Aishwarya Agarwal
Electrical Engineering
Machine Intelligence and Data Science
Indian Institute of Technology Bombay

170040118
Dual Degree (Bachelor of Technology)
Dual Degree (Master of Technology)
Gender: Female
DOB: 25-04-1998

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2022	9.51

Pursuing **masters** in **AI & Data Science**, bachelors in Electrical Engineering under Dual Degree programme

SCHOLASTIC ACHIEVEMENTS

- Currently holding **Department Rank** of **1** in **AI and Data Science** batch based on merit of CPI *(Present)*
- Awarded **Change Of Branch** to Electrical Engineering for academic excellence out of **900+** students *(2018)*
- Recipient of **Institute Named Scholarship** for consistently good academic track record *(2018 - Present)*

PROFESSIONAL EXPERIENCE

Adobe Research | **Computer Vision** *(May'21 - Aug'21)*
Research Internship at Big Data Research Labs

- Worked on **Context-Aware Scene Enrichment** and **Enhancement** to aid the designers in ideation phase
- Proposed a novel **context-aware recommendation framework** for quicker illustrations in **sketch domain**
- Explored various deep learning architectures such as **RetinaNet** and **FRCNN** for object detection, **VAE** and **ResNet** for sketch representation, **Transformers** to capture context, and **U-Net** for saliency map generation
- Extended the frameworks to **UI/UX designs** by giving recommendations for parallely enhancing **UI sketches** to a **lo-fi prototype** thereby allowing rapid iterations between the sketch domain and the prototype domain

Adobe Research | **Natural Language Processing** *(Apr'20 - July'20)*
Research Internship at Big Data Research Labs

- Proposed a novel task - MIMOQA - **M**ultimodal **I**nput **M**ultimodal **O**utput **Q**uestion **A**nswering on documents
- Developed a novel **transformer** based **multimodal question-answering** framework, **MExBERT**, that incorporates a **joint textual** and **visual attention** towards producing an output across **multiple modalities**
- Curated a **multimodal dataset** for this problem from publicly available unimodal datasets like MS-MARCO
- Developed a **Flask** based web application to demonstrate the working of our **information retrieval** system
- **Publication:** MIMOQA: Multimodal Input Multimodal Output Question Answering (**NAACL - HLT 2021**)
- **Patent:** Modality Agnostic Information Retrieval from Documents (Filed in Dec'20)

KEY PROJECTS

OCR & Machine Translation | **Natural Language Processing** *(Feb'21 - Apr'21)*
Course Project under Prof. Pushpak Bhattacharyya, IIT Bombay

- Finetuned a **pretrained model mt5** for Hindi to English translation on IIT-B English-Hindi parallel corpus
- Extended **transformer** architecture to include **layerwise coordination** between encoder and decoder layers
- Performed comparative analysis between encoders like **RNN**, **LSTM** and **transformer** based on **BLEU** score

Multi-domain Learning | **Visual Decathlon Challenge** *(Jan'21 - Apr'21)*
Btech Project under Prof. Amit Sethi, IIT Bombay
Overview: *Simultaneously solving ten image classification tasks representative of very different visual domains*

- Performed extensive literature review on **feature transferability** and **sharing** between deep learning models
- Worked towards developing modularization techniques with an aim to achieve reduction in number of trainable parameters needed to match accuracy of fully fine-tuned CNNs on new domains
- Proposed a novel architecture by extending parallel **residual adapters** for multi-domain few shot learning

Automatic Sentiment and Headline Generator | **Natural Language Processing** *(Mar'21)*
Inter IIT Tech challenge by Bridgei2i
Overview: *Automated identification, summarization, and entity-based sentiment analysis of articles and tweets*

- Performed theme classification for articles using **fuzzy string matching** with a hand-crafted **bag of words**
- Implemented multilingual-BERT classifier for **entity-level sentiment analysis** conditioned on brand names
- Finetuned distill-BART for task of extreme summarisation of articles using XSUM dataset & provided articles

Visual Question Answering | **Deep Learning** *(Oct'20 - Dec'20)*
Course Project under Prof. Amit Sethi, Electrical Engineering Department
Overview: *Given an image and a query in natural language, produce accurate answers based on content of image*

- Processed questions using **BERT embeddings** and also compared them with pretrained **Glove embeddings**
- Experimented with pretrained **VGG16** and **ResNet-18** to extract **local image features** for the VQA dataset
- Combined image and question representation using attention module so as to learn a multimodal representation

Invention Factory *(May'19 - June'19)*

Summer Programme under Prof. Alan Wolf and Eric Lima

- Competitively selected to participate in an intensive 6 week program of **Inventing/Prototyping** a tangible product that meets a significant need and filing a **provisional patent application 201911027105 (India)**
- Comprehensively researched and analysed the issues and factors underlying unhygienic menstrual management
- Designed and prototyped a **mechanical washing device** for washing and spin drying reusable menstrual pads
- Designed **grooved silicone diaphragms** to mimic the handrubbing action required for removing blood stains and **foot pedal operated plungers** to squeeze out menstrual blood from cloth pads
- Received recognition in national media like **India Today**, **Outlook** and **The Better India** for the invention

Flow-Based Image Abstraction | Digital Image Processing *(Oct'20 - Dec'20)*

Course Project under Prof. Suyash Awate, Computer Science and Engineering Department

- Implemented **non-photorealistic rendering** technique by using **Edge tangent flow**, Flow-Based Difference of **Gaussians Filter** and Flow-Based **Bilateral Filter** iteratively for **line drawing** and **region smoothing**
- Inspected improvement over non-flow based algorithms like Canny Edge Detector and Mean Shift Segmentation

ICU beds prediction | Covid-19 *(Nov'20 - Dec'20)*

Course Project under Prof. Sunita Sarawagi, Computer Science and Engineering Department

- Performed intensive **exploratory data analysis** using statistical techniques like correlation, and plots like bar plot, histograms etc and extracted the most relevant 37 features out of the 111 features given in the dataset
- Implemented kNN algorithm and also neural network architecture with different learning rates and batch size
- Improved the representation of **under-represented class** by using **oversampling** techniques and **focal loss**

D.R.D.O. SASE's UAV Fleet Challenge *(Nov'19 - Dec'19)*

Inter IIT Tech challenge by Defence Research and Development Organisation (DRDO)

Overview: *Selected for the high-prep problem statement that involved* ***developing a UAV fleet*** *that should be able to* ***take flight and land autonomously and communicate*** *with each other using* ***swarm technology***

- Worked in the **image processing** subsection and contributed to the implementation of **algorithms to detect camouflaged targets** among a clutter of objects and subsequently relaying the location of targets to a map

Rakshak | Initiative to develop robust Unmanned Aerial Vehicles *(Apr'19 - Feb'20)*

Core member of software subsystem

- **Objective:** Designing, integrating, report on, and demonstrating a **UAS** capable of **autonomous flight and navigation**, **remote sensing** via onboard payload sensors, and then making it execute a specific set of tasks
- Gained insights on **real time object detection** in OpenCV using **SIFT** (Scale-Invariant Feature Transform)

POSITION OF RESPONSIBILITY

Teaching Assisstant | Programming for Data Science *(July'21 - Present)*

- Responsible for doubt-solving, conducting coding tutorials and evaluation of assignments and examinations

TECHNICAL SKILLS

Languages	C++, Python, MATLAB, LaTeX, VHSIC Hardware Description Language
Softwares	NGspice, AutoCAD, SolidWorks, Gnuplot, Xcircuit, Quartus, Fusion360, Rhino
Major Libraries	PyTorch, TensorFlow, OpenCV, Numpy, Pandas, Matplotlib
Microcontrollers	CPLD(Altera Max V), Arduino, Tiva C

KEY COURSES UNDERTAKEN

Core Courses	Digital Signal Processing, Speech Processing, Network Security, Control Systems, Digital Communications, Communication Systems, Microprocessors, Digital & Analog Circuits, Signals and Systems, Power Electronics, Network Theory, Introduction to Electrical and Electronic Circuits
Computer Science & Mathematics	Deep Learning for Natural Language Processing, Advanced Machine Learning, Digital Image Processing, Communication Networks, Web Search and Mining, Introduction to Optimization, Markov Chains and Queuing Theory, Computer programming and Utilization, Probability & Random Processes, Data Analysis & Interpretation, Linear Algebra, Differential Equations, Complex Analysis

EXTRA CURRICULAR ACTIVITIES

Cultural	• Pursued Hindustani Vocals in **NSO (National Sports Organization)** under Prof. Veena • Secured **third position** in Hindustani Vocal **Music Festival** organized by DPS Varanasi • Actively involved in events of **State** and **National level Spic Macay Convention** Society
Social	• Participated in '**Service Before Self**' in **National Heritage Festival** held in Rohini • Visited slum areas in Moradabad to spread value of health and education among the people
Technical	• Secured overall **second** position in the 9th Inter IIT Tech Meet organised by IIT Guwahati • Attended bootcamp on **data analysis** & **visualization** organised by TakenMind & Udemy