



**PRASHANT KUMAR SHARMA**  
**Computer Science & Engineering**  
**Indian Institute of Technology Bombay**  
**Specialization: Computer Science and Engineering**

**173059007**  
**M.Tech.**  
**Male**  
**DOB: 24/12/1993**

Examination	University	Institute	Year	CPI / %
Post Graduation	IIT Bombay	IIT Bombay	2020	7.53
Undergraduate Specialization : Computer Science and Engineering				
Graduation	Dr. A.P.J. Abdul Kalam Technical University	Kamla Nehru Institute of Technology, Sultanpur	2016	84.02
Intermediate/+2	CBSE	Kendriya Vidyalaya AFS Gorakhpur	2011	83.40
Matriculation	CBSE	Kendriya Vidyalaya AFS Gorakhpur	2009	90.80

#### FIELDS OF INTEREST

- Machine Learning, Deep Learning, Natural Language Processing, Computer Vision, Reinforcement Learning

#### M.TECH THESIS AND SEMINAR

- Explainable Artificial Intelligence (M.Tech Project)**  
*Guide: Prof. Pushpak Bhattacharyya | Industry Collaborator: IBM* (May'19 - Present)
  - Product Objective** : To develop an explainability framework which takes a trained deep learning model as input and interprets it with **state-of-the-art methods** like **Integrated Gradients** and **LIME algorithm**. This framework will be distributed as a python package, which can be used either as a **command-line tool** or as a **web service**.
  - Research Objective** : To develop a model to capture **causal relationships** in natural languages, and differentiate between **causal and correlated factors** using knowledge graphs and deep learning techniques.
- Explainable Artificial Intelligence (M.Tech Seminar)**  
*Guide: Prof. Pushpak Bhattacharyya | Industry Collaborator: IBM* (Spring'19)
  - Objective** : Conducted extensive research literature survey of explainability of deep neural networks: Need, Scope, Challenges and state-of-the-art methods.
  - Involved comprehensive study of explainability of deep neural network representation, output and algorithms for explainability: Sensitivity Analysis, Layer-wise Relevance Propagation, LIME, Integrated Gradients, Influence Functions, Sanity Checks for Saliency maps, Attention mechanism, Semantically Equivalent Rules.

#### RnD AND MAJOR PROJECT

- Deep Learning for Deep Semantics**  
*Guide: Prof. Pushpak Bhattacharyya* ( R&D Project, Spring'18)
  - Objective**: To explore deep learning methods for Natural Language Generation using Universal Networking Language(UNL).
  - Implemented a **sequence to sequence network** with attention on the custom prepared dataset using both **random embeddings**(network self-learned the embeddings) and **pre-trained GloVe embeddings**.
  - Achieved **BLEU Score for UNL to English: 0.766923**. Achieved BLEU Score for **UNL to French: 0.602187**.
  - Developed a Web tool with UNL as input and outputs top 10 predicted sentences using **beam search**.
- International Aerial Robotics Competition**  
*Innovation Cell (UMIC), IIT Bombay* (Aug'17 - present)
  - Objective**: To design four autonomous drones (gesture and audio controlled) as part of longest-running university-based robotics competition in the world organized by the **AUVSI** foundation.
  - My role has been to apply machine learning/deep learning for various tasks:
    - \* **Object Detection**: To detect Letters on boxes, enemy quadcopters, human player: Implemented, Trained, and Tested various CNN architectures (i.e. YOLOv2/v3, RetinaNet) on custom prepared datasets.
    - \* **Audio Command Recognition**: Trained and Tested various deep learning models (i.e RNN-based, Deep-Speech).
    - \* **Quadcopter Control**: Explored Reinforcement Learning Approaches for quadcopter controls.
    - \* **Neural Network Compression**: Performed Experiments for compressing the size of deep learning models without significant compromise in the performance.

#### KEY COURSE PROJECTS

- Drone Surveillance** (Science of Information Statistics And Learning, Advisor: **Prof. Manoj G.**, Spring'19)
  - Objective**: To build a deep learning model for pedestrian detection from an aerial view and investigate model compression for efficient deployment of the model on a quadcopter.
  - Implemented RetinaNet** architecture in TensorFlow using Stanford Drone Dataset. Achieved **F1 score** of **.7862**.
  - Collaboration with FlytBase**: provides **Enterprise Drone Automation Platform** for clients in the US and Europe.

- **Neural Network Compression** (Computer Vision, Advisor: **Prof. Arjun Jain**, Spring'19)
  - **Objective:** To explore ways to compress deep neural networks, so that the state of the art performance can be achieved over a resource-constrained devices eg. embedded devices.
  - **Implemented compression approaches** inspired by the papers: **SqueezeNet** and **Deep Compression**.
  - **Datasets:** CIFAR10, MNIST-60000. **Models compressed:** LetNet-300-10, LeNet-5 and VGGNet.
- **RL agent to play FIFA 14** (Foundations of Intelligent and Learning Agents, Advisor: **Prof. Shivaram K.**, Autumn'18)
  - **Objective:** To demonstrate the performance of a reinforcement learning agent on FIFA 14 skill games such as dribbling, passing and improve the baseline score by at least 10%.
  - **Implemented epsilon-greedy, deep Q-Learning.** Player, and Score extraction using **YOLO, MobileNet**.
  - Demonstrated the effectiveness of reinforcement learning in playing adversarial games.
- **Semantic Image Segmentation using U-Net** (Digital Image Processing, Advisor: **Prof. Ajit Rajwade**, Autumn'18)
  - **Objective:** To address the problem of semantic segmentation using U-Net(deep learning approach) and contrast it with traditional image processing approaches.
  - **Datasets:** ISBI Challenge 2012 Dataset, Kaggle Carvana Challenge, Open Street Dataset.
  - **Implemented the U-Net architecture** using TensorFlow and showed the results across above mentioned datasets.
- **Music Composition using GANs** (Advanced Machine Learning, Advisor: **Prof. Sunita Sarawagi**, Spring'18)
  - **Objective:** To compose music using generative models based on learned expertise in training.
  - **Implemented RNN, LSTM-GAN** using TensorFlow.
- **Diabetic Retinopathy** (Foundations of Machine Learning, Advisor: **Prof. Ganesh R.**, Autumn'17)
  - **Objective:** To classify retinal images according to various degree of the disease.
  - Created dictionary using **bag of visual words** as feature.
  - **Implemented** various approaches: **SVM, Random forest, Logistic Regression**. **F1 score** achieved: **.70** using SVM.

## WORK EXPERIENCE

- **Research Assistant** (Computer Center, IIT Bombay, Jul'17 - Present)
  - Developed a **new email infrastructure** for IIT Bombay, serving **35000 email accounts**.
  - Implemented python modules for **log analysis, automated email reply, filters** and **signature migration** from old email infrastructure to new email infrastructure.
  - Created training modules (Bash/Python Scripting, Log Analysis, Server Configuration) for incoming batch of Research Assistants of Computer Center for smooth work transition.
  - **Machine Learning based spam classification system** (ongoing): Objective: To upgrade the heuristics-based spam classification system to Machine learning-based system trained on **encrypted email data**.

## POSITION OF RESPONSIBILITY

- **ML-Lead for IARC Team** (IIT Bombay, Aug'17 - Present)
  - **Lead ML Sub-system** of 4 members to extensively study and **implement deep learning-based pipeline:** data collection, data pre-processing, deep learning models to solve tasks (related to Object Detection, Audio command recognition, and Quadcopter Control), validation, testing and integration of the models with rest of the system.
  - **Mentored 5 Undergraduates** from four different departments i.e., EE, Mech, Aero, Chem for Applied Machine learning, and Deep learning, for smooth work transition.
  - Conducted **hands-on workshop** (6 hours) on **Git: Basics + Advanced**, to fine-tune the development workflow for the IARC team of 20 members.
- **Student Companion - ISCP** (IIT Bombay, July'18 - May'19)
  - Worked in a team of **177 members** to organize Institute Orientation, Course Registrations, lab visits and Interactive sessions for **1673 students** and Parent Orientation for **400+ parents**.
  - **Mentored 6 students** for the whole year, helping them on academic and non-academic fronts.

## TECHNICAL SKILLS

- **Programming Languages:** Python3, C, C++, Core Java, Javascript, PHP, Bash
- **Frameworks & Platform:** PyTorch, TensorFlow, Keras, Scikit-Learn, Git, AWS, Linux

## KEY COURSES TAKEN

Machine Learning, Advanced Machine Learning, Computer Vision, Digital Image Processing, Science of Information, Statistics and Learning, Learning Agents, Network Security and Cryptography, Software Architecture

## ACHIEVEMENTS AND EXTRA-CURRICULARS

- Won **Best Presentation Award** at the **International Aerial Robotics Competition, Beijing, China.** (2018)
- Recipient of **Secure and Private AI Challenge Scholarship** by Udacity and Facebook AI. (2019)
- Secured **98.30% percentile** in GATE. (2017)
- Organizing committee member for MHRD's **Smart India Hackathon Finale.** (2019)
- **Lead FoundationAI** : amongst 11 teams to be selected for **I-NCUBATE program** by GDC, IIT Madras. (2019)