KUNAL KASODEKAR

+1 (602) 862-8872 · kkasodek@asu.edu · linkedin.com/in/kunalkas/ · https://github.com/gremlin97

EDUCATION

Arizona State University, AZ   *8/2022 - 5/2024*
Master of Science in Computer Science   **GPA:** 4.00/4.00
Courses: Statistical Machine Learning, Algorithms, Data Processing at Scale, Data Intensive Machine Learning

Vellore Institute of Technology, Chennai, India   *7/2015 - 4/2019*
Bachelor of Technology in Computer Science and Engineering   **GPA:** 8.73/10.00

TECHNICAL SKILLS

- **Programming/Scripting Languages:** Python, C++, SQL, Javascript, R, Bash
- **ML Frameworks/Tools:** PyTorch, Pandas, Keras, OpenCV, Numpy, Tensorflow, TorchGeo, CUDA, Scikit-Learn, HuggingFace
- **Platforms:** Azure, AWS, Terraform, Docker
- **Data Science Skills:** Hypothesis testing, A/B Testing, PySpark, Airflow, MLFlow, Data-Cleaning & Vis, Feature-Engineering
- **Databases:** PostgreSQL, SQL, Neo4j, RocksDB
- **Other Skills:** Qiskit, Ethereum, Blender, UE4, DVC, QGIS, HuggingFace, GEE, Django, Robot, Langchain, LLamaIndex

EXPERIENCE

Kerner Lab (Prof. Hannah Kerner)   Tempe, Arizona
Research Volunteer   *8/2023 - Present*
- **Detected and segmented cones** on the Mars surface using an ensemble of segmentation models (UNet, DeepLabv3, FPN, MANet) by stitching results from 512x512 CTX tiles on the Conequest Dataset and established a **baseline**. **Resolved artifacts** and improved results by stitching tiled outputs using a **4-directional overlap** of 256px, **test-time augmentations, and CRF postprocessing**.
- Experimented with **custom multimodal-segmentation architectures** to improve segmentation results through **text-conditioning**.
- Created text prompts from Domain-Specific research papers using **ChromaDb** as vector store, BGE for embeddings, **Langchain** for querying, and **LLama-2** as the local-LLM..
- Created RemoteDiffusion, an **SDv1.5** model fine-tuned on the RSICD dataset, to **generate images** for the remote sensing domain.
- Created a **text corpus** for remote sensing and fine-tuned a lightweight **Phi-1.5 (QLoRA)** on this data. Used RAG, Phi, and RemoteDiffusion to curate a synthetic dataset for the Land-Use-Land-Classification task and trained a downstream model in TorchGeo with an F1 Score of **0.56**.

W. P. Carey School of Business   Tempe, Arizona
Research Aide   *8/2023 - 01/2024*
- Worked on the task of detecting guns in CCTV streams and analyzing these detections to trigger alarms. Developed robust **neural inference engines** using C++ and deployed them as containers on AWS GPU instances for efficient inference. Furthermore, efficient models for deployment, such as FastViT, MobileViT, MobileNet, and Efficient Net were trained.
- Implemented classification & object detection models in PyTorch for satellite surveillance and gun detection; optimized via **quantization**, reducing the size by 40%. Created XAI models, boosting interpretability and **reducing** false positives by **15%**.

Rocket Central   Detroit, MI
Software Engineer Intern   *5/2023 - 8/2023*
- Created and deployed a web crawler using Terraform IAC modules to commit results and search them using a GCS interface. I created the search bar, results page angular components, and a NestJS backend to consume the search results from GCS.
- Created an **SD** 1.5/2 **inpainting** Gradio demo to **customize Rocket Homes listings** by altering furniture and repainting walls.

Wipro Limited (CTO Office)   Bengaluru, India
Senior Software Engineer   *Jul 2019 - Jun 2022*
- Detected bark-beetle-infested trees from drone footage/images for Sodra with MS-Research with **0.507 mAP** as follows:
  - Orchestrated the video analytics pipeline using **Airflow** and used **Azure functions** to trigger the Rocket container on our simulated Nvidia edge to use our **Yolov3** model. Passed on the inference JSON data downstream to Azure IoT Hub.
  - Captured the Inference JSON from the IoT Hub using **Azure Stream Analytics** to filter, clean, and store it (**ETL**).
  - Obtained deep insights to interpret the inference data using the **Power BI** dashboard with interactive graphs and a Q&A prompt to get answers using natural language.

- Used Blender, Unreal Engine, and Meshroom to create a [Simulated forest environment](#) to explore**, generate, and label** data for the above problem.
- The simulation ran headless on the cloud to generate datasets to do **pixel-wise segmentation** using **DenseNet** to detect infested trees with **mIOU=0.6.**
- Experimented with **DCGAN** and superresolution for **data augmentation**, and for XAI, used SHAP, Grad-CAM, and Occlusion (Captum) to have **explainable decisions** and alleviate the problem of **lack of data** for the above problem.
- Implemented a large-scale time-series forecasting solution to predict wastewater tank fill-up times for Halliburton during fracking. Experimented with SARIMA, **ARIMA**, **FBProphet**, and LSTM, with LSTM yielding the lowest RMSE of **0.34**.
- **Led** and **mentored** an ML/DL team of three for CREATE Labs from 2021 to 2022.
- Developed a solution for obtaining [Minutes of the Meeting](#) using a React application with an end-to-end API-based containerized flow with Streamlit, FastAPI, and ACS. Experimented with various fine-tuned **transformer**-based language models like GPT-2, LED, BART, T5, BERT, etc.
- Created an AWS-lambda solution to detect mispacked medical items in the packaging area using **s3buckets** to store video streams, **dynamo DB** for storing orders.
- Creating tech blogs to communicate insights on **QML** while concurrently exploring Quantum Differentiable Programming, specifically focusing on QSVM and Quanvolutional neural nets.

MODEL ARCHITECTURE PROJECTS
- Implemented a fully convolutional [ViT](#) from scratch with a test accuracy of around 65% on CIFAR-10 with GradCAM. Additionally, conducted an analysis using GradCAM to identify influential regions in class activations.
- Created a **custom-optimized fast Resnet Architecture** inspired by the DAWN CIFAR-10 Benchmark winner. Achieved **88%** test accuracy on CIFAR-10 with a training time of ~**12 minutes** on [COLAB](#). Trained using OCP and augmentations via albumentations.
- Created an optimized, high Receptive Field, low-parameter (~**10k params**) edge deployable custom vision model with **99.48%** test accuracy on MNIST Dataset. Experimented with **GAP, Squeeze, and Expand**, dilated convolutions, layer, and [group](#) norm.
- [Implemented](#) the Vanilla Segnet architecture and developed an enhanced version called SegNext inspired by UNet.
- Trained a Custom Control-Net specialized in dogs trained from scratch using distributed training with a custom dog dataset.
- **Experienced in RAG, ControlNet/Stable Diffusion Finetuning from Scratch, and LLM Finetuning using QLoRA.**

ACADEMIC PROJECTS
- Developed a **multimodal [CLIP model](#)** for **Satellite Images and geo-coordinates**, achieving a validation loss of **3.34**. Utilized embeddings from latitude and longitude for California Housing Price Prediction, **surpassing** the baseline with an MSE loss o**f 2.1**.
- Detected and [**mitigated racial bias amplification**](#) in the COCO dataset. Introduced **2 novel model improvements** to the previous paper on bias mitigation. Bias amplification is reduced by **6.5%** by using an adversarial loss to minimize spurious correlations.
- [Implemented](#) the Transformer-Encoder architecture from scratch to serve the encoder model using a relational database called **NetsDB**. Leveraged relational databases for efficient model serving, combining the power of deep learning with the benefits of structured data storage and retrieval with an inference time of **9.7** seconds and a model size of **52** MB.
- Used **PostgreSQL** to efficiently load (~100 seconds) with pg_bulkload, **analyse and gain insights** from the Reddit Pushshift (~1 million tuples) DB. I used range and round-robin table partitioning and created range query and point lookup functions for them.
- Utilized **Minikube and Kafka** to manipulate an input document stream and stream it for real-time analytics in Neo4j. Successfully performed PageRank and BFS on the NYC Cab dataset (22/3-Bronx) within the deployed environment.
- **PaaS AWS Facial Recognition** | Python, Docker, CV, AWS SDK, S3, ECR, Lambda, DynamoDB
  - Elastic application using AWS Lambda for detecting faces in video clips stored in S3 and retrieving data from DynamoDB
- **IaaS-AWS-Image Recognition As A Service** | AWS AutoScaling, EC2, SQS, CloudWatch
  - Image recognition service that dynamically scales resources up and down on-demand cost-effectively using CloudWatch

PUBLICATIONS AND ACCOMPLISHMENTS
- **Presented** and published "AI-based approach to enforce budget restrictions on Azure RG's for large enterprises" (Adjudged as the "Best Industry Research Paper"), "Solutions to Gig Economy using AI and Blockchain" at SPM Summit 2021 (IIM-B), "Intelligent Traffic Light Scheduling" at SIGMA-2018**"** and **"Quantum Feature Maps for Binary Classification",** at QTML 2021.
- **Presented "Quantum Feature Maps for Binary Classification"** at QTML 2021 for a poster presentation.
- Hosted DMTS Masterclass on **"Rendering Engines for generating Video and Image data for ML/DL"** at Wipro Techtonic 2022.
- IBM Certified Associate Developer - [Quantum Computation using Qiskit v0.2X](#)