Kalpana Chawla Scholarship Application

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In an era where artificial intelligence (AI) emerges as the frontier of technological innovation, my academic and research endeavours are deeply rooted in the exploring and advancing Natural Language Processing (NLP), Deep Learning, and Probabilistic Robotics. Motivated by intense curiosity and a relentless pursuit of knowledge, my journey in AI is characterised by a series of research projects, academic achievements, and multiple initiatives to cultivate a vibrant AI research community at the university, with aims for a larger and broader impact. This only reflects my commitment to pushing the boundaries of AI research and shows my dedication to fostering a culture of excellence and collaboration that extends beyond the confines of individual achievements.

Over the past two years of my undergraduate studies I have contributed to several research projects in AI and data science. I have summarised the key projects below:

1. **Co-operative Learning in Large Language Models** in collaboration with **Prof. Tanmoy Chakraborty** and **Ayan Sengupta**

   We are working on an exciting new project that aims to improve the **generalization capabilities of Large Language Models** using **Bayesian approaches** and other novel techniques that we have formulated. We plan to publish the work at **NeurIPS 2024**.

2. **Research Internship and Consultancy at Inria Sophia Antipolis, France**

   During my summer internship, I developed **AutoHelios** which aids in **LiDAR scanning of virtual environments**. The tool is built on top of **HELIOS++** LiDAR scanning software and gets rid of the multiple manual intricacies required in running in HELIOS++. I have also developed a system of **automatically detecting optimal LiDAR positions** for some environments, and the feature is currently being tested. The project is part of the larger **BIM2TWIN** project under the **European Union**. Now, I am acting as a consultant to Inria for the same project. We are also in the process of writing a paper for the same.

   The other part of the above project is object detection in Point Clouds. I attacked this problem using a Deep Learning approach. Currently, we have a model for the object detection task that employs the attention mechanism used in Transformers and we hope that the model will outperform other Object Detection techniques.

3. **Linguistic Error Correction in Clinical Documents** in collaboration with **Prof. Pradeep Ravikumar** and **Juyong Kim** at **Carnegie Mellon University**

   We are developing a state-of-the-art model for grammatical error correction in the clinical domain. We have also constructed a new labelled dataset for the same task using novel techniques that do not require much human effort. The project will help medical practitioners correctly log their work without any Linguistic errors. The project is in the final stages and we are writing a paper with plans to publish it at top medical and AI conferences.

4. **Identification of Claim Spans in Tweets on Twitter** as the course project for the NLP course under **Prof. Tanmoy Chakraborty**

   I improved the **Description-Aware RoBERTa** model developed by a student under **Prof. Tanmoy** by adding custom **prompt-tuning layers** and devising new **Claim-Descriptions** to make the model focus better on the relevant claim spans. I also switched out the **RoBERTa** model for the more efficient **ELECTRa** model and got good performance.

Other than the above-mentioned projects , I have worked on several other ML-related projects and participated in a few Hackathons as well.
My academic record also shows my dedication and proficiency in my chosen fields. I have excelled in advanced courses in NLP, Machine Learning, Optimisation, Calculus and Linear Algebra, consistently achieving high grades and gaining a deep understanding of these complex subjects. I have outlined some of my key Scholastic Achievements below:

1. **Department Rank 5** among 91 students of MT1 at the end of the 4th Semester,2022-23.
2. **Top 7% merit award** for semesters I, II and IV.
3. **All India Rank 291** among over 1,50,000 candidates, JEE Main,2021
4. **All India Rank 401** among over 10,00,000 candidates, JEE Main,2021
5. **All India Rank 434** among over 50,000 candidates, KVPY-SX
6. Awarded the **Quadeye Excellence Scholarship** for outstanding performance in their Quantitative Aptitude Tests.
7. **Ranked 5th at IIT Delhi** and **119 overall in the International Quant Championship** '23 organised by **WorldQuant**
8. Course topper for **Natural Language Processing** offered by **Prof Tanmoy Chakraborty**

Besides my research work and academic achievements, I am actively contributing to fostering a culture of research and innovation in Artificial Intelligence. I have started a student AI community at IIT Delhi. **The Artificial Intelligence Society (ARIES) - IIT Delhi** will not only be a hub for AI enthusiasts to share ideas and collaborate on projects but also serve as a springboard for a student-run research group dedicated to advancing AI research. My vision extends beyond the institute; as a student body, we aim to create a nationwide network of AI student communities, fostering a culture of research, innovation, and shared knowledge that promises to elevate the AI landscape in our country.

My journey in AI is driven by a belief in the transformative power of technology, a commitment to excellence, and a vision for a future where AI enhances every aspect of human life and is also accessible and understood by all. **The Kalpana Chawla Scholarship** represents not just financial support but an affirmation of my efforts and a partnership in my future endeavors. With this support, **I will be motivated to pursue higher studies** and continue pushing the boundaries of AI, contributing to both scientific advancement and the cultivation of a vibrant, inclusive AI research community.