Satyam Singh

Curriculum Vitae

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LinkedIn GitHub
Portfolio

Research Interests

Machine Learning: Neural Networks, Representation Learning, Natural Language Processing
Focus Areas: Robust Model Design, Real-time Inference, Deployment-aware Learning Systems

Technical Skills

Machine Learning	PyTorch, TensorFlow, Keras, Scikit-learn, CNNs, RNNs, LSTMs, Representation Learning
Computer Vision	Image Classification, Object Detection, Feature Pyramids, Context Modeling, Data Augmentation
Natural Language Processing	Text Classification, Sequence Modeling, Word Embeddings (GloVe), Tokenization, Error Analysis
Data and Evaluation	NumPy, Pandas, Data Preprocessing, Model Evaluation, Ablation Studies
Systems and Deployment	Docker, CUDA, Model Optimization, Inference Latency Reduction
Backend and Infrastructure	REST APIs, PostgreSQL, MongoDB, Kafka, AWS

Research Experience

- **Research Intern – Computer Vision and Remote Sensing**
  Indian Institute of Technology (IIT) Mandi
  - Formulated and implemented lightweight deep learning pipelines for small object detection in high-resolution remote sensing imagery, with specific emphasis on objects below 32 x 32 pixels under severe background clutter and scale imbalance.
  - Redesigned YOLO-based detection architectures by incorporating customized feature enhancement, multi-scale feature fusion, and global context modeling components to improve localization and classification robustness.
  - Investigated local contextual representation learning through multi-branch convolutional structures and receptive field expansion to strengthen weak and low-contrast object features.
  - Developed refined multi-scale feature fusion strategies to mitigate semantic inconsistencies between shallow and deep feature representations via channel-aware reweighting.
  - Integrated global context modeling mechanisms to capture long-range spatial and cross-channel dependencies, enabling effective suppression of confounding background regions.
  - Conducted end-to-end model training, controlled ablation studies, and comparative benchmarking using mAP-based evaluation metrics under constrained computational budgets.
  - Led dataset curation efforts including annotation verification, handling extreme class imbalance, and construction of stress-test evaluation splits with synthetic degradations such as blur, Gaussian noise, low illumination, and shadow occlusion.
  - Performed systematic robustness analysis under adverse imaging conditions and proposed mitigation strategies through degradation-aware augmentation.

– Optimized inference latency, memory footprint, and parameter efficiency through architectural simplifications and partial convolution-based design choices targeting deployment-ready inference.

Projects

- **Brain Tumor Classification Using Convolutional Neural Networks** *Feb 2025*
  - Designed a medical image analysis pipeline for automated brain tumor classification from MRI scans, addressing limited labeled data, inter-patient variability, and subtle intra-class visual differences.
  - Adapted pretrained convolutional neural networks (VGG16, ResNet) to the medical imaging domain through selective layer freezing and fine-tuning strategies.
  - Employed data augmentation, normalization, and regularization techniques to improve generalization performance in small-sample training regimes.
  - Achieved 92 percent validation accuracy on held-out scans and conducted class-wise and failure-mode analyses to assess sensitivity to tumor size, contrast variation, and imaging artifacts.
- **Sign Language Recognition Using Deep Learning** *Sep 2024*
  - Developed a vision-based sign language recognition system for American Sign Language gestures with emphasis on real-time inference and robustness to environmental variability.
  - Designed and trained convolutional neural networks optimized for live webcam input while balancing accuracy and inference latency.
  - Curated and preprocessed gesture datasets to address background clutter, illumination changes, and inter-user variability.
  - Achieved 95 percent classification accuracy and evaluated system robustness across multiple users and operating conditions.
- **Fake News Detection Using NLP and LSTM Models** *Jun 2024*
  - Designed a natural language processing pipeline for automated fake news detection, addressing semantic ambiguity, noisy labels, and domain shift across heterogeneous news sources.
  - Implemented Long Short-Term Memory based sequence models with pretrained GloVe word embeddings to capture contextual and temporal dependencies in text.
  - Performed extensive text preprocessing including tokenization, padding, normalization, and class balancing to stabilize training dynamics.
  - Achieved an F1-score of 89 percent and conducted qualitative error analysis to identify linguistic patterns contributing to misclassification.

Awards and Achievements

- **Finalist** (Top 30 out of 2400 teams) – IIT Guwahati Techniche Tech-Expo 2025
- **Rank 76** – IIT Kharagpur Data Science Hackathon (Kshitij) 2025
- **First Prize** – College Research Paper Competition
  Paper titled: "Fault-Tolerant Task Scheduling for Cloud Computing"
- **Research Paper under review** – "IoT for Sustainable Resource Management"

Education

- **B.Tech in Computer Science and Engineering** *Aug 2023 – Present*
  NIST University, Berhampur, Odisha. CGPA: **8.98** / 10

Current Focus

Exploring efficient and robust neural architectures for perception and language tasks under data scarcity, noise, and computational constraints.