SAYANTAN DAS

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SUMMARY

A MASc (Master of Applied Science) Artificial Intelligence student at Queen's University with a robust research portfolio and a focus on machine learning algorithms, fairness evaluation, and algorithmic bias reduction. Highly skilled in academic and industrial collaborations, excelling in technical writing and project management. Awarded research funding from esteemed organizations such as the Vector Institute and Irdeto BV.
Technical proficiency spans Python, CUDA, Docker, Kubernetes, AWS, GCP (Google Cloud Platform) and other MLOps tools.

EDUCATION

QUEEN'S UNIVERSITY Kingston, ON

MASc (Master of Applied Science) – Artificial Intelligence September 2021 – December 2023
Cumulative GPA: 4/4.3.

WORK EXPERIENCE

Machine Learning Developer (Contract) United States(remote)
Ready Tensor Inc October 2023 – Nov 2023

- **Contributed** to expanding Ready Tensor's model-first portfolio by incorporating graph neural networks.
- **Trained** Graph Convolutional Networks (GCN) and Graph Attention Networks (GAT) on the Planetoid datasets (Cora, Cite Seer, PubMed) for node classification tasks.
- **Facilitated** multiple installation methods, including Docker and local setups.
- **Supported** real-time inference capabilities through the integration of Fast API using node id as input.

Graduate Research Assistant Kingston, ON
Ingenuity Labs Research Institute September 2021 – December 2023

- **Developed** self-supervised models, specifically masked autoencoders and vision transformers, to enhance facial forgery detection accuracy by 5%
- **Published** at **International Joint Conference on Biometrics (IJCB 2023)** [Read paper]
- **Implemented** fairness evaluation protocols to assess and quantify bias in deepfake detection algorithms.
- **Devised** mitigation strategies to improve the fairness of deepfake detection, reducing demographic bias by 10%.
- Previously worked on developing **controllable GANs (Generative Adversarial Networks)**, enabling targeted data generation and enhancing model interpretability.
- **Received** funding from the Vector Institute and Irdeto BV for my research and Alliance (Compute Canada) for research compute (NVIDIA A100 clusters).

Technical Writer United States(remote)
Weights and Biases (wandb) March 2021 – Jan 2022

- **Authored** comprehensive guides and tutorials on machine learning experiment tracking, versioning, and hyperparameter tuning. My works are available at https://www.wandb.ai/ucalyptus

Research Intern Basel, Switzerland
ETH Zurich September 2020 – February 2021

- **Investigated** machine learning through topological data analysis, advancing feature extraction techniques.
- **Implemented** manifold learning algorithms for high-dimensional data visualization.
- **Co-authored** NeurIPS 2020 spotlight paper on optimizing GANs via topological constraints. [Read paper]

Research Intern Calcutta, India
Indian Statistical Institute Kolkata March 2020 – July 2020

- **Explored** hyperspectral satellite imagery applications across agriculture, mineralogy, and environmental monitoring.
- **Developed** image processing algorithms with a specialized team, elevating hyperspectral classification accuracy by 7%.
- **Co-authored an IEEE GRSL** journal paper on channel selection for HSI classification. [Read paper]

Research Intern Ahmedabad, India
Indian Space Research Organization (ISRO) June 2019 – August 2019

- **Analyzed** Synthetic Aperture Radar (SAR) microwave images from Sentinel-2 and Indian satellites to develop algorithms for Ground Moving Target Indication (GMTI).
- **Collaborated** with subject matter experts to adapt existing image processing methods for optimized GMTI applications.
- **Conducted** comparative studies of GMTI techniques, assisting in the selection of the most effective methods for operational use.

PROJECTS

BongoVaad **Toronto, ON**
Queen's University June 2023

- **Developed** a Python framework aimed at transcribing Bengali YouTube videos using Whisper Large V2.
- **Fine-tuned** the model via Low Rank Adaptation (LoRA) on Mozilla Common Voice 13 dataset to improve transcription capabilities.
- **Employed** rigorous testing methodologies to evaluate and enhance the accuracy and efficiency of the model.
- I am currently looking to **research** the efficacy of this product using ASR benchmarks available in the audioDL community.
- Currently available as a Chrome Extension that works when a YouTube tab is active. We will work to make it a paid service once we finalize the best-fit deployment strategy for this product.
- **Technologies/Framework Used**: Python, Whisper Large V2, Huggingface, PEFT, LoRA

AskPDF Pro **Kingston, ON**
Queen's University Ongoing

- **Created** a deployed web service to perform instruction-tuned Q&A, summarization using LLAMA2-chat finetuned on a plethora of openly available PDFs with variety of chart images and other images.
- **Integrated** OCR pipelines and PyPDF2 to understand the PDF with images and tables (used CLOVA-ai's DONUT) and created an embedding store on Pinecone using instructor-xl (open-source alt to ada-002).

- **Designed** the LLM (Large Language Models) deployment strategy using AWS Sagemaker.
- Project is **ongoing** as I attempt to integrate a Visual Language Model (VLM like LLAVA) into the product and make it more end-to-end.
- **Doing** research on the RAG (Retrieval Augmented Generation) capabilities of this product with unique PDF chat benchmarking strategies using tools like ragas (GitHub).
- **Technologies/Framework Used**: Langchain, PyPDF2, Pinecone, Vector Databases, LLAMA-2, AWS

Esrgan-cli **Toronto, ON**
Queen's University May 2023

- **Engineered** a command-line interface for image super-resolution using the ESRGAN algorithm.
- **Provided** an intuitive user interface for API interaction, allowing users to easily process and enhance image quality.
- **Conducted** iterative testing to validate the effectiveness of the image enhancement techniques.
- **Technologies/Framework Used:** ESRGAN, Python, PyPI development

N-BEATS Forecasting **Remote**
Upwork April 2023

- **Engaged** on a multivariate time series forecasting hourly electricity consumption for 321 customers with data of over 2 years using a state-of-the-art N-BEATS algorithm.
- **Evaluated** the model's performance on a comparative basis with a baseline model on SMAPE metric.
- **Generated** decomposition plots to interpret the predictions possible due to the N-BEATS' unique architecture.
- **Performed** a separate time series modeling task on ECG (non-seasonal) and site traffic (seasonal) data using S-ARIMA, GARCH modeling in R for the same client on Upwork.
- **Technologies/Framework Used:** PyTorch Forecasting, DeepAR, Prophet, PyTorch Lightning, R

AskTRS **Toronto, ON**
Queen's University May 2023

- **Created** a Gradio web app for vector-based search and response in NLP (Natural Language Processing), hosted on Huggingface Spaces.
- **Integrated** Langchain, FAISS, and OpenAI Embeddings(ada) to facilitate Retrieval Augmented Generation capabilities.
- **Designed** the app to function seamlessly across multiple platforms, ensuring broad accessibility and usability.
- **Technologies/Framework Used**: Gradio, Langchain, FAISS, OpenAI Embeddings, Huggingface Spaces