February 4, 2022

To Whom It May Concern,

First, I felt thrilled about pursuing a dedicated scientific research project and teaching to diverse interests at IIT-Kgp and The University of Manchester. My primary research interests are Theoretical Machine learning, Deep Learning, and Computer Vision.

My Academic and Research Background:- Imaginative problem-solving has always been a source of great fun to me. It was an excellent opportunity to study at the International Institute of Information Technology (IIIT), Hyderabad, one of India's premier research institutes, in my desired Computer Science & Engineering discipline. Ever since I joined the ML Lab, IIIT-Hyderabad, I have focused on my research, culminating into three research articles, "CInC Flow," "Automated Seed Quality Testing System using GAN & Active Learning," and "Region of Interest selection for the remote PPG (pre-print)." During my post-graduate studies, I have learned these courses -Topics in Applied Optimization, Optimization Methods, Digital Image Processing, Computer Vision, Reinforcement Learning, Deep Learning (GAN, Normalization Flow, VAE), Probabilistic Graphical Models, and Active Learning. Moreover, I have taught three courses (Linear Algebra, Probability & Statistics, and Computer Network) at IIIT-Hyderabad.

Research Projects:- i). *Generative models for 3D Molecules Generation:* End-to-end design of chemically and conformationally valid 3D molecules with high drug-likeness using graph-based generative models (Normalizing Flow). ii). *Normalizing Flow: CInC Flow* We study conditions such that 3×3 CNNs are invertible, allowing them to construct expressive normalizing flows. We derive necessary and sufficient conditions on a padded CNN for it to be invertible(accepted: 4th Workshop on Tractable Probabilistic Models, UAI-21). iii). *Automated Seeds Quality Testing System using GAN & Active Learning:* We give a better hardware design, which takes images from the top and bottom to inspect defective/pure seeds. We build an annotation tool that accelerates the annotation process using Batch Active Learning and specific user interface elements. We created a dataset of 26K corn seed images labeled as pure, broken, silkcut, and discolored. We use Conditional GANs to generate fake images of each class, leading to a more balanced training dataset. Finally, we train an image classifier on the dataset with generated and real images, improving accuracy (accepted: PReMI-21). iv). *Remote Physiological Measurement:* We are working on the remote heart rate measurement (rPPG) using the camera and image processing in the CVR Lab at UIUC under the supervision of Prof. Narendra Ahuja. v). *Normalizing Flow for Geochemical anomaly detection:* Recognizing multivariate geochemical anomalies for mineral exploration by combining Normalizing flow and VAE under the supervision of Prof. Rohitash Chandra at UNSW, Sydney. vi). *Energy-Based Models (EBMs):* Image generation and decision-making tasks, such as steering a robot using EBMs, Energy-Based Training. During my active involvement in these research projects, I developed a keen interest in Machine Learning, AI for Healthcare, and Computer Vision.

My Aim:- As a researcher, my primary focus is developing and designing low-cost machine intelligent systems. I visualize myself as a proactive researcher, intending to broaden my horizons in the field of Machine Learning and Computer Vision through this doctoral program. I visualize myself as a productive researcher as my next research plan. Please consider my investigative qualities of independence, creativity, and critical thinking; my technical skills in Computer Science, Digital Image Processing, Deep Learning, and Machine Learning.

Thank you for your time and interest and receive a warm greeting.