Praneet Bomma

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[LinkedIn](#) | [GitHub](#) | [Portfolio](#)

EDUCATION

MSc in Autonomous and Intelligent Systems   September 2022 – September 2023
University of Sheffield, Distinction   Sheffield, UK

- Led an industry project focused on leveraging Deep Reinforcement Learning techniques in Additive Manufacturing
- Completed dissertation research in the domain of Deep Learning with a focus on Explainable AI for Cancer Cells
- Implemented XAI techniques like GradCAM, Layer-relevance propagation, Saliency Maps, and Visual Attention. Evaluated these techniques using Deletion and Addition metrics. Developed metric calculation from scratch.

Computer Engineering   August 2015 – May 2019
Mumbai University, 7.23 CGPA   Mumbai, India

EXPERIENCE

Machine Learning Engineer   August 2021 – September 2022
DL Analytics   Canada, Remote

- Developed data ingestion pipeline and a deep branched architecture from scratch, integrating 3D Convolutions and LSTMs for Rain Attenuation Prediction on spatial and sensor data.
- Trained AutoEncoder and Conditional GAN for floor pattern transfer. Implemented illumination-transfer research paper and experimented with Pyvista and Blender for adding shadow effects on floor patterns.
- Fine-tuned object detection, segmentation, jersey classification, and pose-estimation models on 4K stream data. Developed 3D pose generation using triangulation. Initiated the development of data ingestion pipelines and implemented classification of football events like passing, goals, blocks, freekicks, etc on live video using XGBoost. Engineered additional features and achieved 90%+ AUC score and automated hours of manual work.
- Orchestrated an end-to-end Realtime Football Video Analytics pipeline, efficiently processing 12 4K streams with 5 models using Deepstream, Triton and TensorRT. Leveraged Libtorch and CUDA kernels for instance segmentation post-processing. Helped build end-to-end streaming pipeline with C++ and CUDA streams on A100 servers.
- Assisted in developing visualization tools in C++ to render real-time 3D graphics (OpenGL) overlaid on UHD video with Cinder. Visualization included rendering 3D pitch with player tracking graphics, performance analytics, and the results of the deep learning models. Optimized and profiled the pipeline using Nvidia Nsight Systems.

Data Scientist   September 2019 – August 2021
Blackstraw.ai   Mumbai, India

- Developed row, column, and table segmentation with MaskRCNN. Implemented advanced spatial and representation rules to enhance entity extraction accuracy from invoices and receipts. Successfully improved accuracy of entity extraction from 70% to over 90%, marking a 20% increase.
- Fine-tuned YOLOv3 and DeepSORT tracking for a Real-time Risk Monitoring Video Analytics system. Improved facemask detection with colour mode changes to training data. Optimized models with TensorRT, achieving a 2x throughput. Deployed the system with Deepstream 5 for 40 cameras to process streams in real-time and reduced the server cost by 80%. Streamlined CI/CD with Docker and Jenkins on AWS.
- Built object detection and tracking for UAVs. Quantized models to half-precision and optimized the threading pipeline to run real-time on edge devices like Nvidia Jetson Nano and Xavier.
- Designed real-time detection and instance segmentation using Yolact++, and crafted a novel Neural Path Planner with branched architecture incorporating human priors for achieving intermediate waypoints independent of GPS.
- Developed Autonomous Navigation System for mini-trucks. Achieved 5x optimization in Occupancy Grid generated using LiDAR, increasing the speed from 4FPS to 20FPS. Integrated all components and established seamless inter-process communication using Robot Operating System.

TECHNICAL SKILLS

Development: Python, C, C++, CUDA, SQL, Flask, Django, Redis, Kafka, ROS, Bash Scripting, FastAPI
Machine Learning and Deep Learning: PyTorch, Tensorflow, Keras, Scikit-Learn, PyTorch Distributed
Deployment: Git, Docker, Deepstream, GStreamer, TensorRT, Triton, ONNX, OpenVINO, Docker, AWS
Libraries: NLTK, Libtorch, HuggingFace, OpenCV, cuDF, Pandas, NumPy, Matplotlib

Projects

MAFAT | Data Science competition by The Israeli Ministry of Defense and Directorate of Defense Research & Development (DDR&D) to classify whether a radar signal segment represents a human or an animal

- Attained 23rd rank globally on the competition public leaderboard, showcasing a 0.9028 ROC AUC score.
- Developed a CRNN architecture from the ground up for classification tasks, effectively addressing class-imbalanced data challenges through the use of Focal Loss and Hyperparameter tuning.
- Employed an ensemble technique to optimize performance by selecting the superior score between two well-performing trained architectures. Additionally, explored the potential of transformers to enhance the AUC score.

ReLIE - Paper Implementation | Implemented paper by Google Research - Representation Learning for Information Extraction from Form-like Documents - Link to paper

- Constructed the neural network outlined in the paper from scratch, addressing gaps and unknown elements that were omitted in the paper's implementation
- Incorporated a self-annotated dataset alongside a publicly available dataset to enrich the training process and enhance model performance
- Successfully enhanced results by effectively applying Focal Loss to handle imbalanced data challenges

Travel Mode Classifier - Paper Implementation | Implemented paper "Trajectory-as-a-Sequence: A novel travel mode identification framework" - Link to paper

- Engineered a 5-step data aggregation and filtering process, leveraging Pandas vectorization and multiprocessing, to handle a sizable 5GB dataset efficiently.
- Developed a feature engineering pipeline extracting relevant features from GPS data, optimizing model performance for sequence classification tasks focused on travel modes (walk, bike, car, taxi) using a publicly available dataset.
- Constructed and trained a sequence-to-sequence model, comprising a convolutional encoder and bidirectional LSTM decoder from scratch, achieving accurate classification of travel modes.

Open-Source Contributions

- Core contributor in the deployment team for pez-globo/pufferfish-software, the software repository for the cost-effective and portable pufferfish ventilator.
- Contributed a feature for kornia, a differentiable computer vision library for PyTorch.
- Contributed two features for unifyai/ivy, an open-source machine learning framework.
- Fixed a bug in the TensorRT conversion code for YOLOv3 in the jkjung-avt/tensorrt_demos repository.

Certifications

- Deep Learning Specialisation on Coursera

Publications And Blogs

- "Disorder Detection of Tomato Plant using IoT & Ensemble Techniques" AFITA conference at IIT Bombay, Maharashtra, India. Link to paper
- Visualization of LSTM Activations in Keras - Towards Data Science
- Distributed Training in PyTorch - Analytics Vidhya
- Real-time Object Detection on CPU - Towards Data Science

Achievements

- **Ranked 23rd Globally** in the prestigious MAFAT Challenge, hosted by The Israeli Ministry of Defense. Distinguished as one of the top 25 teams out of 300 with an exceptional AUC score surpassing 0.90.
- Recognized as an **Outstanding Performer** for Q2, Q3 - 2020 & Q1 - 2021 at Blackstraw.ai
- Qualified for the **Grand Finale** of the esteemed Smart India National Level Hackathon in 2018.
- Achieved **1st Runner-Up** position in the KJSCE State Level Hackathon, India, in 2017.
- Secured **1st Runner-Up** position in the ITSA State Level Hackathon, India, in 2017.