Pushkar Ambastha

Roll No.: 210106050
B.Tech - Bio Science and Bio Engineering
Indian Institute Of Technology, Guwahati

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Education

Degree/Certificate	Institute/Board	CGPA/Percentage	Year
B.Tech. Major	Indian Institute of Technology, Guwahati	7.85 (Current)	2021-Present
Senior Secondary	CBSE Board	92.2%	2021
Secondary	CBSE Board	95.2%	2019

Experience

- **MIT Media Labs** *June 2023 - Present*
  Undergraduate Researcher - Remote Cambridge, MA
  – Developing methods to calibrate clinical Agent-Based Models(ABMs) directly from biopsies, therefore, minimizing the samples and also developing multi-modal calibration of ABMs.
  – Working to apply gradient-based ABMs to diverse realms like morphogenesis, epidemiology, and opinion dynamics
  Advisor: Prof. Ramesh Raskar

- **Hugging Face** *May 2023 - Present*
  Research Intern - Remote Brooklyn, NY
  – Developing and experimenting with novel models derived from the Segment Anything Model (SAM), Medical SAM (MedSAM), Fast-SAM, and Faster-SAM.
  – Working to apply these foundational segmentation models on a variety of Medical datasets having diverse modalities.
  Advisor: Katie Link (Hugging Face X Health)

- **University of Utah** *Nov. 2022 - Feb. 2023*
  Research Intern - Remote Salt Lake City, UT
  – Analysed Domain Shift in biomedical image segmentation models as a critical insight into Model Explainability.
  – Developed pipeline for binary segmentation (UNet and DeepLabV3) for domain adaptation in diverse datasets.
  Advisor: Tushar Kataria

Projects

- **Domain-specific Question Answering chatbot** *Dec 2022 - Feb 2023*
  11th Inter IIT TechMeet, IIT Kanpur Github
  – Developed a question-answering system by retrieving the top candidate sentences from the corpus, used up to free collab resources, and **quantized** models to keep **latency** less than 1000 ms.
  – Developed question-answering **pipeline** using techniques like model distillation, sparsification, pruning, and fine-tuning the **DebertaV3-Base** model to decrease inference time and have a minimum loss in accuracy.

- **Cover Generation using OpenAI tools** *Jan 2023 - March 2023*
  IITG.ai Club, IIT Guwahati Github
  – Developed a **multi-modal** pipeline that converts **audio/text** input into **images** using state-of-the-art **OpenAI** tools. Generated optimal transcripts for the podcasts and songs with **OpenAI Whisper** to create prompts.
  – Designed **pipeline** with Latent Diffusion Models (**DALL-E**) to generate aesthetic cover images from created prompts using **ChatGPT/GPT-2** models.

- **Super Resolution Photographic Mosaic** *March 2023 - April 2023*
  Coding Club, IIT Guwahati Github
  – Developed a **Computer Vision** pipeline that enhances the images by **super-resolution** and stitching.
  – Designed multi-model **pipeline** consisting mainly of Latent Diffusion Upscaler model for super-resolution and Image Stitcher for creating a **panorama**.

- **Re-colorisation of monochrome images using conditional GANs** *Aug 2022 - Sep 2022*
  Coding Club, IIT Guwahati Github
  – Trained a conditional Generative Adversarial Networks model (Discriminator and Generator) based on **U-Net** block with **Resnet18** backbone and devised **Image Processing** strategies for colorization of monochrome images.
  – Deployed a web app using **Streamlit** library on HuggingFace for the fine-tuned model over the **COCO** dataset.

- **Captcha Breaker Project** *Aug 2022 - Dec 2022*
  Consulting and Analytics Club, IIT Guwahati Github
  – Deployed a **Computer Vision** program using **Streamlit** library on HuggingFace that recognizes Text-based **Captcha** images and converts them into writable text.
  – Developed the **pipeline** using **Pytorch** involving the **RCNN** model, giving the **CTC** Loss as 0.03.

Skills

- **Programming**: Python, PyTorch, Tensorflow, OpenCV, Keras; C/C++; Latex; Matlab; JAX*; FLAX*
- **Web technologies**: HTML, CSS, Streamlit, Gradio, Javascript*, Flask*
- **Machine Learning/Data Analysis**: Deep Learning, including CNNs, RNNs, VAEs, GANs, Bayesian NNs, Transformers; Machine Learning, KNN
- **Wet laboratory skills**: techniques in bioengineering, biochemistry, bacterial cell culture

** Elementary proficiency*

Key courses taken

- **Mathematics**: Linear Algebra, Basic Calculus, Complex Analysis
- **Computer Science**: Data Structures and Algorithms, Computer Lab
- **Biology**: Genetic Engineering, Biochemistry, Microbiology, Cell and Molecular Biology
- **Online MOOCs(Coursera)**: Machine Learning, Deep Learning, Computer Vision, NLP

Positions of Responsibility

- **Research Head**, IITG.ai Club, IIT Guwahati — *May 2023 - Present*
- **Coordinator**, Coding Club, IIT Guwahati — *Jun 2022 - May 2023*
- **Associate**, Consulting and Analytics Club, IIT Guwahati — *Aug 2022 - May 2023*
- **Associate**, IITG.ai Club, IIT Guwahati — *Sep 2022 - May 2023*

Achievements

- **Inter IIT Tech Meet 11.0**, Secured **Gold** Medal in High Prep problem statement by DevRev.ai — *2023*
- **IITG.ai Hackathon**, Secured **6th** rank in hackathon conducted by IITG.ai club — *2022*
- **Joint Entrance Examination (Mains)**, Achieved a percentile of **99.29** among **1.2** million candidates — *2021*
- **Joint Entrance Examination (Advanced)**, Secured All India Rank **8512** among **2,50,000** applicants — *2021*
- **NEST 2021-22**, Secured All India Rank **140** among **1,00,000** candidates — *2021*
- **PRMO 2019**, Qualified for the Pre Regional Mathematics Olympiad — *2019*
- **NTSE 2019**, Secured a seat (first stage) in the top **8000** out of **12,00,000** candidates. — *2019*