Anuj Nagpal

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Education

Stanford University — California, U.S.A.
Masters in Computational and Mathematical Engineering; GPA: 4.1/4.0 — *Sep 2021 - June 2023*

Indian Institute of Technology Kanpur — Uttar Pradesh, India
Bachelors in Computer Science and Engineering; GPA: 9.3/10.0 — *July 2014 - May 2018*

Work Experience

Matic Robots, Inc. — Mountain View, California
Research Engineer — *August 2023 - Current*

- Designed robust and efficient **Visual SLAM** algorithms in **Rust** with support for loop closure, map merge, re-localization, and bundle adjustment using **Google's Ceres Solver**.
- Improved pose estimates by **60%** by replacing hand-engineered rules with deep learning models including **NetVLAD** for extracting global image descriptors, **SuperPoint** for keypoint extraction, and **LightGlue** for keypoint matching.
- Spearheaded **Odometry** model using wheel encoder data, removing failure points for keypoint tracking in featureless areas.
- Reduced **corrupted slamgraph instances by 80%** by building evaluation platform and visualizer tools for **multi-threaded and non-deterministic** SLAM system in **Streamlit (Python)** and **eframe (Rust)**.
- Enhanced 3D object detection and semantic segmentation accuracy by designing **50+** realistic simulations using **Microsoft's AirSim C++ plugin with Unreal Engine 5**.

Facebook — Menlo Park, California
Machine Learning Engineering Intern — *June 2022 - September 2022*

- Improved search and recommendations for **Facebook Marketplace** by designing an **end-to-end Multimodal network in PyTorch** with a multi-head classification network for objects and attributes.
- Automated **machine learning pipeline** through **SQL data processing in Apache Hive** and **distributed** training using **FAIR's MultiModal Framework (MMF)**.
- Increased **precision (mAP)** for object-attribute **composition classification by 3%** on internal marketplace data using **hierarchical vision transformer** backbone in image encoder.

Goldman Sachs — Bengaluru, India
Associate — *June 2018 - July 2021*

- Boosted trade volume on **electronic market exchanges** by developing **algorithms and infrastructure in Java** for automatic and manual trading of **fixed-income products**.
- Expanded e-trading inventory of **Credit Default Swap Indices** by **3 times in London** and **1.5 times in New York** by devising auto-pricing algorithms and constructing live trading channels.
- Built robust **microservices** for **trading state machines** and **price streams** using **CI/CD tools (Maven, Jenkins, GitLab) and Kafka**, capable of handling **50K+ requests with millisecond latency** and rapid market movements.

Research Experience

Stanford University — Stanford, California
Graduate Student Researcher — *August 2021 - December 2022*

- Reduced **text perplexity by 63%** than maximum likelihood objective (used in GPT-3 LLM) for **natural language generation** by devising an **adversarial-free imitation learning approach** in **PyTorch** [**Won the best project award**]. [Project Link]
- Formulated a **multi-sample denoising autoencoder** approach for **score value estimation in diffusion models**, giving **training speedup with an inverse power-law (0.37 exponent)** and improved image generation quality. [Project Link]
- Constructed **neural Granger causality models** with sparsity inducing penalties on **MLPs, RNNs and LSTMs**, capturing **95%+ causal matrix entries** for time series having long-range non-linear relations. [Project Link]

Teaching Assistant Experience

- **CS224N**: Natural Language Processing with Deep Learning, Stanford University — Winter 2023
- **CME323**: Distributed Algorithms and Optimization, Stanford University — Spring 2022
- **CS236G**: Generative Adversarial Networks, Stanford University — Winter 2022
- **CME100**: Vector Calculus for Engineers, Stanford University — Fall 2022, Spring 2023
- **ESC101**: Fundamentals of Computing, IIT Kanpur — Winter 2018

Technical Skills

- **Languages**: Python, Rust, C++, C, SQL, Java, Scala, JavaScript, Ruby, Bash, R, Matlab, HTML, CSS
- **Libraries/Tools**: PyTorch, TensorFlow, Protobuf, Docker, DVC, Linux, JIRA, Bazel, AWS S3, PyG, JAX, Unreal Engine