Soumitra Pandit

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1 SUMMARY

AI and Robotics Engineer with a strong foundation in robotics control, computer vision, and optimization. Experienced in developing algorithms for dynamic environments and passionate about learning and solving real-world problems through AI-driven solutions.

2 SKILLS

- **Programming Languages**: Python, Scheme, C/C++, MATLAB, Julia
- **Frameworks and Libraries**: JAX, PyTorch, Pandas, OpenCV
- **Mathematical Expertise**: Projective Geometry, Minimization Techniques, Estimation Methods, Numerical Optimization
- **Other Tools**: Isaac Sim, ROS2, Docker, SVG, CAD, Blender

3 WORK EXPERIENCE

AI and Robotics SDE Intern | Prime Vision Technology (July 2024 – Dec. 2024)

- Innovated a novel approach to localization in dynamic environments using a "Lidar Field" and robust state estimation, increasing mapping speed by 40% in simulated environments (Isaac Sim, Blender).
- Prototyped 3D reconstruction algorithms like RANSAC and Bundle Adjustment using JAX and PyTorch.
- Researched and integrated monocular, color, and depth sensors to develop Computer Vision solutions for online pose estimation.
- Designed a Dockerized Floorplan Converter Application with a CI/CD pipeline from GitHub to Azure.

Robotics Control Researcher | WPI (Jan. 2024 – May 2024)

- Modeled an under-actuated robot "BipolarBot" in MATLAB and designed control strategies.
- Implemented Model Predictive Control, Shooting Methods, Cascading Control, and Genetic Algorithms.

CS Researcher | Truth Lab (Aug. 2023 – Dec. 2024)

- Investigated Homotopy Type Theory and its applications in functional programming.
- Researched Martin-Löf Type Theory, Context-Free Grammars, Syntax Trees, and Parsers.
- Studied type systems in Penrose and LaTeX.

4 EDUCATION

Worcester Polytechnic Institute (WPI) — Worcester, MA

Master of Science in Robotics — *Jan. 2022 – May 2024*

Relevant Coursework: Robot Dynamics, Robot Controls, Statistical Learning, ML, DL, Computer Systems, Programming Language Design, Extensive Research Experience

City, University of London — London, UK

BEng Biomedical Engineering, First Class Honours — *Sept. 2018 – July 2021*

5 PROJECTS

DIY Numpy - An NDArray Module | Aug. 2024 – Present

- Built and optimized a scalable NDArray module for high-performance tensor operations across CPU and GPU environments.
- Enhanced memory efficiency using advanced memory management and broadcasting techniques.

Implementing Deep Learning Architectures from Scratch | Oct. 2024 – Present

- Built custom CNNs for robust image classification tasks on the CIFAR-10 dataset.
- Developed RNNs and LSTMs for sequential data processing applied to language modeling on the Penn Treebank dataset.
- Implemented Transformer architectures, focusing on masked multi-head attention and position encoding.

NEEDLE - A Home-brewed Reverse Mode Auto Diff Library | Jan. 2024 – May 2024

- Developed NEEDLE's core automatic differentiation framework, enabling dynamic computational graph construction.
- Optimized MNIST classification performance through efficient tensor operations.

Structure and Interpretation of Computer Programs (SICP) | Aug. 2023 – Dec. 2023

- Mastered procedural and data abstraction, recursion, iteration, and advanced algorithm design.
- Designed a digital circuit simulator and abstracted bank account functionalities for stateful object studies.
- Implemented rational number operations, picture languages, and list-based set manipulations to explore abstraction barriers.

Gesture Controlled Da Vinci Surgical Robot | Jan. 2023 – May 2023

- Developed a robotic solution for surgeons with upper limb disabilities, enabling remote operation of surgical systems.
- Innovated a "decoupling clutch" mechanism to switch between translation and rotation seamlessly.
- Integrated motion capture for accurate robotic movements and a ROS bridge for system communication.