Anar Nurizada

1389 E 18, NY 11230, USA

+1 631-304-0554 • anar.nurizada@gmail.com • anarnuri.github.io
in anar-nurizada-609189177

Education

Stony Brook University — **NY, USA**
Ph.D. in Mechanical Engineering, Minor in Computer Science, GPA: ***3.71*** — *2022 – present*

Stony Brook University — **NY, USA**
M.S. in Mechanical Engineering, GPA: ***3.86*** — *2020 – 2022*

Experience

Stony Brook University — **Stony Brook, NY**
Graduate Research Assistant — *Sep 2020 – Present*

- **Designed a novel dual-decoder transformer with Mixture-of-Experts (MoE)** for multimodal path synthesis, achieving **15% higher accuracy** (vs. baseline) and **<200ms inference**. Key innovations:
  - **MoE-augmented decoders** (8 experts, **2 active + 1 shared**) with **dynamic gating**, improving sample diversity while maintaining stability via **forced expert utilization**.
  - **Dual-branch architecture**: Parallel decoders (each with **RMSNorm**, **cross-attention**) process structured inputs (curves/graphs) encoded by a **contrastive ResNet backbone**, enabling **multimodal fusion**.
  - **Optimized training**: Combined **Classifier-Free Guidance** with **LoRA fine-tuning** for efficient adaptation to new tasks.
- Extended the framework with **3 complementary architectures**:
  - A **diffusion-augmented transformer** (LLaMa 2 encoder + diffusion decoder) for high-precision synthesis.
  - **Conditional VAEs** (beta-VAE, graph-VAE) with adaptive latent space constraints.
- **Full-stack development**: Built custom datasets, trained models on **HPC (SLURM) & cloud GPUs** (Lambda & VAST.AI), and tracked experiments with **Weights & Biases**. **Tools**: PyTorch (Lightning), Hugging Face, NumPy, SciPy, OpenCV, Git/GitHub.

Zortag — **St. James, NY**
Machine Learning Engineer — *Aug 2024 – Present*

- Fine-tuned **YOLOv8** models, increasing detection accuracy from **90%** to nearly **100%** while optimizing inference time to milliseconds. Replaced the previous two-step detection-verification process with a streamlined single-step approach, significantly improving efficiency.
- Led the automation of the **myCobot 280 PI** robotic arm to simulate human hand movements for video and image capture, reducing manual workload by **60%**. Developed an automated data labeling pipeline, accelerating annotation speed by **3×** and reducing dataset compilation time from several hours to approximately an hour.
- Developed an iPhone-based inference system for real-time QR code detection, leveraging **SwiftUI** and **CoreML** for efficient on-device inferencing with minimal latency. Additionally, containerized the model using **Docker** to enable seamless deployment across a wider range of iOS environments, ensuring accessibility and scalability.

Projects

AI Chatbot for PDF Reading and Q&A — *2024*

- Created an AI chatbot that reads PDF files and answers user questions based on the content.
- Integrated Streamlit for an interactive user interface and Langchain for advanced natural language processing.
- Implemented FAISS for efficient and accurate information retrieval from PDF documents.

ESP32-CAM Object Detection and Control System — *2024*

- Developed a real-time object detection system using ESP32-CAM and a custom TensorFlow.js model, reducing inference times from **4** seconds to **10** milliseconds. Trained the model on Azure and deployed it for inferencing.
- Built a JavaScript server to process detection results over WiFi and communicate back to the ESP32, enabling real-time adjustments via a servo-mounted ESP32 and Arduino.

Awards and Publications

2025: **Nurizada, A.**, Dhaipule, R., Lyu, Z., Purwar, A.. "A Dataset of 3M Single-DOF Planar 4-, 6-, and 8-bar Linkage Mechanisms with Open and Closed Coupler Curves for Machine Learning-Driven Path Synthesis." *ASME Journal of Mechanical Design*, 1-16. doi:10.1115/1.4067014.

2025: **Nurizada, A.**, Lyu, Z., Purwar, A.. "Path Generative Model based on Conditional β- Variational Auto Encoder for Mechanism Design." *ASME Journal of Mechanisms and Robotics*, 1-14. doi:10.1115/1.4067169.

2024: **PASHA HACKATHON 4.0 Winner**, Baku, Azerbaijan

2024: **TransitHack Hackathon Winner**, Baku, Azerbaijan

2023: **Nurizada, A.**, Purwar, A.. "An invariant representation of coupler curves using a variational AutoEncoder: Application to path synthesis of four-bar mechanisms." *ASME JCISE*, doi:10.1115/1.4063726.

2022: **Nurizada, A.**, Purwar, A.. "Transforming hand-drawn sketches of linkage mechanisms into their digital representation." *ASME JCISE*, doi:10.1115/1.4064037.

2021: **Nurizada, A.**, Kirane, K.. "Induced anisotropy in the fracturing behavior of 3d printed parts analyzed by the size effect method." *Engineering Fracture Mechanics*, 239, 107304. doi:10.1016/j.engfracmech.2020.107304.