

Amit Kumar Rana

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EXPERIENCE

COMPUTER VISION GROUP, RWTH AACHEN | RESEARCH ASSISTANT | INTERACTIVE SEGMENTATION, PYTHON, SLURM, PYTORCH, DETECTRON2, OPENCV, CUDA

Jun 2022 – Ongoing | 📍 Aachen, Germany

- Developed a novel and efficient architecture (DynaMITe 📄) for **multi-instance interactive object segmentation** using Transformer.
- Achieved state-of-the-art results on multiple existing interactive segmentation benchmarks and the proposed new multi-instance benchmark.
- Gained expertise in efficient **large-scale multi-GPU training** of deep learning models across multiple nodes.

SAMSUNG R&D INSTITUTE | MACHINE LEARNING ENGINEER | PYTHON, ANDROID, JAVA, C++

Jun 2017 – Nov 2020 | 📍 Noida, India

- Designed a **pose detection** mechanism on live camera preview, and led the development of TensorFlow-lite and OpenPose-based library for automated optimal pose matching and storage.
- Developed a **music recommender system** for the Samsung music application; Implemented an Android library for user data collection, audio feature extraction, and libSVM-based recommendation model training.
- Prototyped a real-time automatic volume control system based on conversation detection using **voice activity detection and recognition** using GMMs.
- Mentored two teams of four interns each in the development of **Generative Adversarial Networks (GANs)** based **facial attribute editing** application and CNN-based similar image-grouping application.

BARCLAYS TECHNOLOGY CENTER | DATA ANALYST INTERN | SPARK, BIG DATA, PYSPARK

May 2016 – Jul 2016 | 📍 Pune, India

- Assisted the data team in the task of transferring large data sets from JVM to Python using py4j and PySpark.

PROJECTS

VIDEO FUTURE FRAMES PREDICTION 📄 | PYTHON, PYTORCH, CUDA, OPENCV, VSCODE

Oct 2021 – Mar 2022 | 📍 University of Bonn, Germany

- Implemented an **autoregressive hierarchical encoder-decoder model** for future frame generation, augmented by recurrent connections at all layers.
- Benchmarked multiple recurrent models (LSTMs and GRUs) along with different feed-forward architectures (ResNets and VGGNets).

LOSS LANDSCAPE ANALYSIS FOR BIASED TRAINING DATA 📄 | KERAS, TENSORFLOW

Apr 2021 – Sep 2021 | 📍 University of Bonn, Germany

- Analyzed **loss landscape topology** to study the correlation between flatness around minima and generalization behavior of networks trained on the CIFAR-10 dataset with induced biases.
- Experimented with Resnet18 and ShaResNet architectures and used filter-normalized random directions techniques to visualize loss landscape.

REAL-TIME VEHICLE RECOGNITION | PYTHON, SKLEARN, OPENCV

Jan 2016 – Apr 2016 | 📍 IIT Kanpur, India

- Built real-time **vehicle recognition and tracking** pipeline for Surveillance Video.
- Benchmarked multiple feature representations (HAAR, SIFT, HOG) along with different machine learning algorithms such as SVM, Random Forests, and ANNs.

PUBLICATIONS

A. K. Rana, S. Mahadevan, A. Hermans, B. Leibe (2023). DynaMITe 📄: Dynamic Query Bootstrapping for Multi-object Interactive Segmentation Transformer. arXiv:2304.06668

SKILLS

PROGRAMMING

Python • L^AT_EX • C • C++ • SQL

LIBRARIES & PLATFORMS

PyTorch • NumPy • Tensorflow
Keras • Scikit-Learn • OpenCV
Pandas • Git • VSCode • Linux
Jira • Docker • Kubernetes •
Cuda • Matplotlib • AWS Basic

OTHERS

Exploratory Data Analysis
Data Visualization • Process
Mining • Bash Scripting • Slurm
Workload Manager

EDUCATION

RWTH AACHEN UNIVERSITY

MSC IN MEDIA INFORMATICS

Oct 2020 – Jun 2023 | 📍 Aachen, Germany

CGPA: 1.4 / 4.0 (Best 1.0, Sufficient 4.0)

Teaching: Foundations of Data Science

INDIAN INSTITUTE OF TECHNOLOGY, KANPUR

BTECH IN COMPUTER SCIENCE

Jul 2013 – Apr 2017 | 📍 Kanpur, India

CGPA: 7.3 / 10.0 (Best 10.0, Sufficient 4.0)

ACCOLADES

DEAN'S LIST RECIPIENT

2022 | RWTH AACHEN UNIVERSITY

BEST INNOVATOR AWARD

2019 | SAMSUNG R&D INSTITUTE

TOP 0.01% IN IIT-JEE

2013 | RANKED IN TOP 0.01% (OUT OF 1.2M CANDIDATES) IN IIT-JEE

OTHER PROJECTS

Flight Delay Prediction
Library Management System
End-to-End ADA Compiler
NachOS Operating System

COURSEWORK

Advanced Machine Learning
Computer Vision
Intro to Computer Graphics
Intro to Data Science
Database Management System
Mining Media Data-II (NLP)
Data Structure and Algorithms