Pulkit Mishra

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Work Experience

Jio AICoE July 2021 – Present

Software Development Engineer - Machine Learning *India*

- Enhanced annotation tool with **RBAC** and workspaces, boosting data labelling efficiency and enabling **active learning** at scale. Drove **100% org-wide adoption** through seamless integration with other tools and comprehensive documentation
- Devised a novel **dataset generation algorithm** for cricket shot detection and **drafted patent** for Mumbai Indians. Trained models achieving **95.6% accuracy** in shot classification and **84.8 video mAP** at 0.75 IoU for spatiotemporal localization
- Developed a **multimodal self-supervised learning framework** leveraging video, audio, and text data, incorporating various feature extractors, preprocessing and augmentation pipelines, and custom loss functions to enhance representation learning
- Led end-to-end **MLOps implementation**, transitioning models from notebooks to production REST APIs on **Kubernetes** using **Seldon, Docker, Helm Charts, and Azure CI/CD**. Integrated APIs into **Flyte workflows** for added functionality
- Developed value-adding ML services for Jio HR, including a **face verification system** for employee onboarding and an **Argo workflow for exam proctoring**
- Enhanced **MLServer** with **GPU inference and proxy variable support** and led team-wide migration from Seldon to it. Leveraged **Scalene and Locust** for automating profiling and load testing, demonstrating a 3x throughput increase
- Spearheaded development and deployment of **DeepStream applications** for safety monitoring at Jamnagar Refinery. **Optimized models**, built **C++ plugins**, enabled dynamic stream management, overhauled the entire backend and infra to efficiently run **32 concurrent streams per T4 GPU**. Co-architected v2 as a versatile, industry-agnostic solution
- Adapted **EfficientGCN** from 3D 25-keypoint NTU RGB+D to 2D 17-keypoint COCO data and trained a **0.19 MB model** with **2.73G FLOPs** inference speed for **real time human activity recognition**
- Developed a high-performance **real-time multi-person pose estimation, tracking, and activity detection** system for edge devices using **OpenVINO and DL Streamer**, achieving **45 FPS on a single CPU core**

skit.ai Jun 2021 – July 2021

Machine Learning Research Assistant, Conversational AI *Remote*

- Leveraged **Found Spontaneous Speech** data in conversational settings to build a **Text-To-Speech System**, successfully synthesizing human-like, engaging, and authentic speech with a **mean opinion score of 4.1±0.3**
- Co-created and open-sourced **Emotional TTS**, the first public TTS dataset for emotions in an Indian English accent

Major League Hacking (Facebook - Pysa) Jun 2021 – July 2021

Open Source Fellow *Remote*

- Enhanced Facebook's **static analysis** tool, Pysa, by extending its capabilities to detect **SQL injection** and **server-side template injection** vulnerabilities
- Developed Flask application showcasing the detection of multiple vulnerabilities, including **SQL injection, path traversal, cross-site scripting (XSS), and remote code execution (RCE)** using Pysa

Hike Messenger Apr 2020 – Nov 2020

Machine Learning Intern *India*

- Built **real-time 3D avatar system** generating Hikemojis from faces and mimicking head movements using **TensorFlow.js and BabylonJS**, reaching **30 FPS** on mid-range devices, enabling Hike's metaverse pivot
- Designed and implemented **custom asset integration algorithms** for attaching features such as hair and headwear to 3D Hikemojis and aligning their motion with user movements

Google Summer of Code (CCExtractor) Jun 2020 – Aug 2020

Student Developer - Poor Man's Rekognition *Remote*

- Trained and deployed diverse **computer vision models** for **scene text detection and recognition, object detection, scene classification, face detection, and facial expression recognition** in both images and videos
- Enhanced project robustness by **containerizing** with Docker, implementing **custom logging**, ensuring **PEP-8 compliance**, writing **unit tests**, and setting up **CI pipeline** using Travis

Invigilo Technologies Jan 2020 – Mar 2020

Computer Vision Intern *India*

- Trained model for **instance segmentation** of barricades, excavator body and arm in construction site videos
- Trained **object detection** model to detect trenches and shorings in construction site images for worker safety

Machine Origin Sep 2019 – Oct 2019

Deep Learning Intern *India*

- Trained **deep learning** models for celebrity detection in videos, video genre classification, and laughter detection from audio

Superbolter Jun 2019 – Jul 2019

Software Developer Intern *India*

- Developed and deployed model to recommend room images based on text descriptions using **NLP and Computer Vision**

Education

Indian Institute of Information Technology, Kalyani — West Bengal, India
Bachelor of Technology (B. Tech.) - Computer Science and Engineering — *Graduated July 2021*

- Cumulative GPA: 9.41 — Department Rank 2

Swaraj India Public School — Kanpur, Uttar Pradesh, India
Class 12: 96.5% — Class 10: 95.6%

Projects

NanoGPT4V: Small Vision-Language Model

- Pretrained a compact **multimodal model** on small portions of datasets like LAION, CC3M, SBU
- Utilized **LoRA** for efficient adaptation; fine-tuned with **LLaVA prompts** for instruction following

LoRA implementation of Diffusion DPO

- Implemented **LoRA-based DPO** for efficient fine-tuning and alignment of **Stable Diffusion XL**

Enterprise QnA System over B2B SaaS Data

- Developed a **Large Language Model**-based chatbot for HR, Sales, Ticketing, and Accounting data, leveraging **Retrieval Augmented Generation (RAG)**.
- Implemented **NexusRavenV2** for function calling and tool use with optimized **chunking** strategies, and utilized **Claude3 Sonnet** for natural language response generation

Virtual Tourist Guide for Government of Goa

- Developed end-to-end system: Scraped data, trained **monument classification model**, deployed as **FastAPI service**, integrated **TFLite** version in **Flutter app**
- Enhanced user experience with **Google Assistant Actions** for voice support

CI and Version Control for Machine Learning

- Built tool for data scientists with **data visualization**, **performance metrics**, and **version control** of ML models, datasets, and hyperparameters

Skills

Languages & Core Technologies: Python, C++, Shell, SQL, Git, Linux
ML Frameworks & Libraries: PyTorch, PyTorch Lightning, Keras, scikit-learn, OpenCV, NumPy, Pandas, Matplotlib, Seaborn, Natural Language Toolkit (NLTK), HuggingFace, Librosa, Coqui Text-to-Speech (TTS), Diffusers, LangChain, NVIDIA NeMo
ML & DL Domains: Computer Vision, Image Processing, Natural Language Processing (NLP), Audio Processing, Video Analytics, Transformers, Self-Supervised Learning, Active Learning, Transfer Learning, Generative AI, Retrieval Augmented Generation (RAG), Convolutional Neural Networks (CNN), Recurrent Neural Networks (RNN), Graph Convolutional Networks (GCN)
Web & App Development: FastAPI, Django, Flask, TensorFlow.js, BabylonJS, PyQt, Alexa Skills, REST APIs
MLOps & DevOps: Docker, Kubernetes, Helm Chart, Argo, Flyte, MLServer, Seldon, Triton Inference Server, DeepStream, TensorRT, ONNX, OpenVINO, DL Streamer, TensorFlow Serving, Azure, Continuous Integration/Continuous Deployment (CI/CD) Pipelines, Travis CI, MongoDB, Scalene, Locust, Unit Testing

Achievements

- **Mentorship:** Google Summer of Code Mentor (2021, 2022); Judge and Mentor, StatusCode0 Hackathon 2023
- **Hackathons:** Winner, Smart India Hackathon 2020; Second Runner-Up, CodeUtsava 3.0 (NIT Raipur); Best Hardware Hack, Hack-A-BIT (BIT Mesra)
- **Leadership:** Vice President, Student Government Body; Founding Member, Institute Innovation Cell and Free and Open Source Club; Creative Head, Udaan Literary Club (IIIT Kalyani); School Captain, Swaraj India Public School
- **Public Speaking:** Winner, Tech Talk Debate (Comfest) and Frank Anthony Memorial Debate; Runners Up, ASISC Declamation Nationals and ASISC Debate State Level
- **Quiz:** Winner, Rotary Club Quiz Competition Nationals