**Statement of Purpose**

Simply with relevant domain data, complicated problems demanding intricately crafted heuristics can be addressed with black-box machine learning (ML) solvers. The seemingly "magical" capabilities have always captivated my interest, driving me to explore the potential of ML at Shanghai Jiao Tong University.

My research in ML started when I joined the [SJTU-ReThinkLab](https://thinklab.sjtu.edu.cn/) led by Prof. Junchi Yan. I led a project on Graph Matching and published one paper at ICASSP as the first author. Witnessing the success of my method, I became eager to explore the potential of ML in other combinatorial optimization (CO) problems. I joined another research in our lab aiming at designing the guided diffusion model for CO. The main challenge was injecting guidance to the generation required reformulating the Bayesian probability distribution, demanding a strong grasp of mathematical skills. I spent substantial efforts conducting mathematical derivation meticulously and proposed approximating the cost of solutions as guidance using Taylor’s First Order Expansion and Energy Function. Eventually, our proposed guided-diffusion model achieved the SOTA performance on TSP and MIS benchmarks and reduced the solving time by one order of magnitude compared with exact solvers (e.g. from 1h to 4 min). Our paper was accepted by NeurIPS and I was the second author.

The research in CO honed my programming and mathematical skills. In the summer research, I joined the [ML-PL](https://github.com/ML-PL/) group led by Prof. [Xujie Si](https://www.cs.mcgill.ca/~xsi/) at University of Toronto. I researched on interpretable ML solvers and chose logical puzzles, such as Sudoku, as the testbed. To build a white-box solver. I intuitively proposed rewriting the SAT conjunctive normal form and built the forward and backward from MaxSAT view. The main challenge in this project was the unfamiliar programming language CUDA, as all my previous projects were written in PyTorch. I delved into the NVIDIA tutorial and grasped the basic syntax Within three days. Finally, our model could precisely capture the logical rules of the puzzles. Notably, once the rules are learned, the model can definitely output correct answers, and our representation made the learned rules entirely interpretable, marking a significant breakthrough. Our paper was accepted by NeurIPS and I was the second author.

The positive impact of my proposed ML method strengthened my determination to be a future prominent researcher in ML. Now I dream of designing advanced ML solvers that achieve scalability and interpretability for optimization problems. The MSCS program at UCLA, with its top-notch faculty and impeccably crafted curriculum, is the perfect incubator for this dream. I am particularly excited to work with the pioneering researcher Prof. *Baharan Mirzasoleiman* and Prof. *Cho-Jui Hsieh* on *ML4Optimization* to help push the boundaries of this exciting field.

With a robust quantitative skill-set and extensive experience, I firmly believe that I am a well-suited candidate for the program. I am confident that my journey at UCLA will equip me with the expertise demanded to pursue future study as a PhD after master’s degree, make insightful contributions to the *ML4Optimization* field and finally contribute back to the community at UCLA.