When I took a ride on a Tesla automobile for the first time, I was surprised that the vehicle could depict streets and surroundings in detail on the screen, just like humans perceive the world. This experience triggered my passion for self-driving vehicles and propels me to step into the field of Computer Science, especially regarding Computer Vision and Natural Language Processing. I am applying to the M.S.-Scientists and Engineers program at the University of Southern California (USC) because it provides me with an environment to lay a sufficient foundation of Computer Science, develop real-world applications, and solve social issues with a group of outstanding members.

During my undergraduate studies, I turned my expectations into action by participating in diverse courses. For instance, the Transfer Learning assignment in the Machine Learning course impressed me since it changed streetscapes into different styles and strengthened the ability of autonomous vehicles to move in a variety of environments. Hence, I combined semi-supervised learning to improve the performance and utilized PCA visualization to observe the latent space. My work earned recognition when it was selected as exemplary. Additionally, I implemented “Land and Road Detection” in the final project of the Robot Vision course. The experience cultivated my ability to utilize traditional Computer Vision to build a practical application, reinforcing my competence in the self-driving car industry. To hone my ability to work independently and collaboratively, I joined several research projects in my senior year.

To begin with, I took part in the Vision and Learning Lab led by Prof. Yu-Chiang Wang to develop neural networks related to Computer Vision. After winning 1st Place in the Deep Learning for Computer Vision Final Project, I became determined to focus on Face Anti-Spoofing (FAS) as my research topic. To address the image domain shift problems in FAS, I designed a disentanglement representation framework that disentangled facial liveness features and liveness-irrelevant features. The work was awarded 2nd Place in the Bachelor Thesis Award and submitted to AAAI for publication after further refinement. Reviewing the latest papers about FAS and transforming knowledge into a successful framework cultivated my ability to analyze technology trends and propose novel ideas to solve problems.

To understand more about public needs, I gained industry experience by participating in the industry-academia cooperation project on Fisheye Face Recognition, which was supervised by Prof. Homer H. Chen. Aside from working with the team to develop the Smart Face Recognition Access Control, I also improved the recognition rate from 98% to 100% successfully by developing a continuous image mechanism. To overcome the barriers posed by the COVID-19 pandemic, we also researched Masked Face Recognition and effectively achieved state-of-the-art performance, which research outcome was accepted by ICCE. The lessons I learned from the project were not only professional knowledge but also positive attitudes to face stress and frustration.

At first, my unfamiliarity with identifying and resolving the core problems has often resulted in harsh criticism from my supervisor. I was overwhelmed by stress and was afraid to take part in meetings. However, I soon realized that dodging problems would put me several steps behind my goals; therefore, I actively consulted the experience of senior peers and solicited guidance from the supervisor to address the issues that I encountered. Gradually, I turned the challenge into an opportunity for self-learning and advancement. Since then, I have pinpointed potential problems accurately and leveraged systematic and efficient approaches to tackling them. I was even recommended by my supervisor to deliver a speech about my research experience to undergraduates. This experience has fostered my forward-looking mindset and armed me with the ability to turn stumbling stones into building blocks whenever I came across obstacles.

In addition to Computer Vision, it was smart conversational robot systems that made me realize the importance of Natural Language Processing in the automobile industry. Therefore, I actively participated in the research of Question Answering, under the guidance of Prof. Hung-Yi Lee, to lay my foundation in the field. My efforts paid off when I led my team to reproduce a state-of-the-art model in the ShARC dataset. In the next stage, I plan to research multi-user reading comprehension machines and obtain deeper knowledge about Speech Processing from online courses, both of which are promising techniques in intelligent vehicles. The research outcome and future plans show my sufficient background knowledge in AI industries and strong executive ability.

I pay close attention to social issues and strive to stay on top of global development. Hence, I hope to pursue a field that enables me to address the most urgent needs of our society. According to my observation, the "road rage" phenomenon is prevalent in many countries, including Taiwan. Often, drivers refuse to give in to each other and resort to irrational quarrels since they treat each other as objects instead of subjects. I believe that more connections can be established between the drivers and the automobiles to create a friendlier and safer road environment. By integrating the existing self-driving system and AI-backed voice-activated robot technology, I seek to make driving more humanized to alleviate the problem of road rage.

Aside from professional AI techniques, I believe it is also important for AI engineers equipped with a foundation in Computer Science since they have to foster great teamwork to make products with other software engineers in the field of Computer Networks, Databases, and so forth. In this regard, USC’s M.S.-Scientists and Engineers program offers essential training for students to excel in Computer Science. For example, the program consists of Operating Systems and Introduction to Computer Networks courses, which would help me make up the background knowledge related to Computer Science. After finishing the foundational and core requirements, I plan to focus on course works about AI applications such as Robotics and Applied Natural Language Processing.

To become experts of AI, I am enthusiastic about working with distinguished faculty to improve myself. For instance, Prof. Joseph J. Lim’s research on developing intelligent systems that could perceive, reason, and interact with the world strongly appeals to me. I look forward to integrating Reinforcement Learning and Robot Vision to create humanized vehicles and robotic systems. Also, I am interested in Prof. Jesse Thomason’s research on connecting language to the world by Natural Language Processing and Robotics. To elaborate, the “Cooperative Vision-and-Dialog Navigation” project could be applied to a user-friendly driver navigation system, which fulfills my dream to create intelligent automobiles. Furthermore, the research topic links to my experience in several Computer Vision projects and the Question Answering project. Attending your program would prepare me for assuming positions in the Research and Development department in a related industry after graduation, such as Argo AI, Waymo, Tesla, etc.

USC's diversified courses and solid training will give me an in-depth understanding of Computer Science, cultivating my competitive edge when entering the workforce. I am confident that my persevering and creative personality will allow me to contribute to the diversity of USC and begin a successful career in my field of interest.