

Akkapaka Saikiran

CSE Undergraduate, IIT Bombay

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Education

Indian Institute of Technology Bombay

2018–2022

B.Tech. with *Honours* in Computer Science and Engineering

CPI: 9.19 / 10.00

Research Interests

Machine Learning, Computer Vision, Fairness and Interpretability, Natural Language Processing

Internships and Research Experience

Self-supervised Learning of Multimodal Representations

Ongoing

Prof. Preethi Jyothi and Prof. Ganesh Ramakrishnan

Bachelor's Thesis

- Exploring self-supervised intermediate pre-training strategies to discover joint **audio-video-text representations** by learning to project individual modalities into a shared embedding space
- Experimenting with **contrastive** losses and extending them to three modalities using mixup
- Performing controlled studies on a tri-modal **synthetic dataset** to compare various techniques
- Evaluating the effectiveness of the learned representations on **cross-modal retrieval** tasks

Bing Ads Classification using Multimodal Learning | [Presentation]

Summer 2021

Microsoft India R&D

Data Science Internship

- Worked on improving Microsoft's Bing Ads classification module using **vision-language** models
- Studied and experimented with recent multimodal models (Oscar and VinVL) which combine word embeddings and object detection features from images and feed them to a transformer
- Designed & finetuned a multimodal pipeline, compared with baselines, and got preliminary results

Sketch-based Modeling | [Report]

Spring 2021

Prof. Parag Chaudhuri

Research Project

- Surveyed various approaches of generating **3D models** from user-drawn 2D or 3D sketches
- Worked on devising a novel system to generate smoothly-connected **Bézier patches** to fit sketches
- Created a dataset of **parametric surfaces** to facilitate learning of patch-stroke associations

Analysis of Vector Addition Systems | [Report]

Summer 2020

Prof. Alain Finkel, ENS Paris-Saclay

Research Internship

- Studied Vector Addition Systems by building an understanding of **Karp-Miller Graphs**
- Read literature about the Petri Nets' **Minimal Coverability Set** problem, notably MinCov and QCover
- Worked on the non-trivial problem of devising an algorithm to construct the **semi-linear bases** for projections of reachability sets of Vector Addition Systems, rewriting definitions and **formal proofs**

Selected Academic Projects

Fooling Neural Networks | Fairness and Explainability in ML | [Code]

Autumn 2021

- Implemented **adversarial attacks** on neural networks by optimizing on images to maximize the likelihood of false predictions, following Szegedy et al.'s *Intriguing properties of neural networks*
- Optimized using gradient descent instead of L-BFGS to study incremental properties of attacks
- Performed analysis on the **transferability** of these attacks and the **ease of fooling** across classes

Image Segmentation | Medical Image Computing | [Code]

Spring 2020

- Segmented **medical images** (skin cancer, retinal vessels) using deep neural networks
- Built on top of the **U-Net architecture**, augmenting it with **residual connections** and recurrence
- Evaluated the model on ISIC and DRIVE datasets, achieving impressive **dice coefficient** values

FMX Modeling and Animation | Computer Graphics | [Movie]

Autumn 2020

- Modeled a bike, a rider, and a track in **OpenGL** and rendered it using shading and texturing
- Animated the above scene to create a **short movie** of an FMX rider performing stunts

Hospital Management System | Database Systems | [\[Code\]](#) Spring 2021

- Developed a patient-centric hospital management system as a Flask **web app** which provides functionalities such as book/cancel appointments, buy medicines, pay bills, add prescription, etc.
- Added **secure access** to patients' details & history and an interface to view disease analytics

Foreshadow (L1TF) Attack | Computer Architecture | [\[Report\]](#) Autumn 2020

- Explored and imitated Foreshadow, a **speculative execution attack** on Intel's processors which allows attackers to steal sensitive information from personal computers or third-party clouds
- Studied earlier attacks like **Meltdown** and **Spectre** which exploit transient out-of-order execution
- Presented a proof-of-concept by simulating SGX's **abort page semantics** to showcase an attack

Bandits and MDPs | Foundations of Intelligent and Learning Agents | [\[Code\]](#), [\[Code\]](#) Autumn 2020

- Compared many algorithms for sampling the arms of **multi-armed bandits**, devising a variation of **Thompson Sampling** which outperforms other methods given a permutation of the true means
- Implemented **planning algorithms** for Markov Decision Processes and used them to solve mazes

Proofreading Rewriter | Software Systems Lab | [\[Code\]](#) Autumn 2019

- Developed a Python-based tool which corrects spelling and grammar mistakes while also suggesting alternative words and phrases using statistics from APIs like datamuse and phrasefinder

Academic Achievements

- Secured All India Rank 304 in IIT JEE Mains 2018 2018
- Secured All India Rank 665 in IIT JEE Advanced 2018 2018
- Awarded the Kishore Vaigyanik Protsahan Yojana (KVPY) fellowship (twice) 2016 & 2017
- Received the prestigious National Talent Search Examination (NTSE) scholarship 2016

Selected Coursework

Machine Learning	Artificial Intelligence and Machine Learning, Medical Image Computing, Foundations of Intelligent and Learning Agents, Fairness and Explainability in ML, Automatic Speech Recognition*
Computer Science	Operating Systems, Computer Architecture, Computer Graphics, Virtualization and Cloud Computing, Database Systems, Compilers

* to be completed by Apr 2022

Technical Skills

Programming	C/C++, Python, MATLAB, HTML/CSS, Javascript, Java
Tools & Libraries	PyTorch, TensorFlow, Keras, Git, OpenGL, PostgreSQL, Django, NodeJS

Positions of Responsibility

- **Teaching Assistant**
 - Logic for CS (CS228) | [Prof. S. Krishna](#), [Prof. Ashutosh Gupta](#) Jan 2022 - Apr 2022
 - Operating Systems (CS333, CS347) | [Prof. Mythili Vutukuru](#) Aug 2021 - Dec 2021
 - Calculus (MA109) | [Prof. Ravi Raghunathan](#) Nov 2020 - Jan 2020
 - Logic for CS (CS228M) | [Prof. S. Krishna](#) Jul 2020 - Dec 2020
 - English Language Improvement Training (ELIT) | [SMP, IITB](#) Summer 2019, Spring 2020
 - Took weekly tutorial sessions, prepared questions for assignments, and graded students
- **Winter in Data Science Mentor** | *Analytics Club, IITB* Winter 2021
Guiding juniors towards understanding, implementing, and documenting **neural networks visualization tools** like saliency map approaches, occlusion sensitivity maps, and **GradCAM**
- **Editorial Head** | *CSE Research Website* July 2021 - Present
Co-leading a team whose goal is to create a repository of our **department's research** activities

Extra-curricular Activities

- Represented IIT Bombay at the 34th **Inter IIT Aquatics Meet**, held at IIT Guwahati 2018
- Swam continuously for **12 hours** covering **17 kms** at **Swimathon**, IITB's swim marathon 2019
- Attended **Vijyoshi**, an annual national science camp, as a KVPY scholar 2017
- Bagged trophies in **mridangam** competitions at many music societies in Mumbai 2016-2018
- Represented Mumbai Region at KVS **National Swim Meets** for 3 consecutive years 2013-2015