Statement of Purpose

I am Kanak Raj, currently in the pre-final year of Integrated MSc in Mathematics and Computing (BSc + MSc 5-years course) from Birla Institute of Technology - Mesra, Ranchi, India. I am writing this cover letter to express my interest, and motivation behind wanting to work as a Research Intern. I am looking for a long-term research association if possible onsite else remote.

The application of logic and mathematics to derive accurate decisions has always fascinated me. My research interests include machine learning, **deep learning**, **computer vision**, **NLP**, and **Generative Adversarial Networks**. During the first and the second year of my degree, I spent time making my mathematical foundation strong enough to dive into the field of artificial intelligence and implement my mathematical knowledge in the field of data science. My intricate coursework in advanced Mathematics and Computer Science also provided me with the ideal background to work in the field. I started by exploring and scratching the surface of artificial intelligence and data science. I have done several courses from Coursera and open Youtube courses such as **Practical Deep Learning for Coders** (Jeremy Howard), and **CS231n: Deep Learning for Computer Vision**, among others. By the end of the second year, I became quite fluent in the application of machine learning and deep learning.

During my third year, I first joined **Visual Learning and Intelligence Lab**, **IIT Hyderabad** where I started exploring **Computer Vision for the Biomedical** domain. I worked on **Diabetic Retinopathy Classification** and later worked on **Panoramic X-Ray Teeth Segmentation**. Here, I was introduced to the **attention** and other state-of-the-art models such as **Capsule Networks**, **Residual Networks**, **Receptive Field Blocks**, **UNet**, etc. I read and **implemented research papers** to clearly understand the different architectures and modified them with **single-headed** or **multi-headed attention layers** and different backbones for getting better results. Our team proposed a very **lightweight modified Receptive Field UNet** which gives state of art segmentation results on Panoramic Teeth X-Ray images, the research **paper is under review**. During the work, I also learned the ethics of working in laboratories and how to maintain a great work culture in laboratories.

To gain industrial experience I had earlier worked as a **Software Engineer** Intern at Rhizicube Technologies at the end of 2nd year. At Rhizicube, I worked with different clients such as **Fiserv**, **Microsoft**, and **Netcore Technologies**. I worked on backend development for **Customer Data Platform** and built a **Data Pipeline** with **Apache Kafka**. This opportunity helped me to learn writing **quality and modular code** in **collaboration** with the team.

At the end of the 3rd year, I got the opportunity of working as a **Machine Learning Engineer** Intern at EdgeNeural.ai. EdgeNeural.ai provides Model Zoo and Studio to build and train ML models for multi-use cases. Here I excelled at **designing** and **containerizing deep learning training and optimization** pipelines for state of art models such as **YOLO**, **MaskRCNN**, **BERT**, and **SSD**, among others. I have worked on model optimization and improving inference speed through various techniques like distillation, quantization, and hardware-specific CPU and GPU

optimization. This internship allowed me to explore the core of deep learning as the use-cases required high modification at the core of the **CNN-based architectures**. I also learned about **Multithreading** in Python to boost the performance of my code. During the work, I gained overall experience in **solving business problems** with my skills.

As we all know that **contributing to a community** with the knowledge we have is a work of great blessing, hence I started contributing to **Linux Foundation Networking** under Anuket (An open-source community working on different machine learning projects). My contributions have also been listed on their [website](#) & [project page](#). To contribute more I started **mentoring students** under the Society for Data Science. I have taken several lectures and seminars on a variety of topics.

I also have been part of the Research team at **Video Analytics Lab**, **IISc Bangalore**. I worked on **Generative Adversarial Networks** and **Neural Radiance Fields** for Image and Video Generation, **Superresolution**. I read and implemented several papers such as **ProGAN**, **StyleGAN**, **NeRF**, and **TecoGAN**. My work was concentrated on finding **independent interpolation** and **disentangled latent space** for video and image editing purposes.

In the last few years, I have been engrossed in research and industry in Data Science and Machine Learning. My aim is to work in the fields of **AI for Social Good and Healthcare** and I realized that I need to gain more experience and exposure to an excellent research environment. These experiences have further motivated me to build a career in Machine Learning. After my master's, I would be looking to **further pursue a Ph. D** under your guidance. I wish to **work further** in **state of art techniques** and **publish papers** in the relevant conferences and journals and raise my understanding of the nuances of Deep Learning in the fields of **healthcare**, **computer vision**, **graph deep learning**, and **NLP**, and use this opportunity to further my chances for a career in research and development. I have been through your work and research field, I believe that working under your guidance would be the best opportunity for me

After my Ph.D., I want to work as Research Scientist at DeepMind or OpenAI. I feel that working in such state-of-art research labs will support my vision to find ways for advances to benefit society, especially tackling the bigger problems such as developing faster ways of identifying, and better ways of understanding diseases such as diabetes retinopathy, and cancer, among others from routine scans. I have greatly enjoyed my research experiences so far, and am looking to build on that in the future.

I believe that in addition to my experiences and knowledge, my **inquisitive**, **fast learner**, and go-getter personality will make me an excellent addition to the team. I would be grateful for the opportunity to discuss this further with you. Thank you for your time and consideration. I would look forward to hearing from you.

Thanking You

Yours sincerely,

Kanak Raj