

VIKASH SINGH

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Publications

- [1] **Efficient Fine-Grained GPU Performance Modeling for Distributed Deep Learning of LLM**
The 32nd IEEE International Conference on High Performance Computing (HiPC), 2025
 - Biyao Zhang, Mingkai Zheng, Debargha Ganguly, Xuecen Zhang, **Vikash Singh**, Vipin Chaudhary, Zhao Zhang
- [2] **K⁴: Online Log Anomaly Detection Via Unsupervised Typicality Learning**
The 32nd IEEE International Conference on High Performance Computing (HiPC), 2025
 - **Vikash Singh**, W. Chen, Z. Rahmani, D. Ganguly, M. Hariri, V. Chaudhary
 - [Preprint] [Code]
- [3] **Grammars of Formal Uncertainty: When to Trust LLMs in Automated Reasoning Tasks**
arXiv preprint
 - D. Ganguly, **V. Singh**, S. Sankar, B. Zhang, X. Zhang, S. Iyengar, X. Han, A. Sharma, S. Kalyanaraman, V. Chaudhary
 - [Preprint] [Code]

Experience

Amazon Web Services

Aug 2025 – Nov 2025

Applied Scientist Intern

New York City, NY

- Improved logical reasoning of LLMs using formal verification methods, including automated reasoning checks.
- Enhanced the performance of several large language models by over 40% through agentic reasoning frameworks.
- Manager: **Darion Cassel**, *Sr. Applied Scientist*, AWS

MGenio

Jun 2024 – Aug 2024

Machine Learning Internship

Cleveland, OH

- Led self-driven research on machine learning models and their integration on IoT platforms.
- Developed an efficient platform to manage data flow and monitor machine learning model training.
- Designed a pipeline flow and automated data preprocessing system for machine learning models to feed directly into IoT Systems.
- Manager: **Satish Ramade**, *CEO*, MGenio

DRDO, Ministry of Defence

Jan 2022 – Sep 2022

ML/DL Internship

Chandigarh, India

- Developed a sophisticated approach to enhance precision in satellite imagery analysis by employing segmentation, labeling, and training methods using Variational Autoencoders (VAEs), resulting in 83% accuracy.
- Advisor: **Dr. MK Kalra**, *Scientist G, Defence Geoinformatics Research Establishment (DGRE)*, DRDO

Hatchmarine Consultants

Dec 2021 – Feb 2022

Research Intern

Delhi, India

- Developed machine learning models to predict river scour depth in Taiwan, informing strategic resource allocation.
- Fine-tuned predictive models using Python (Scikit-Learn) to achieve high accuracy and meet project requirements.
- Advisor: **Dr. Karan Gupta**, *Technical Director and Founder*

Case Western Reserve University

Jan 2024 – Present

Teaching Assistant (Computational Perception)

Cleveland, OH

- Efficiently grade assignments, ensuring accuracy and providing constructive feedback.
- Deliver engaging lectures on specialized topics, fostering student understanding and conduct effective office hours.
- Professor: **Dr. Michael Lewicki**, *Professor, Dept. of Computer Science & Engineering*, CWRU

Indian Institute of Technology Mandi

Feb 2021 – Aug 2022

Teaching Assistant (Data Science I, II, & III)

HP, India

- Conducted engaging lectures and facilitated Python hands-on lab sessions, enhancing students' practical skills.
- Assessed student understanding through various evaluation methods, including assignment grading and in-person viva sessions.
- Professors: **Dr. Deelip AD**, **Dr. Varun Dutt**, **Dr. Manoj Thakur**, *Professors*, IIT Mandi

Education

Case Western Reserve University	Aug 2024 – Present
Doctor of Philosophy in Computer Science	Cleveland, OH
Case Western Reserve University	Aug 2023 – May 2025
Masters of Science in Computer Science (Specialisation in ML/AI)	Cleveland, OH
Indian Institute of Technology Mandi	Jun 2019 – May 2023
Bachelors of Technology in Civil Engineering with minor in AI & Computer Science	Mandi, India

Research Work

Case Western Reserve University	Jan 2024 – Jul 2024
Advancements in XAI with Specialization in Counterfactual Explanation Methods	Cleveland, OH
<ul style="list-style-type: none">Engaged in leading-edge research on Explainable AI, particularly specializing in Counterfactual Explanation methods.Advisor: Dr. Jing Ma, Assistant Professor, Department of Computer Science & Engineering, CWRU	
IIT Mandi	Jun 2020 – Jun 2021
Analysis of Nano Particles in Environment using Deep Learning	Mandi, India
<ul style="list-style-type: none">Developed a deep multi-modal architecture for accurately predicting the behavior of nanoparticles on different species using environmental data.Advisor: Dr. Tanushree Parsai, Assistant Professor, IIT Madras	

Projects

Enhanced YOLOv4 using SMM on OneAPI in SYCL Python3, SYCL, CNN, PyTorch	Nov 2023
<ul style="list-style-type: none">Developed and integrated Enhanced YOLOv4 with SYCL-Python for advanced object detection algorithms.Conducted performance optimization and applied ML techniques to improve real-time data processing.	
Human Activity Detector Machine Learning, Python3	Nov 2023
<ul style="list-style-type: none">Built models using Logistic Regression, Decision Tree, and Support Vector Classifier, achieving 96% accuracy with Logistic Regression using accelerometer and gyroscope sensor data.	
Landslide Warning System Python3, Machine Learning, DNNs	Aug 2020
<ul style="list-style-type: none">Designed a data-driven predictive system analyzing hillside landslide risk factors like weather, slope, and temperature.	

Technical Skills

Languages: Python3, C++, Java, JavaScript
Developer Tools: VS Code, Google Colab, Overleaf, High-Performance Cloud, OneAPI DevCloud
Technologies/Frameworks: TensorFlow, PyTorch, Scikit-Learn, OpenCV, Linux, GitHub

Relevant Coursework

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| <ul style="list-style-type: none">Large Language ModelsData Structures & Algo.High-Perf. Systems for | <ul style="list-style-type: none">AIAnalysis of AlgorithmsDeep Learning | <ul style="list-style-type: none">Machine LearningData Science I, II, IIIComputer Vision | <ul style="list-style-type: none">Pattern RecognitionData PrivacyComputer Security |
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Academic Achievements & Recognitions

- Awarded the **Silver Medal** and **Director’s Medal** for academic excellence at IIT Mandi.
- Conducted lab sessions for the "Training Program on Machine Learning for Ocean Acoustics" at DRDO-NPOL, Kochi.
- Won two **gold medals** in badminton at the Inter IIT Sports Meet (2019, 2022).
- Secured first place in the **Inter IIT Tech Meet** hackathon at IIT Delhi for plant disease detection algorithm.