SAKSHAM JAIN

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EDUCATION

SEP 2022 - Present	**Ph.D., Statistics** - UNIVERSITY OF WASHINGTON, SEATTLE Advisors: Alex Luedtke, Lalit Jain
AUG 2020 - MAY 2022	**M.S., ECE (Machine Learning)** - DUKE UNIVERSITY Advisors: Cynthia Rudin, Alex Volfovsky, Sudeepa Roy	Grade: 3.9/4
AUG 2015 - JUN 2019	**B.E., (Robotics & Automation)** - NSIT, UNIVERSITY OF DELHI Advisor: Umang Soni	Grade: 7.7/10

PREPRINTS & PUBLICATIONS (* DENOTES EQUAL CONTRIBUTION)

Jain, S.*, Seale-Carlisle, T. M.*, Lee, C., Levenson, C., Ramprasad, S., Garrett, B., Roy, S., Rudin, C., & Volfovsky, A. (2024). "Evaluating pre-trial programs using machine learning matching algorithms". **AAAI '24 (oral)**. (Publication)

Kornfein, C., **Jain, S.***, Willard, F.*, Tang, C.*, Long, Y.*, Malof, J.*, Ren, S.*, & Bradbury, K.* (2022). "Closing the Domain Gap - Blended Synthetic Imagery for Climate Object Detection". *NeurIPS '22 Workshop on Tackling Climate Change with Machine Learning.* (Publication). Extended: *Environmental Data Science.* (2023). (Publication)

Nayak, G. K., Mopuri, K. R., **Jain, S.**, & Chakraborty, A. (2021). "Mining Data Impressions from Deep Models as Substitute for Unavailable Training Data". *IEEE Transactions on Pattern Analysis and Machine Intelligence* **(TPAMI)**. (Publication)

Jain, S., Seth, G., Paruthi, A., Soni, U., & Kumar, G. (2020). "Synthetic data augmentation for surface defect detection and classification using deep learning". *Journal of Intelligent Manufacturing, 1-14.* (Publication)

Nayak, G. K., **Jain, S.**, Babu, R. V., & Chakraborty, A. (2020, September). "Fusion of Deep and Non-Deep Methods for Fast Super-Resolution of Satellite Images". *IEEE International Conference on Multimedia Big Data (BigMM) (pp. 267-271).* (Publication)

Jain, S., **Jain, S.**, & Komanduri, A. P. (2018, October). "A cascade predictive control strategy for active suspension systems". *IEEE International Conference on Automation/XXIII Congress of the Chilean Association of Automatic Control (ICA-ACCA) (pp. 1-5).* (Publication)

Jain, S., & Sreedevi, I. (2018, December). "Robust Detection of Iris Region Using an Adapted SSD Framework". *Workshop on Computer Vision Applications (pp. 51-64). Springer, Singapore.* (Publication)

PROFESSIONAL & RESEARCH EXPERIENCE

JUN 2024 - SEP 2024 NYC, USA	**Applied Scientist II Intern**, Amazon Science • Finetuned Large Language Models (LLMs) within deep sequence models for multi-horizon time-series forecasting. • Integrated embeddings of text data using pre-trained sentence transformers to improve forecasting performance for diverse product categories.
JUL 2023 - SEP 2023 LA, USA	**AI/ML Engineering Intern**, involve.ai • Built a research-and-revise approach for post-hoc LLM output correction, implemented as a 'co-pilot' for market research tasks. • Built a DistilBERT multi-task classifier for job titles, improving recall for sales lead retrieval by 4x.
AUG 2021 - MAY 2022 NC, USA	**Graduate Team Lead**, Bass Connections Project, Duke Energy Initiative • Developed a synthetic imagery-based domain adaptation technique for energy infrastructure detection, improving cross-domain AP by 8.23%.
MAY 2021 - APR 2022 NC, USA	**Graduate Research Assistant**, Almost Matching Exactly Lab, Duke University • Developed an interpretable ML-based approach for sub-population level impact evaluation of judicial pre-trial services on recidivism.
MAY 2021 - AUG 2021 NC, USA	**Research Intern**, RAILabs, Duke University • Developed an end-to-end YOLO-based pipeline for lesion detection and joint ipsilateral matching in mammograms, reducing false positives by 80% with minimal speed impact.

Jan 2020 - Jul 2020 Karnataka, India	**Research Project Assistant**, Visual Computing Lab, IISc Bangalore • Developed a novel statistical approach for constructing training data 'impressions' from pre-trained CNN parameters, advancing the SOTA in several data-free ML tasks. • Created a model-agnostic technique for fast selective superresolution, matching deep model performance at near-bicubic interpolation speed.
Jun 2019 - Jan 2020 UP, India	**Machine Learning Engineer**, Million Sparks Foundation • Developed an unsupervised domain adaptation network for real-time user outcome prediction, achieving ~4.3% improvement over SOTA AUC scores • Built models for text classification using BERT, recommendation using neural collaborative filtering, and explainable (with SHAP) churn prediction.

Select Projects

Heterogeneous Distributional Treatment Effects (ongoing)
- Working on efficient doubly-robust estimation and inference for conditional distributional kernel treatment effects.

Online Experimental Design (ongoing)
- Developing algorithms for adaptive sampling of instrumental variables for sample-efficient effect-estimation in the online setting.

Variable Selection and Causal Inference (ongoing)
- Designing simple low-dimensional linear problems to test for presence of confounders in regression adjustment sets that bias average causal effect estimates.

Out-of-Distribution (OOD) Detection using Likelihood Ratios (Project)
- Implemented likelihood ratio-based approaches that construct a background-contrastive statistic, to correct for spurious background information that can confound deep generative models into assigning high likelihood to OOD image inputs.

Window Level Optimization for Pectoral Muscle Segmentation in MLO-view Mammograms (Project)
- Formulated the window-levelling operation (the typically deterministically-set function for mapping a 12–16 bits/pixel grayscale DICOM image to an 8-bit grayscale display) as a convolution layer.
- Jointly optimized it with a U-Net, to obtain an improvement of ~4.5% on pectoral muscle segmentation.

Bachelor's Thesis: Synthetic Data Augmentation for Surface Defect Detection and Classification using Deep Learning (Project)
- Proposed a highly-cited synthetic data augmentation approach for (typically small) manufacturing defect datasets to offset the high opportunity cost of data acquisition, surpassing the classic augmentation performance by ~5.5%.

Technical Skills

Languages: Python, R, C/C++, Matlab
Frameworks/Libraries: PyTorch, TensorFlow, Keras, OpenCV
Technologies: AWS, Apache Airflow, GCP, Git, Flask, REST, FastAPI

Awards & Recognition

Sep 2022	**Coursera Department Fellowship** by UW, for outstanding promise for graduate work
Aug 2021	**CVSPK Talent Incentive Scheme** by NSIT, Award for SCI-indexed research
Jul 2019	**Cash Award for Merit**, both computer vision and machine learning summer schools at IIIT Hyderabad, for scoring in the top-20 out of 280 participants
May 2019	**Bachelor's Thesis Ranked 2** in the Dept. of Manufacturing Processes and Automation Engg.
Jun 2018	**International Rank 20**, CanSat Competition 2018

Teaching Experience (Pre-doc Teaching Associate)

Autumn 2024	Visualizing Data (STAT 451), Dept. of Statistics, UW Seattle
Spring 2023	Introduction to Statistical Machine Learning (STAT 435), Dept. of Statistics, UW Seattle
Winter 2023	Statistical Methods in Engineering and Science (STAT 390), Dept. of Statistics, UW Seattle
Fall 2022	Elements of Statistical Methods (STAT 311), Dept. of Statistics, UW Seattle
Spring 2022	Probabilistic Machine Learning (STA 561D), Dept. of Statistics, Duke University
Fall 2021	Vector Space Methods with Applications (ECE 586), Dept. of ECE, Duke University