MANAN MEHTA

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EDUCATION

University of Illinois Urbana-Champaign Aug 2020 - May 2024
Ph.D., Mechanical Engineering GPA: **3.9/4.0**
Graduate Minor, Statistics

Ph.D. Thesis: Data-Efficient Machine Learning for Decision-Making in Smart Manufacturing

Birla Institute of Technology and Science, Pilani Aug 2015 - May 2019
B.E. (Hons.), Mechanical Engineering GPA: **9.7/10.0**

WORK EXPERIENCE

University of Illinois Urbana-Champaign | Ph.D. Research Assistant Aug 2020 - Present

- Research focused on advanced ML methods for smart manufacturing and industrial IoT
- Demonstrated the first applications of federated learning in additive manufacturing and machine fault diagnosis
- Formulated a novel clustering algorithm to tackle on-device statistical heterogeneity in federated learning
- Developed an end-to-end response surface methodology for multi-task learning with input-dependent noise
- Designed a novel framework to combine active learning and multi-task learning for Gaussian processes
- Enabled highly data-efficient, flexible, and accurate modeling in crucial manufacturing applications like defect detection from images, fault diagnosis from sensor signals, part qualification after 3D printing, and surface shape prediction

Seagate Technology | AI/Machine Learning Intern May 2023 - Dec 2023

- Implemented ML models to improve performance of wafer classification systems on highly imbalanced KPIV data
- Incorporated AutoML for hyperparameter tuning to increase model deployability by 80% on key production toolsets
- Fixed bugs in the data pipeline to reduce attribute and label noise in training datasets across six ML projects
- Formulated advanced deep learning models to enable over 90% wafer skip rate in virtual metrology

Lam Research | Data Analyst Intern May 2020 - Aug 2020

- Automated the detection of Fluorine deposition depth from images to reduce manual testing from 20 min to 10 sec
- Performed statistical analysis of machine age data to draw useful inferences for remaining useful life prediction

ACADEMIC PROJECTS

Highly precise defect detection in 3D printed parts using computer vision

- Implemented a U-Net-based semantic segmentation algorithm for in-situ defect detection in additive manufacturing
- Achieved a meanIoU of 0.83 on highly imbalanced and partially labeled image datasets

Mixed fault detection in rotating machinery using deep learning

- Formulated a novel duplet-CNN architecture for fault classification and anomaly detection using sensor signals
- Achieved state-of-the-art classification accuracy of 96% over 48 mixed fault classes

Equity portfolio optimization for personal finance using machine learning

- Formulated a PCA-based modified K-Means algorithm to generate diversified stock portfolios from S&P500 data
- Identified high Sharpe ratio portfolios with low volatility yielding consistent returns of upto 26% YoY on test data

Sentiment analysis of movie reviews using text classification

- Performed a comparative study of models for binary sentiment classification of movie reviews in the IMDB dataset
- Implemented a TF-IDF bag of words model and an LSTM model using pre-trained word embeddings

TECHNICAL SKILLS

Python (NumPy, Pandas, SciPy, Matplotlib, OpenCV, Scikit-Learn, LightGBM, XGBoost, H2O, FLAML, PyTorch, TensorFlow, Keras, MLRun), SQL, R, Git, LaTeX

PUBLICATIONS

1. Manan Mehta, Siyuan Chen, Haichuan Tang, and Chenhui Shao, (2023), "A federated learning approach to mixed fault diagnosis in rotating machinery," *Journal of Manufacturing Systems*, Vol. 68, pp. 687-694.
2. Manan Mehta and Chenhui Shao, (2023), "A greedy agglomerative framework for clustered federated learning," *IEEE Transactions on Industrial Informatics*, in press. [pdf] [news]

3. Manan Mehta and Chenhui Shao, (2022), "Federated learning-based semantic segmentation for pixel-wise defect detection in additive manufacturing," *Journal of Manufacturing Systems*, Vol. 64, pp. 197–210. [pdf] [code] [news]
4. Manan Mehta and Chenhui Shao, (2021), "Adaptive sampling design for multi-task learning of Gaussian processes in manufacturing," *Journal of Manufacturing Systems*, Vol. 61, pp. 326–337.
5. Manan Mehta, Miles V. Bimrose, Davis J. McGregor, William P. King, and Chenhui Shao, (2023), "Federated learning enables privacy-preserving and data-efficient geometry prediction and part qualification across additive factories," submitted.
6. Manan Mehta, Yuhang Yang, and Chenhui Shao, (2023), "Multi-task response surface modeling with multi-resolution manufacturing data," in preparation.

HONORS AND AWARDS

1. NSF Travel Award for the North American Manufacturing Research Conference (NAMRC) 51 — 2023
2. Swati and Mukul Chawla Scholarship for graduate studies, UIUC — 2022
3. K. C. Mahindra Fellowship for graduate studies — 2019
4. Rank 3/120 in Mechanical Engineering, BITS Pilani — 2019
5. Institute Merit Scholarship, BITS Pilani — 2019
6. DAAD-WISE Scholarship for summer research exchange in Germany — 2018
7. Dhirubhai Ambani Scholarship for excellence in mathematics — 2016

INVITED TALKS

1. Addressing data heterogeneity in collaborative fault diagnosis using clustered federated learning, *INFORMS Annual Meeting*, Phoenix, AZ, Oct. 2023.
2. Federated learning in manufacturing and beyond: opportunities and challenges, *AI Institute for Food Systems, UC Davis*, Sep. 2022.
3. Introduction to Gaussian process regression and filtered kriging for surface interpolation, *NanoHUB, Purdue University*, July 2022.
4. Active learning for multi-task learning of Gaussian processes, *UIUC–Cyprus Institute Joint Talk Series*, Oct. 2021.

SERVICE

Peer Review

Served as a reviewer for AI/ML-track papers in

- IEEE Transactions on Industrial Informatics
- Journal of Manufacturing Systems
- Mechanical Systems and Signal Processing
- Journal of Manufacturing Processes
- 2023 North American Manufacturing Research Conference (NAMRC)
- 2024 ASME Manufacturinig Science and Engineering Conference (MSEC)

Teaching

- Teaching assistant at UIUC for Calculus II (1 semester) and Computer-aided Design (2 semesters)
- Led teaching sessions and laboratory discussions for 60-90 students
- Included in the 'List of Teachers Ranked as Excellent' by the Center for Innovation in Teaching and Learning

SELECTED COURSEWORK

Computer Science :	Machine Learning, Deep Learning, Computer Vision, Data Science and Analytics, Big Data Foundations, Data Structures and Algorithms
Mathematics/Statistics :	Advanced Regression Analysis, Statistical Learning, Random Processes, Optimization, Mathematical Statistics, Probability Theory