Q: **Can you tell us about your favorite project you had and why?**

A: Hello admission committee. My favorite project is the one I conducted at University of Toronto, namely *[Learning Reliable Interpretations with SATNet](https://github.com/jp-guo/satnet-rules).* In this project, we proposed SATNet\*, built on a differentiable MaxSAT solver, to learn interpretable and reliable rules of logical puzzles such as Sudoku by representing the CNF formula as a parametric matrix and applied Gurobi as the backend solver to solve weighted Max2SAT. The project was impressive since the method enabled machine learning models to reliably learn the logical rules and explicitly conducted inference. The learned rules were completely interpretable and the inference process was robust and reliable. I believe one of the ultimate goals of machine learning is to enable computers to conduct slow thinking process and generate critical thinking like real human beings. I still remember how excited we were when the method worked successfully and endued the agent with the capability to conduct inference critically. I am curious to witness to how language models exhibits reasoning skills and generate proofs step by step for complicated reasoning problems, drawing on my previous research experience in ML, particularly in logical reasoning to help push the boundaries of this exciting field.

Q: **What would you like to achieve during your time in our program?**

A: Hello admission committee. My dream now is to design ML agents that surpass human experts, well-designed algorithms and solvers in terms of both accuracy and efficiency for tasks involving logical reasoning. Therefore, I aspire to acquire advanced ML knowledge, deepen my understanding of logical reasoning and pursue further research on logical reasoning field such as Symbolic Reasoning in the program. The goal I want to achieve is to develop methods to bridge the gap between system 1 thinking and system 2 thinking, where system 1 thinking refers to think intuitionally without critical thinking, and system 2 thinking refers to thinking slowly step by step therefore is more like human’s thinking process. Currently machine learning models show strong capabilities in system one, involving tasks in computer vision, natural language processing, multi-modalities, etc. They also show potential in system 2, such as symbolic reasoning. Humans are capable of bridging system 1 and system 2. For instance, we observe the chess board, and think critically what the next strategy is. Nevertheless, there is still a huge gap to develop an end-to-end model to capture features and conduct inference in a single forward process. I believe one of the ultimate goals of machine learning is to make artificial intelligence more like real human beings. Thus, I am eager to explore how to make breakthrough and help to conquer the obstacle in the machine learning for reasoning filed, drawing on my research experience in ML, particularly in logical reasoning.

Q: **Which areas of subjects would you like to study in the program and why?**

A: Hello admission committee. The area I feel excited to explore is to apply machine learning to those tasks requiring logical reasoning. I believe one of the ultimate goals of machine learning is to enable computers to think like real human beings, rather than simply capture features and generate response without critical thinking. Artificial intelligence requires slow process of thinking to mimic the humans’ thinking process. The logical reasoning filed is such an ideal testbed to evaluate the reasoning capability of machine learning agents and provide extensive research tracks such as how to bridge the gap between system 1 and system 2, how to elicit large language model’s capability of reasoning, etc. Besides, I also had program experience in logical reasoning. I applied a MAXSAT solver to learn the representations of logical problems such as Sudoku, in conjunctive normal form. I still remember how excited we were when we successfully learned the reliable rules and endued the agent with the capability to conduct inference critically. I am curious to witness to how language models exhibits reasoning skills and generate proofs step by step for complicated reasoning problems, drawing on my previous research experience in ML, particularly in logical reasoning to help push the boundaries of this exciting field.

Q: **After you finish the program, what would you like to do for your future?**

A: Hello admission committee. After the program, I want to pursue further study as a PhD. My dream now is to design ML agents that surpass human experts, well-designed algorithms and solvers in terms of both accuracy and efficiency for tasks involving logical reasoning. Particularly, I want to figure out how to bridge the gap between system 1 thinking and system 2 thinking, where system 1 thinking refers to think intuitionally without critical thinking, and system 2 thinking refers to think slowly step by step therefore is more like human’s thinking process. Currently machine learning models show strong capabilities in system one, involving tasks in computer vision, natural language processing, multi-modalities, etc. They also show potential in system 2, such as symbolic reasoning. Humans are capable of bridging system 1 and system 2. For instance, we observe the chess board, and think critically what the next strategy is. Nevertheless, there is still a huge gap to develop an end-to-end model to capture features and conduct inference in a single forward process. I believe one of the ultimate goals of machine learning is to make artificial intelligence more like real human beings. Thus, I am eager to explore how to make breakthrough and help to conquer the obstacle in the machine learning for reasoning filed. I am confident that my journey at CMU will equip me with the expertise demanded to pursue future study as a PhD, make insightful contributions to the ML field and finally contribute back to the community at CMU.

**Q: Can you tell us why you applied to our program?**

A: Hello admission committee. I am Guo Jinpei from Shanghai Jiao Tong University. The reason I want to apply to the program is that I dream of designing ML agents that surpass human experts, well-designed algorithms and solvers in terms of both accuracy and efficiency for tasks involving logical reasoning. Therefore, I aspire to acquire advanced ML knowledge and explore further applications of ML on tasks involving logical reasoning. The MIIS program at CMU, with its top-notch faculty and impeccably crafted curriculum, is the perfect incubator for this dream. With the elaborately designed ML courses, I can not only strengthen my foundation of ML via Machine Learning but also advance my knowledge of ML application with Applied Machine Learning. The MIIS program also permits the future pursue of PhD, bringing more choices for the future career. I am particularly excited to work with the pioneering scientist Prof. Eric Nyberg on [Summarization and Question Answering](https://msaii.cs.cmu.edu/research-areas/information-extraction-summarization-and-question-answering). I am curious to witness how ML models exhibit the potential of summarization and reasoning to answer questions based on the acquired knowledge, drawing on my previous research experience in ML to help push the boundaries of this exciting field.