

# STATEMENT OF PURPOSE

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*Applicant for Residency Program*

Deep learning has significantly improved the performance in various domains such as computer vision, natural language processing, and healthcare [1, 2, 3]. However, it has been reported that the deep classifiers make unreliable predictions on samples drawn from a different distribution than the training distribution [4, 5, 6]. To tackle these challenges, **I am primarily interested** in working towards improving the generalization and reliability of these networks while making them efficient for deployment in resource-constrained devices.

Currently, I am a Masters student in the School of Computing at Korea Advanced Institute of Science and Technology (KAIST), under the supervision of Professor [Edward Choi](#). I also closely collaborate with Professors [Yixuan Sharon Li](#), [Jaegul Choo](#), [Srinath Sridhar](#), and [Leonidas Guibas](#). I am interested in Artificial Intelligence at the intersection of Computer Vision, Machine Learning Healthcare. **My career goal** is to pursue my research interests so that I can contribute to the field of deep learning and can solve open-ended, high-impact problems in this field. I believe joining the Artificial Intelligence (AI) Residency Program will help me in this endeavor.

My undergraduate degree at [Panjab University](#), Chandigarh proffered me a solid foundation by exposing me to core Computer Science subjects through courses enabling me to design practical solutions for different engineering problems. My curiosity to learn drove me to do some courses besides my course-work. I completed Neural Networks and Deep Learning, Convolutional Neural Networks by deeplearning.ai on Coursera. These courses enabled me to understand the working of different algorithms in Machine Learning and Deep Learning. Such compelling applications, along with the research exposure in these courses, led me to develop a keen interest in the fields of ML and CV. To enhance my problem solving, analytical skills, and knowledge in the field, I completed multiple projects in my sophomore year. For instance, to learn more about the area of video processing, I worked on a project titled “**Breathing Rate and Pulse Rate tracking using videos**” during my two months long internship.

At the end of my junior year, I was fortunate to get selected for the prestigious [Celestini Project India](#) and got an opportunity to work with [Dr. Aakanksha Chowdhery](#) (Google Brain) and [Prof. Brejesh Lall](#) (IIT Delhi) as summer research intern at Samsung IoT lab at [Indian Institute of Technology Delhi, India](#). During my internship, I worked on a project titled [Air Pollution Prediction](#) to tackle the critical problem of air pollution in different areas of Delhi. In particular, we introduced VayuAnukulani framework 20madaanvayu, which comprised of a distributed architecture to simultaneously model the interactions between direct (air pollutants) and indirect (meteorological data and time) factors for the prediction of air pollution of Delhi. My role consisted of data analysis, model development, and deployment to progressive web applications. We won **second prize for the same in Celestini Project India** ([Blog post](#), [Indian press](#) and [Demo youtube video](#)). This work was later published at [IEEE GlobalSIP 2019](#). Although the proposed framework predicted the air pollution precisely, its scalability was constrained due to the lack of reliability.

In my final year, I worked under the supervision of [Dr. Vineeth N Balasubramanian](#) as a Visiting Researcher at [Indian Institute of Technology, Hyderabad](#). **Motivated by the problem of network reliability**, during my internship, I worked on [ViQAR: Visual Question Answering and Reasoning](#). In this work, we proposed a new task and methodology for automatically generating answers and rationale for a visual question, thus going beyond traditional Visual Question Answering. Deep learning models are a quintessential example of black-box methods where it is tough to see why the model generates the output it does. Over recent years, there has been a rise in the need for explainable deep learning models that have led to several efforts; however, the need to generate a human-understandable justification for the decisions of a neural network model still remains. Our proposed task aims to provide a new direction to interpretable models that can perform visual reasoning and provide a human-understandable explanation. We believe that this work could lead to further efforts on human-understandable answer and rationale generation in vision tasks in the near future. This work was published at MULA workshop at [CVPR 2021](#). Further, due to my curiosity to learn and gain in-depth knowledge in Machine Learning, I audited the Applied Machine Learning course at IIT Hyderabad. Later, I got an opportunity to work as a **teaching assistant of Deep Learning for Computer Vision (CS5370) course and Advanced Topics in Machine Learning (CS6360) course**, instructed by Dr. Vineeth at IIT Hyderabad. During my internship with Dr. Vineeth, I got the opportunity to review paper for [SDM 2020 \(SIAM International Conference on Data Mining \(SDM20\)\)](#).

Apart from my academic experiences, I have invested my free time in several extracurricular activities

and social responsibilities. I was fortunate to be the recipient of the prestigious [Grace Hopper Celebration India \(GHCI\) 2018 Student Scholarship](#), **granted to around 250 deserving women students from computing, engineering, and IT backgrounds**. I also got recognized as India's 91 Brightest Engineering Student by [Economic Times Campus Stars 2018-19](#). It is a four-phase program in which 91 students out of a total of 37,000 participants were selected. I have also been an active participant and headed various events. I was a **speaker at codechef campus chapter UIET (2016-17)**, where I, along with other students, conducted programming sessions for junior year students. I was also a key **speaker at Software Freedom Day 2017, Panjab University**, which aims to motivate the youth to contribute to open-source software and pursue an education in STEM fields. I led my team at various hackathons, including **Hack in the North 2017**, which is the largest student hackathon in India, where we developed an application using machine learning techniques to assist blind people and won the second prize. I also participated in **Hack Infinity 2017**, where we developed an optimal solution for automated irrigation pests and disease detection. We trained a convolutional neural network on Indian Space Research Organization datasets to predict pests and diseases. From there, the journey never stopped, and we also participated in **India Hacks 2017 hackathon organized by Hackerearth**, where we made use of AI to determine the breathing and pulse rate of a person using video source. I was among the top 10 teams selected to attend the finale and was also awarded a cash prize of INR 10,000.

Additionally, as someone who has always felt the desire to do my part to help society, I **volunteered for the National Service Scheme (NSS) at Panjab University**, which organized several social and cultural events. Through these endeavors, I have not only been able to develop leadership qualities but have also made friends from a wide variety of cultural backgrounds, which has opened my mind to new experiences and ideas. Given that Facebook accepts students from different backgrounds and cultures, I firmly believe that it will help me grow overall to be a more empathetic, understanding and accepting person, more specifically understanding and accepting of different ideas from my batchmates that stem from different cultures.

After joining for the residency program, I wish to work in the R&D cell so that I can do my part to contributing to the cutting-edge research happening in the domains of my interest. After honing my skills, I want to leverage the technological breakthroughs arrived at through research to help come up with innovative solutions and solve societal problems that make people's lives better. I also have an incessant desire to share my knowledge and help students and professionals develop their skills and find suitable employment. I enjoyed the time I have spent on my research projects, and I further aspire to continue learning and improving to make significant contributions to the field and become an integral part of the research community.

In conclusion, I believe that my self-motivation, strong urge to contribute to computer science and extensive research experience make me a perfect candidate for the residency program. I am confident that joining residency program will help me build a strong foundation based on knowledge and experience to forward advances in academic and industrial research.

My most sincere gratitude and appreciation for both your time and consideration.

## References

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