Sudhir Kumar Suman
Electrical Engineering
Indian Institute of Technology, Bombay

16D070027
Dual Degree (B.Tech. + M.Tech.)
Gender: Male
DOB: 10-01-1999

Examination	University	Institute	Year	CPI / %
Graduation	IIT Bombay	IIT Bombay	2021	null
Intermediate	CBSE	Hellens School	2016	89.00%
Matriculation	CBSE	St. Xavier's	2014	9.8

Scholastic Achievement

- Ranked among **top 1.2%** of candidates appearing for the **JEE Advanced**, for admission to the IIT's *(2016)*
- Ranked among **top 2%** in **JEE Mains**, out of 1.4 million candidates from all over India *(2016)*

Internships and Research Projects

Attention-Based Multi-Resolution Model for Whole-Slide Image | Master's Thesis *IIT Bombay*
Prof. Amit Sethi, EE Department | Machine Learning | Whole-Slide | Region of Interest(ROI) *Aug 2020 - ongoing*
- Developing an AI algorithm for **multi-resolution whole-slide** image and demonstrating its use in cancer grading
- Propose **Attention**-based **Multiple Instance Learning** model for **weakly-supervised** Region of Interest detection
- Detecting ROI at a lower resolution and analyzing it at higher resolution, similar to pathologist diagnostic process

Combined Radiology and Pathology Brain Tumor Classification | Internship *Stony Brook University, USA*
Prof. Prateek Prasanna, Biomedical Informatics Department | Machine Learning | Whole-Slide | MRI *Jul 2020 - ongoing*
- Developing an AI algorithm to integrate use of **Radiology** & **Pathology** image having different spatial resolutions
- Working on **brain tumor grading** using both radiology and pathology image data to improve tumor diagnosis
- Exploring methods like **Majority Voting**, **Averaging** to combine base models to produce optimal predictive model

Prostate cANcer graDe Assessment (PANDA) | Supervised Research Exposition *IIT Bombay*
Prof. Amit Sethi, EE Department | Machine Learning | Whole-Slide | Solo Kaggle | PyTorch *Jan 2020 - Jul 2020*
- Developed Machine Learning pipeline for detection of **Prostate Cancer(PCa)** from **gigapixel** whole-slide images
- Employed two-staged network to classify the severity of PCa from microscopy scans of **prostate biopsy** samples
- Ranked in **top 3%** on Public and in **top 12%** on Private Leaderboard among **1000+ international teams** on Kaggle

Detection of Sign of Depression using Social Media Text | Internship *University of Cambridge, UK*
Prof. Juned Kadiwala, Department of Surgery | Natural Language Processing | Mental Health *Dec 2019 - Mar 2020*
- Developed Machine Learning pipeline to detect a sign of **depression** from user's **posts** and **comments** on Reddit
- Used **GLoVE Word2Vec** trained on Wikipedia text to learn different analogies and find similarities between words
- Employed **BiLSTM** with **Attention** to learn **mental** information from sparse space with unbalanced small dataset

Course Projects

Swift for TensorFlow Machine Learning Model *Introduction to Machine Learning*
Prof. Amit Sethi, EE Department | Open Source | Swift for TensorFlow | Machine Learning | Swift *Spring 2019*
- Implemented model to recommend new products based on past interaction between users and items
- Added **recommendation** model **Neural Collaborative Filtering** and **MovieLens** dataset to **Swift for TensorFlow**
- Tested the model on MovieLens dataset for correctness test by predicting upcoming **top-K** user-items interaction

Instance Segmentation *Advanced Machine Learning*
Prof. Amit Sethi, EE Department | Machine Learning | Segmentation | Object Detection | Keras *Autumn 2019*
- Finetuned model **Mask-RCNN** to detect object in image and provide a **segmentation mask** to the detected object
- Tackled class **hierarchy** and **imbalance** in dataset by grouping classes and training group based separate models
- Extended the result of Mask-RCNN to **Open Image Dataset** by **Google AI** consisting of **300** different classes

Looking to Listen *Automatic Speech Recognition*
Prof. Preethi Jyoti, CSE Department | Audio | Video | PyTorch *Autumn 2019*
- Implemented **Google Research Speech Seperation** paper to isolate a single speech signal from mixture of sounds
- Built an End-to-End pipeline consisting of **Audio** & **Model** using **Dilated CNN** & **Fusion** Model using **BiLSTM**
- Trained multi-stream model to split mixture of sounds into separate audio streams for each speaker in the video

Competition and Collaboration *Intelligent & Learning Agents*
Prof. S.Kalyanakrishnan, CSE Department | Reinforcement Learning | Unity | MADDPG Algorithm *Autumn 2019*
- Leveraged **Multi-Agent Deep Deterministic Policy Gradient** algorithm to solve **Tennis Environment**
- Employed **Actor-Critic** network, where Actor determine best action and Critic evaluate the quality of Actor action
- Addressed the issue of **exploration** vs. **exploitation** dilemma by adding noise and **Exploratory Boost Coefficient**

License Plate Detection and Recognition *Computer Vision*
Prof. Arjun Jain, CSE Department |Machine Learning | Detection | Recognition | PyTorch *Spring 2018*
- Implemented **EECV** 2018 paper, using CNN to extract features and Fully Connected Layer to detect License Plate
- Built **Recognition Module**, which exploits **Region of Interest** pooling layers to extract feature maps of interest
- Trained model to detect License Plate(LP) and recognize corresponding LP number with **high speed** and **accuracy**

Non-Invasive Glucometer *Electronic Design Lab*
Prof. Shalabh Gupta, EE Department | Machine Learning | Blood Glucose | IR Rays | Regression *Spring 2018*
- Designed an analog circuit to get the amplified voltage for corresponding **glucose concentration** present in blood
- Trained **Regression** model on **blood glucose** data collected using the designed setup and invasive glucometer
- Delivered an alternative **low-cost non-invasive** glucose testing method for monitoring glucose-related diseases

Toonification of Image *Digital Image Processing*
Prof. Ajit Rajwade & Prof. Suyash Awate, CSE Department | Bilateral Filtering | Edge Detection *Autumn 2018*
- Implemented **Bilateral Filtering** and **Edge Detection** for smoothing colors and detecting the edges in image
- Combined Bilateral Filtering and Edge Detection to get an **artistic** and **comica**l effect on a wide range of images
- Enhanced speed and accuracy of the algorithm using **Fast Bilateral Filtering** by working in higher dimensional

Other Projects

SIIM-ISIC Melanoma Classification *Kaggle*
Self Project | Machine Learning | Skin Cancer | ROC AUC | PyTorch *Jul 2020*
- Trained multiple **EfficientNet** networks and **Ensembled** it to identify **Melanoma** disease in images of skin lesions
- Applied heavy **Test Time Augmentation** on test dataset and achieved roc-auc of **0.929** on Kaggle Leaderboard

Neural Networks Library *Advanced Machine Learning*
Course Project | FCN | Numpy | Forward Layer | Backward Layer | Activation Function *Autumn 2019*
- Developed a deep-learning library from scratch, having modules of **Fully Connected Layer,Loss Function**,etc
- Used the built library to design a neural network architecture and tested it on **CIFAR-10** datasets

Automation of Gate Security System
Self Project | Detection | Custom Dataset | YOLOv3 *Jun 2019 - Jul 2019*
- Collected 1700+ images of vehicles and manually annotated its type and License Plate(LP) in YOLOv3 format
- Developed **Detection Module** of **Automation System** by fine-tuning **YOLOv3** for detecting vehicle type and its LP

Key Courses Undertaken

- **Machine Learning:** Introduction to Machine Learning, Advanced topics in Machine Learning, Computer Vision, Fundamentals of Digital Image Processing, Foundation of Intelligent & Learning Agent, Automatic Speech Recognition
- **Maths & Statistics:** Advanced Concentration Inequalities, Data Analysis & Interpretation, Linear Algebra
- **Misc. and Online:** Intro. to Deep Learning in PyTorch, Intro. to Data Science, Applied Machine Learning

Technical Proficiency

- **Programming Languages:** C++, Python, Swift, C, Bash, VHDL, Assembly-Language
- **Data Analysis and ML:** MATLAB, Octave, PyTorch, NumPy, SciPy, Pandas, SeaBorn
- **Web and App Development:** HTML, CSS, Javascript, Flask
- **Softwares/Others:** Unity, AutoCAD, Git, LaTeX, ITK-SNAP, Google Cloud

Positions of Responsibility

Teaching Assistant | Advanced Machine Learning, EE Department, IIT Bombay *Aug 2020 - ongoing*
- Responsible for preparing and evaluating assignments, explaining concepts and resolving doubts of students
- Evaluating students' performance periodically, collaborating with instructor regarding teaching tactics

Coordinator | TechFest, IIT Bombay | Asia's Largest College Technical Festival *Jun 2017 - Dec 2017*
- Materialised the social initiative **SHE**(menstrual health awareness)and **Nirbhaya**(self defense) for women
- Negotiated and interacted with over thirty international and national artist for ambiance

School Pupil Leader | St.Xavier's | Highest post of Leadership at school level *Apr 2012 - Mar 2013*
- Elected by students to represent student body, worked with head of school to plan school wide events
- Assisted school management in enforcing the school rules and regulations and in day to day running of the school

Extracurriculars

- Successfully completed a **one year** course under the **National Service Scheme**(NSS) IIT Bombay *(2016-17)*
- Bagged **third** position in Relay Race at Annual Sports Meet held in School *(2014)*
- Secured **second** position in singing at school level singing competition *(2014)*
- Won the **first** prize in Intra School English Elocution competition *(2012)*
- Represented school and secured **first** rank in Inter School **General Science Competition** *(2011)*

Scholastic achievements and extracurricular activities are not verified by the Placement Cell