

Born and raised on the Roof of the World, the Tibetan Plateau, the spirit of adventure runs in my blood. Besides expeditions to the high peaks of the Himalayas, intellectual explorations have also been an indispensable part of my life. Science's unsolved questions have long fascinated me, far more than the close-ended questions I encountered in my coursework. I enjoy challenging myself intellectually because, like surmounting the adversities I face in high-altitude mountaineering, solving difficult research problems brings me a great sense of achievement.

In previous research endeavors, I have explored latency reduction in information-centric networking, the use of the bisecting K-means algorithm to determine data center deployment, and the application of graph neural networks (GNN) on traffic accident prediction. My research has been published twice in major journals with me as the first author. My research participation has enhanced my skills in computational modeling, data mining, and deep learning. From finding research topics to publishing papers, I have demonstrated a profound affinity for academic research.

My first experience with scientific research was as an undergraduate research assistant. After receiving rigorous training in research methodology, I was invited to contribute to a number of original projects that provided me with great opportunities to practice computational simulations and statistical analysis. In the first project [1], I studied the mechanism of information-centric networking and devised two algorithms to improve the routing and placement of data packets. This work could improve the performance of information-centric networking.

The second project I worked on involved simulating the process of data collection using taxis in smart cities [2]. Based on an analysis of the real-world trajectory of cabs, I simulated two vehicular ad-hoc networks. Professor Anfeng Liu and I then proposed three schemes to improve the deployment of data centers to increase the efficiency of data collection. This research proved the feasibility of utilizing taxis to collect useful data that, if applied in practice, has the potential to facilitate the maintenance and update of infrastructure.

Upon completion of my bachelor's degree, I studied abroad at NUS, where I had the privilege to work with Professor Bryan Hooi on graph representation learning. In my master's degree thesis, I built and released a set of graph-based traffic accident datasets using real-world map data. Professor Hooi and I also proposed a novel GNN framework to capture angular and directional information from road networks. I then comprehensively evaluated a variety of state-of-the-art machine learning approaches using the created datasets. We demonstrated that the proposed architecture consistently outperforms the baselines.

After graduation, Professor Hooi and I further improved this work. We increased the number of released datasets up to one thousand, added four GNN baselines, and tested fourteen models on one thousand datasets. This work is presented as a contributed talk at The ACM Web Conference Workshop on Graph Learning Benchmark [3]. Currently, we are investigating model explainability and scalability. For future work, I am especially interested in developing new GNN frameworks, constructing graph structures, and applying GNNs in various interdisciplinary fields. Therefore, it is my hope to continue working on these research topics, including spatial-temporal traffic

forecasting, graph transformations, and drug discovery using GNNs, under the supervision of Professor Hooi.

Your program would provide me with the theoretical background and practical skills needed to conduct independent research in graph representation learning. What is of particular attraction to me is NUS' emphasis on interdisciplinary research. As a university with worldwide recognition for its strengths in computing and medicine, NUS could provide me with valuable inspiration as to how to apply modern computational techniques to biomedical research.

Being a first-generation college student, I am highly grateful for all the teachers and mentors who have helped me along the way. My rural background has not stymied but instead only deepened my aspiration for knowledge. Deciding to pursue a Ph.D. is a bold choice, yet bold decisions are what have brought me this far. Hence, I strongly aspire to join NUS so that I can embark upon one of the most challenging paths. My practical research experience and clear academic goals are well-suited to this program, and I am confident that my adventurous mountaineer's spirit will complement the strengths that my fellow students will bring to NUS.

- [1] **Baixiang Huang**, Anfeng Liu, Chengyuan Zhang, et al. Caching Joint Shortcut Routing to Improve Quality of Service for Information-Centric Networking[J]. *Sensors*, 2018.
- [2] **Baixiang Huang**, Wei Liu, Tian Wang, et al. Deployment Optimization of Data Centers in Vehicular Networks[J]. *IEEE Access*, 2019.
- [3] **Baixiang Huang**, Bryan Hooi. Traffic Accident Prediction using Graph Neural Networks: New Datasets and the TRAVEL Model, *The ACM Web Conference Workshop on Graph Learning Benchmark*, 2022.