

SANJEEV NARASIMHAN

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EDUCATION

Columbia University

M.S. Computer Science, Machine Learning Research Specialization **GPA: 3.97/4.00**

New York, USA

May 2024

Birla Institute of Technology and Science Pilani

B.E. Computer Science **GPA: 9.85/10** (3.97/4.00)

Academic Merit Scholarship, Distinction Graduate

Pilani, India

Jul 2020

EXPERIENCE

COSMOS Lab, Columbia University

New York, USA

Graduate Research Assistant

Jan 2023 – Present

- Conducted cutting-edge research under the guidance of Prof. Zoran Kostic at Columbia University. Currently a member of the cosmos traffic computer vision team (<https://cosmos-lab.org/>). Research funded by Center for Smart Streetscapes (CS3) NSF grant.
- Developed and trained advanced models using Python and deep learning frameworks such as PyTorch and TensorFlow. Also gained experience with machine learning techniques (decision trees, random forests, XGBoost) and statistical testing.
- Curated and released a new object detection dataset named 'Constellation' with 13K+ high-elevation urban streetscape images. Provided state-of-the-art object detection model benchmarks as an open-source contribution, enabling robust small object detection research and identifying a 10% performance gap between aerial pedestrian and vehicle detection.
- Trained state-of-the-art video models on real surgery videos to perform action recognition with up to 90% accuracy. Research done in collaboration with Lenox Hill Hospital / Northwell Health Surgeons and Medical Researchers.
- Developed a Computer Vision system to automatically assess surgical skill level from robotic suturing videos with up to 75% accuracy.
- Utilized Python/C++ to automate data preprocessing tasks, enhancing efficiency and accuracy in model training. Managed large-scale datasets efficiently, including data collection, cleaning, and annotation, ensuring high data quality for training and evaluation.

Summer Researcher

Jun 2023 – Sept 2023

- Experience with state-of-the-art object detection models including the most recent YOLO variants (YOLOv7, v8). Customized the YOLO backbone/FPN using feature map merging to achieve 95%+ accuracy for real-time vehicle/pedestrian detection.
- Applied LSTM-based trajectory forecasting models on object tracks to estimate trajectories up to 4 seconds ahead and detect potential vehicle-pedestrian collisions. Deployed the model to perform inference on an RTSP stream at a busy NYC intersection.

Deloitte Digital

Bangalore, India

Software Engineer / Analyst

Oct 2020 – Jun 2022

- Launched several Salesforce Cloud solutions as a Software Engineer for a long-term client in the sports industry. Created a membership scheme and digital product suite, serving over a million end-users.
- 2+ years of experience with backend development (Java and SQL), integrations (REST API), building front-end components (JavaScript/HTML/CSS).
- Led the project deployments using Git/Azure DevOps CI/CD for production releases.

PROJECTS

Stable Diffusion Inference Optimization

Dec 2023

- Benchmarked several state-of-the-art inference optimization techniques for Stable Diffusion v1.5 including quantization, token merging, distilled UNet/VAE and JIT compilation.
- Achieved up to 7x speedup in per-image generation time while maintaining high image quality by combining multiple optimization techniques.

Pass Receiver Prediction in Broadcast Soccer Clips

Apr 2023

- Developed a multi-stage system combining object detection, perspective transformation, clustering, and graph neural networks (GNNs) to predict optimal soccer player passes in broadcast clips.
- Attained 70% end-to-end accuracy on a custom dataset, highlighting the potential of the system to aid soccer professionals and broadcasters in gaining crucial information about the sport.

Neural Fashion Captioning using Transformers

Dec 2022

- Created an image captioning model for fashion data (DeepFashion Multimodal) using transformer networks to generate high-quality captions for finer attributes such as clothing fabric, jewelry, patterns, etc.
- Gained a 20% increase in caption quality (BLEU score) by pre-training the backbone to perform attribute classification.

PUBLICATIONS

- Turkcan, M.K.; Narasimhan, S. et al. "Constellation Dataset: Benchmarking High-Altitude Object Detection for an Urban Intersection." Preprint, (ArXiv 2024) /abs/2404.16944.
- Zang, C.; Turkcan, M.K.; Narasimhan, S. et al. Surgical Phase Recognition in Inguinal Hernia Repair—AI-Based Confirmatory Baseline and Exploration of Competitive Models. MDPI Bioengineering 2023, 10, 654.

SKILLS

Areas: Machine Learning, Deep Learning, Computer Vision, Data Science, Software Engineering

Languages: Python, Java, C, SQL, HTML5/CSS, JavaScript

Frameworks: PyTorch, Tensorflow, Keras, NumPy, Pandas, Scikit-Learn, CUDA, Android Studio, Bootstrap

Misc: Linux, HPC/Slurm, Google Cloud Platform (GCE), Git, GitHub, Docker, Azure DevOps, Agile Methodology, Salesforce