Speaker: Dr. Indiramma M.

Title of Talk: Big data business models and case studies

Abstract of Talk:

- Big data business models
- Google Now business model
- Netflix business model
- Data as a service
- Data suppliers, delivery networks, data facilitators
- Information as a service
- Answer Data Users

Name of Speaker: Dr. Snehanshu Saha

Title of Talk: Optimization: A Multi-armed Bandit In Deep Neural Nets

Abstract of Talk:

As the State-of-The-Art (SOTA) model performance advances, it is essential to make deep learning, specifically neural networks, reliable and robust. A key point of contention in such learning paradigms is the interpretation, representation and efficient implementation of the optimization problem in Deep Neural Networks. There are issues such Universal Approximation of Activation functions, smoothness and robustness of Loss functions and behavior of gradients in landscape optimization. In this talk, we will touch upon some of these issues, workarounds and connections to some grander problems in Deep Learning such solving Physical systems, large scale data intensive problems and theoretical soundness to help unfold the traditional black-box model. Specifically, in this talk, we shall expect discussion on derivative-based optimisation method, requiring exact analytical error gradients to be computed and the restrictions of such choices. We will present a derivative-free optimization via meta-heuristic algorithms.

The sources of inspiration to fathom and boost optimization techniques in general, and Swarm based techniques in particular are attributed a dynamical systems perspective. We are also influenced deeply by the results from Wellington and Teh, where an SGD optimization technique was translated to a sampling technique aided by added-noise and governed by Langevin dynamics. While these results are new, the strong connections between derivative-free optimization techniques and approximation techniques tie seemingly different sub fields of optimization and sampling. The talk will elaborate on these connections.

Name of Speaker: Shriram Revankar, Ph.D.

Title of Talk: AI and Bigdata Algorithms and Challenges

Abstract of Talk:

Advances in Artificial Intelligence & Big Data technologies has revolutionized every aspect of modern businesses and our day to day lives. Covid-19 pandemic is further accelerating the digital revolution in enterprises and governments across the world. A new generation of technologies in big data, AI, NLP is well positioned to revolutionize how we live and how modern societies operate. Along with the breath taking gains made in cloud computing, distributed systems, software, algorithms and new business models, whole new set of challenges are confronting the researchers and engineers. In this talk I would like to introduce relevant part of our research and use that as a context to introduce the new challenges. Through examples and use cases, I will elucidate some of the advances we have made in the areas big data analytics, customer analytics, automated insights and social networking. The new challenges will be introduced by analyzing the impact of these class of algorithms on our society. In particular I will focus on select aspects of privacy, fairness, trust and loyalty.

Name of Speaker: Sangwon Yoon, Ph.D.

Title of Talk: Digital Transformation using Artificial Intelligence/Machine Learning in Electronics Manufacturing

Abstract of Talk:

Manufacturing has evolved and become more automated, computerized, and complicated. The manufacturing industry aims to improve competitiveness by convergence with cutting-edge information and communication techniques to produce a high-quality product at minimum cost and secure a new growth engine. Due to the cross-functional nature of the manufacturing firms, the enhancement of production planning and control functions can lead to the global improvement of manufacturing systems. Data has recently become a valuable resource, and it is becoming cheaper and more accessible than ever to collect and store along with the rapid development in computing and sensing systems. Such capability can make Artificial Intelligence (AI)/Machine Learning (ML) approach an appealing solution to tackle manufacturing challenges. Along with technical advances toward Industry 4.0, the research team developed a smart manufacturing platform by adapting advanced AI/ML techniques and mathematical optimization to enhance production capabilities and qualities. In this talk, the current research problems in the manufacturing industry will be addressed, and a smart manufacturing platform in electronics manufacturing will be demonstrated, including a closed-loop qualify control system with dynamic parameter optimization and surrogate modeling based on AI/ML.

Name of Speaker: Sreekanth Ramakrishnan, Ph.D.

Title of Talk: Transforming Client Experience through Industrial Engineering Techniques

Abstract of Talk:

Client Experience (CX) is a discipline that is gaining traction across enterprises to understand its competitive landscape and implement features and functions to its products and services in an agile manner with constant client feedback and co-creating solutions with them. There are industrial engineering techniques which has time tested practices for translating client requirements into value. CX disciplines also highlights the need for an organizational culture that can support their clients. Industrial and Systems engineers are perfectly positioned to address the challenges of implementing a client experience program in an enterprise. This talk will showcase how industrial engineering techniques were used to identify areas of improvement. We used Voice of Customer/Kano Analysis, Total Quality Management (Pareto/Regression/FMEA/QFD/5Why), Standardized Work to balance team workload and numerous Engineering Management principles to lead teams effectively. Additionally, using data and AI techniques, insights to improve client situations and resolution paths are also discussed.

Key success factors to drive such transformations include: (1) Tops down leadership support; (2) Bottoms up implementation; (3) client engagement to improve our processes and products and (4) effective use of industrial engineering techniques to deliver insights for our teams. We use the learnings from this effort to replicate to other products and services across the company with the ultimate goal of earning client advocacy.

Name of Speaker: Sreejith V Nair, Ph.D.

Title of Talk: Edge Analytics : Moving computation from cloud to ground

Abstract of Talk:

The advances in big data are undergoing a profound change. With the increasing applications and systems that are moving to the cloud, the load and the data generated are also increasing. Thus it makes a challenge for real-time analysis and also extracting information. The edge devices such as IoT sensors, cameras, mobile phones, etc., generate a huge amount of data and are predicted to result in ~ 80 ZB in the year 2025. Due to various challenges such as network connectivity, latency, and difficulties in processing the huge data in the cloud, there is a need for analyzing and extracting important insights from the data in real-time. A combination of edge analysis along with cloud computing can bring more stability to the network by optimizing the computational power. Research advances in Machine learning and AI have paved the way for fast data analysis and unlocked new insights and opportunities for process optimization. The edge devices including MCUs are equipped with more processing power which helps for faster analytics on edge by deploying light-weighted machine learning models. The ultimate aim is not to move the data analysis out of the data center, but to have both cloud and edge analytics work together to have an optimal performance.

Name of Speaker: Aruna Gowade, Ph.D.

Title of Talk: Frequent Sub Graph Mining

Abstract of Talk:

Frequent Sub Graph Mining (FSM) has several applications in the area of Bioinformatics, Chemical informatics, Social Network Analysis, Weather and Marine Science. FSM is the well-studied problem in the theory of Data Mining, however the complexity of the single graph or mining the subgraphs from multiple input graphs still has the challenge of scalability. In the Era of the Information Age the data is scattered at several locations which needs to be analyzed in a distributed manner. One of the fundamental algorithms for FSM is the Apriori Algorithm which restricts the graph or the set of graphs to be fit in the memory while mining the frequent subgraphs. The redesign of the traditional Algorithm of FSM in a distributed manner will address this restriction.

Name of Speaker: Nitin Upadhyay, Ph.D.

Title of Talk: Big Data Crossroads: Maximizing the opportunity and overcoming the challenges

Abstract of Talk:

The surge of big data is providing immense opportunities to businesses across the globe. Corporate leaders believe that big data will accelerate the digital transformation and unleash new organizational resources, capabilities, and value. However, as with any technological paradigm shift, opportunities go hand-in-hand with the challenges. Today, businesses are at big data crossroads and experiencing dilemmas in choosing the right pathway to harness big data. The Keynote talk will address the big data success pathways by avoiding the biggest mistakes.

Name of Speaker: Vivek Jog, Ph.D.

Title of Talk: Taxonomy of Big Data Analytics Tools for Beginners

Abstract of Talk:

Big Data Analytics has now become a buzz word among the people that are working in the field of data science. Experts working in this field talk lot about different approached towards data analysis considering different needs from the business word. Although it is true that the final aim of data analysis is to save loss or earn profits, all approaches are never the same and differ case by case. Things change drastically every time and depend on the way data is collected, the format in which data is collected, the speed at which data is collected, the nature and depth of analysis required and finally the accuracy at which results are expected. My session will be entirely focused on different ways of getting the analysis done based on different factors that I have just mentioned considering the time and budget that could be utilized in the domain so called as Big Data. Participants will be exposed to the different possible ways of doing data analysis utilizing different tools available in public domain. Which tool can be used at what stage and what results can be expected to what accuracy will definitely a big take away of the session.