Institute of Technology, Nirma University, Ahmedabad
Computer Science & Engineering Department
Closure Report on Online Workshop Series
on
"Research Avenues in Data Science"

Submitted to: Director IT, NU.

As an activity under COE in Data Science, Computer Science and Engineering Department, Nirma University conducted NU-BU online workshop series on Research Avenues in Data Science starting on November 1st, 2022, with SUNY, Binghamton University, New York, USA. This workshop series aimed to exchange knowledge and strengthen our bond with Binghamton University, which will help us connect with their faculty members and students. The topics of the sessions were related to research avenues of data science in different domains. There were four sessions delivered by NU and BU eminent faculty members from both sides. The sessions were arranged alternatively by both Universities, and participants from both universities involving faculties and students of UG and PG programs actively participated in the sessions.

Detailed schedule of the workshop series is as follows:

Activity Name: On Line Workshop Series (Time: 7:30pm – 8:30pm IST)
Coordinators: Dr Vijay Ukani and Dr Jitendra Bhatia
(Coordinators for the Activity, COE in Data Science)

Sr.No	Title	Name of the Speaker	Date and Day
1	Large-Scale Discrete Event Simulation Modeling and Machine Emulator for Pharmacy Automation Systems	Dr. Yu (Chelsea) Jin Assistant Professor, Binghamton University	01-Nov-2022 Tuesday
2	Design and Development of a Scalable Framework for Geospatial/ Geoscience Data Ingestion, Ad-hoc Queries and Analysis on Big Data Environment	Dr. Jai Prakash Verma, Associate Professor, CSE Department.	22-Nov-2022 Tuesday

3	An explainable machine learning (EML) approach for microstructure characterizations toward improving sustainable material manufacturing	Dr. Zimo Wang, Associate Professor, Binghamton University	09-Dec-2022 Friday
4	File Systems of the Future	Dr. Madhuri Bhavsar, Professor and Head, CSE Department, Institute of Technology, Nirma University	19-Jan-2023 Thursday

There were no finances involved in conducting the event.

HOD (Computer Science and Engineering Department)

Brochure of workshop series

Centre of Excellence in Data Science CSE Department presents

Binghamton University – Nirma University Workshop Series Fall 2022

Dr. Yu (Chelsea) Jin
Assistant Professor, Binghamton University

Large-Scale Discrete Event Simulation Modeling and Machine Emulator for Pharmacy Automation Systems
Tuesday, Nov 1, 2022

Dr. Jai Prakash Verma
Associate Professor, Nirma University

Design and Development of a Scalable Framework for Geospatial/Geoscience Data Ingestion, Ad-hoc Queries and Analysis on Big Data Environment
Tuesday, Nov 22, 2022

Dr. Zimo Wang
Associate Professor, Binghamton University

An explainable machine learning (EML) approach for microstructure characterizations toward improving sustainable material manufacturing
Friday, Dec 09, 2022

File Systems of the Future
Thrusday, Jan 19, 2023

Dr. Madhuri Bhavsar
Professor and HoD (CSE), Nirma University

Dr. Gopi Bhatt
PhD, Nirma University

Session Flyers

Session-I

Binghamton University - Nirma University Seminar Series | Fall 2022

Large-Scale Discrete Event Simulation Modeling and Machine Emulator for Pharmacy Automation Systems

Dr. Yu (Chelsea) Jin
Assistant Professor, Binghamton University
10:00am – 11:00am EDT (7:30pm – 8:30pm IST) Tuesday, Nov 1, 2022
Online (via zoom - https://binghamton.zoom.us/j/96176546486)

Abstract

In this talk, advanced 3D simulation modeling frameworks and techniques will be introduced for the design validation and system improvement of large-scale mail order (MOP) central fill pharmacy (CFP) systems. Prescription demand and the complexity of patients' pharmaceutical protocols have drastically increased during the last decades. In this regard, the development of modern automated prescription filling systems has drawn significant attention. Automated pharmaceutical systems provide greater effectiveness in the overall prescription fulfillment process by realizing advancements in system flexibility, consistency, and patients' drug adherence while augmenting patient safety. Typically, the CFP is a make-to-order manufacturing system that fulfills tens of thousands of customized prescriptions every day by utilizing robotic dispensing systems, which integrate auto-dispensers and facilitate the simultaneous dispensing of medications. Such advanced systems can also minimize drug counting errors and inventory holding costs. In this research, therefore, simulation modeling and optimization has been utilized to study and evaluate the performance of existing and proposed pharmacy automation systems through performing capacity planning analysis, analyzing material flow and facility layout, and evaluating resources allocations. In addition, the prototype of virtual reality, emulators, and "digital twins" will be presented to show how they can be utilized in MOP and CFP system developments and operations.

Bio

Yu (Chelsea) Jin received her BS degree in 2014 from the Department of Information Science and Technology at Jinan University in Guangzhou, China. In 2015, she received her master's degree in manufacturing engineering from the University of Michigan at Ann Arbor. She earned her Ph.D. degree in industrial engineering at the University of Arkansas - Fayetteville in May 2020, and she joined Binghamton University as an assistant professor of Systems Science & Industrial Engineering in Fall 2020. Her research focuses on sensing and analytics, optimization, and simulation for advanced manufacturing and service applications. Her research has been sponsored by the Transdisciplinary Area of Excellence Seed Grant, Integrated Electronics Engineering Center Technical Advisory Board, and Watson Institute for Systems Excellence. She received the IISE Gilbreth Memorial Fellowship in both 2018 and 2019; the Kuroda Graduate Fellowship in Engineering, the Graduate Research Award in 2019, and the Outstanding Graduate Student Award in 2020 from the University of Arkansas. Her work has been published in IISE Transactions and ASME Journal of Manufacturing Science and Engineering. She has been a board member of IISE DAIS Division since May 2022 and an officer of INFORMS QSR International Committee since September 2020. She also served as a reviewer for IISE Transaction, ASME Journal of Manufacturing Science and Engineering, IEEE Transaction, Journal of Intelligent Manufacturing, etc.

Session-II

Binghamton University - Nirma University Seminar Series Fall 2022

Dr. Jai Prakash Verma, Associate Professor
Department of Computer Science and Engineering
Institute of Technology, Nirma University
Ahmedabad, India
Join Zoom : https://binghamton.zoom.us/j/92678192078
Date : 22/11/2022, Time : 7:30 PM (IST) / 9:00 PM (EST)

Title : Design and Development of a Scalable Framework for Geospatial/Geoscience Data Ingestion, Ad-hoc Queries and Analysis on Big Data Environment

The availability of the internet and Geographic Information System (GIS) had a very large impact on the day-to-day life of individuals. GIS offers various digital services by processing large datasets available in real-time. These data are generated at a very high speed and also require large storage devices to store data. A variety of data are required to process and produce the result in real-time. Processing of raster geospatial/geoscience big data in various GIS Applications requires a distributed environment to reduce the load and limitations of vertical scaling with a horizontally scaled system. Processing of raster geospatial big data in various GIS applications requires a distributed environment to reduce the load and limitations of vertical scaling with a horizontally scaled system. This project presents a new approach for processing raster geospatial big data using current distributed technology viz. Apache HADOOP, SPARK, SEDONA, and Spark Geotrillise. We discuss the issues and challenges in processing Raster Data in the Big Data Environment and its applications.

Brief Profile :

Dr. Jai Prakash Verma is working as an Associate Professor in the Computer Science and Engineering Department. He has been associated with the department since July 2006. Dr. Verma received his BSc (PCM) and MCA degree from the University of Rajasthan, Jaipur, and a Ph.D. degree from Charusat University, Changa. His Ph.D. subject area was Text Data Summarization and Big Data Analytics. His research interests include Data Mining, Big Data Analytics, and Machine Learning. He has been contributing to the research in the area of said domain with several publications in international conferences and journals. He is a recognized PhD guide at Nirma University and currently guiding two PhD scholars. He has successfully completed one external funded major research project under ISRO Respond basket scheme. He is actively involved in conducting various training programs as customized training on Big Data Analytics to Naval officers at INS Valsura Indian - Navy, SAC-ISRO Ahmedabad Scientists, industry and academic experts.

Session-III

Binghamton University – Nirma University Seminar Series | Fall 2022

An explainable machine learning (EML) approach for microstructure characterizations toward improving sustainable material manufacturing

Dr. Zimo Wang, Associate Professor, Binghamton University
09:00am – 10:00am EDT (7:30pm – 8:30pm IST) Friday, Dec 09, 2022
Online (via zoom - https://binghamton.zoom.us/j/94491378132)

Abstract

Natural fiber reinforced plastic (NFRP) composites are ecofriendly and biodegradable materials that can offer tremendous ecological advantages while preserving unique structures and properties. Studies on using these natural fibers as alternatives to conventional synthetic fibers in fiber-reinforced materials have opened possibilities for industrial application. However, critical issues reside in the machinability of such materials because of their multi-scale structure of natural fibers and the randomness of the reinforcing elements distributed within the matrix basis. This paper reports a comprehensive investigation of the effect of microstructure heterogeneity on the resultant behaviors of cutting forces for NFRP machining. A convolutional neural network (CNN) links the microstructural reinforcing fibers and their impacts on changing the cutting forces (with an estimation accuracy of over 90%). Next, a modified local model-agnostic explainable machine learning (M-LIME) approach is extended to decipher this CNN black-box model by discovering the effect of sizes, shapes, and dispersions of the reinforcing fibers on the cutting forces. The results reaffirm that the localized regions with a higher density of the reinforcing fibers lead to more cutting force during the NFRP machining. The presented framework of the explainable machine learning approach opens an opportunity to discover the causality of material microstructures on the resultant process dynamics and accurately predict the cutting behaviors during material removal processes, which provides guidance on the material structure and product designs using fiber reinforced composite materials.

Bio

Zimo Wang is an assistant professor in the Department of Systems Science and Industrial Engineering at Binghamton University. Wang conducted research projects in broad aspects of manufacturing and data analytics with strengths in sensors and AI for additive manufacturing and precision manufacturing processes. His research focuses on bridging sensor techniques, manufacturing processes, and data science to create smart sensing approaches, develop machine learning approaches, and integrate them into the cyber-physical platform for realizing smart and autonomous manufacturing processes. Other current research interests include sustainable material characterizations and manufacturing and statistical modeling toward analyzing chaotic dynamic systems. Wang is a member of IISE, SME, and INFORMS.

Session-IV

Binghamton University - Nirma University Seminar Series Fall 2022

Date : 19/01/2023, Time : 7:30 PM (IST) / 9:00 AM (EST)

Join Zoom Meeting : https://binghamton.zoom.us/j/91213066833

Title : File Systems of the Future

File Systems are in existence since the first generation computing systems were developed. They form the base of every storage system, yet are highly ignored, or rather to be specific, taken for granted. Right from booting an operating system to data storage and retrieval, file systems play an active role. File systems are bulky software that act as a link between hardware and software (Operating System to be specific). This bulkiness makes them look less attractive, thus reducing people's interest to work in this field. With changing technology, file systems are evolving at a much faster rate. The invent of cloud has not only brought new opportunities in the field of storage but has also added the term "Virtual Hardware" in the kitty, providing new dimensions for evolution of file systems.

Cloud Computing has led the foundation for "Futuristic File Systems". Developers are now able to foresee how the file system in future will be and what additional functionalities/potential they will have. This theme will not only elaborate on how file systems will look like in future, but will also help in answering questions about how the next generation computing technology will be.

Brief Profile :

Dr. Madhuri Bhavsar is currently working as Professor and Head of the Computer Science and Engineering Department and has over two decades of teaching experience at undergraduate and postgraduate level. She did her BTech in Computer Engineering from SSGMCE Shegaon and her ME with specialization in Microprocessor Systems and Applications from MS University. She received her PhD degree from Nirma University in the field of High Performance Computing in 2012. Recently, Dr. Madhuri has received ISTE National level award for "Best Women in Engineering", from Chief Minister of Goa. This award was conferred in 51st ISTE National Convention held at Goa on 27th August 2022. She is a recipient of the "ISTE Best Engineering College Teacher, State of Gujarat" award for the year 2017, in recognition of her outstanding contribution to the academic community and the students. Dr Madhuri's main field of interest is Cloud Computing and she has research project grants of Rs 85 lacs for 5 research projects, each from GUJCOST, Space Application Center - ISRO, Board of Research in Nuclear Sciences (BRNS), DAE and DST, to her credit. She has chaired and successfully organised the International Conference 'NUiCONE 2015', in technical collaboration with IEEE and Taylor and Francis, co-chaired 'NUiCONE 2013' and has also handled ISTE Gujarat section activities as Secretary. Dr Madhuri is a registered PhD guide at Nirma University and is currently supervising five PhD scholars. Besides, five scholars have successfully completed PhD under her guidance. Dr Madhuri has worked as a technical reviewer and has been on the advisory board for various International conferences and Journals.

Dr. Gopi Bhatt is working as an Assistant Professor at ADIT in Computer Engineering department since 2006. She has carried out her research work in the field of "File System as a Service in Cloud Computing" under the guidance of Dr. Madhuri Bhavsar.

Snapshots of the workshop session.

Presentation
on
**Prototype of Portable File Systems
for Virtual Environment
(File Systems of the Future)**

Dr Gopi Bhatt,
Assistant Professor, ADIT,CVM University

Dr Madhuri Bhavsar
Professor & Head, Nirma University

Date: 19th January, 2023

Department of Computer Science and Engineering
Institute of Technology, Nirma University.

Virtualization at Operating System (OS) level:

- File This refers to an abstraction layer between traditional OS and user applications.
- This virtualization creates isolated containers on a single physical server and the OS-instance to utilize the hardware and software in datacenters.
- The containers behave like real servers.
- OS-level virtualization is commonly used in creating virtual hosting environments to allocate hardware resources among a large number of mutually distrusting users.
- It is also used, to a lesser extent, in consolidating server hardware by moving services on separate hosts into containers or VMs on one server.
- Typical systems: Jail / Virtual Environment / Ensim's VPS / FVM