Harshit Kumar

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Education

Northeastern University, Khoury College of Computer Sciences, Boston, MA — *Sep 2022 - Present*
MS in Artificial Intelligence — *GPA:* 3.83/4.0
Courses: Intro to Programming for Data Science, Foundations of AI, Algorithms, Programming Design Paradigm, Machine Learning, AI for Human Computer Interaction, Pattern Recognition and Computer Vision, Large Language Models

Guru Gobind Singh Indraprastha University, Delhi, India — *Aug 2016 - Sep 2020*
BTech in Computer Science and Engineering, top-4 in class — *GPA:* 8.72/10.0

Skills

Programming Languages: Python, C++, C, SQL, Java, R, JavaScript
Machine Learning: PyTorch, Tensorflow/Keras, OpenCV, scikit-learn, pandas, numpy, matplotlib, seaborn, plotly
Tools & Frameworks: Django, Flask, GStreamer, Git, DVC, Docker, Slurm, ONNX, Linux
MLOps: AWS SageMaker, Azure AI, Nvidia TensorRT, DeepStream, Intel OpenVINO, MLFlow, GitHub Actions, CI/CD

Experience

Deep Learning Research Co op - The Jackson Laboratory, Bar Harbor, Maine — *Jul 2023 - Dec 2023*
- Applied ***Explainable AI*** methods: *Saliency Maps, Integrated Gradients, Kernel SHAP* on DNA sequence data using *PyTorch Captum*, leveraging Slurm for job scheduling and model training on High Performance Computing (HPC) clusters.
- Researched 5+ model interpretability methods for ***Graph Neural Networks*** such as *GNNExplainer, GraphSVX*.
- Generated 12 ***benchmark synthetic datasets*** for graph classification tasks for biomedical networks using *PyTorch Geometric*.
- Conducted quantitative assessments with cross-entropy and AUC-ROC evaluate attribution scores against ground truth, optimizing 160+ model architecture configurations *(GCNConv, GraphConv, dropout, L2 regularization)* through *grid search*.

Graduate Teaching Assistant - Khoury College of Computer Sciences, Boston, MA — *Jan 2023 - Apr 2023*
- Resolved queries from students in DS5010 Intro to Programming for Data Science course under Prof. Kylie Bemis.
- Graded Python programming and data science assignments and quizzes of 50+ students.

Machine Learning Engineer - Vehant Technologies, Noida, India — *Aug 2020 - Aug 2022*
- Implemented ***10+ People and Traffic Analytics*** solutions - line crossing, crowd counting, abandoned object detection, tracking, pose estimation, license plate recognition, leading to acquisition of ***4 new Smart City contracts*** within a year.
- ***Optimized*** *multi-GPU inference* end-to-end pipeline ***1.5 times*** for real-time surveillance with *Mixed Precision, Quantization*.
- Mentored 2 fellow teammates and gave technical sessions on ***Edge AI*** topics w.r.t. ***Video Analytics*** for Smart Cities.
- ***Deployed*** and trained ***8+ deep learning models*** *(YOLO, Faster R-CNN, Mask RCNN, ResNet, etc)* using *PyTorch, Tensorflow, Nvidia TensorRT, DeepStream SDK, TAO, Intel OpenVINO, ONNX, MLFlow, Docker*.

R&D Intern - Vehant Technologies, Noida, India — *Jun 2019 - Jul 2020*
- Researched and fine-tuned models for 15+ multi-label *Pedestrian Attribute Recognition* i.e. clothing, age, gender, etc.
- Applied *Monocular Depth Estimation* methods for under-vehicle object detection with 90% accuracy.

AI (NLP) Intern - Arbunize Digital Media Pvt Ltd, Delhi, India — *Jun 2018 - Aug 2018*
- Adapted Satz sentence boundary detection using *decision trees* and *neural networks* reducing errors by 1/3.
- Extracted skills from resume and worked on classification models with 0.89 F1-score to predict job title.

Projects

Visual Question Answering with Generative AI [github] — *Dec 2023 - Present*
- Integrated HuggingFace pre-trained Visual Transformer for image understanding and LLMs for generating answers.
- Fine-tuned multimodal VQA model on 7k DAQUAR dataset, employing transfer learning and data augmentation.
- Achieved 0.3 WUPS with RoBERTa and BEiT outperforming all 4 model combinations viz. ViT, DEiT with BERT, RoBERTa.

Image colorization of historical paintings with GAN [github] — *Feb 2023 - Apr 2023*
- Leveraged U-Net and pix2pix Convolutional Generative Adversarial Network, to colorize grayscale historical paintings.
- Utilized CIELAB color space conversion and Patch discriminator for enhanced image-to-image translation.

Pothole detection and segmentation [github] — *Jan 2020 - Jun 2020*
- Devised custom Mask R-CNN and YOLACT models for pothole segmentation on Indian roads with 25fps speed.
- Attained 86% accuracy, 0.30 mAP on custom testing dataset with PyTorch.

Events & Achievements

- **Conferences:** Computer Vision Summit'23, 22, NVIDIA GTC'22, GTC'21, GTC'20, PyData'22, Google Cloud Summit'18.
- **Hackathons:** Smart India Hackathon'18 finalist, Rajasthan Hackathon 5.0, Rajasthan Hackathon 4.0.
- **Certifications:** PyTorch Scholarship (**Deep Learning Nanodegree**), Deep Reinforcement Learning Nanodegree, and Bertelsmann Scholarship (**Data Analyst Nanodegree**) by being in **top 3% out of 10k** applicants.
- **Top-15 answerer** of all time on **Stack Overflow** in PyTorch category (**10th** to earn **PyTorch Silver badge**).