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 Intelligent Robotic Systems, especially regarding Computer Vision and Natural Language Processing. I am applying to the M.S.-ECE program at the University of California, San Diego (UCSD) because it provides me with an environment to 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-users 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 self-driving vehicle 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.

In this regard, UCSD’s M.S.-ECE program offers essential training with distinguished faculty for students to become experts in Intelligent Robotic Systems. For example, the Sensing & Estimation in Robotics course would make up my background knowledge related to fundamental theories of sensing and estimation in Robotics Systems, while the Planning & Learning in Robotics course would help me build robust automobile applications through a better understanding of motion planning and decision making in robotics. In addition, Prof. Sujit Dey’s research on developing advanced driver assistant systems by detecting drivers’ emotions strongly appeals to me. The research topic links to my experience in the Vision and Learning Lab and the Multimedia Processing and Communications Lab, where I took advantage of facial data to create Face Recognition and Face Anti-Spoofing models. 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.

UCSD's diversified courses and solid training will give me an in-depth understanding of Intelligent Robotic Systems, cultivating my competitive edge when entering the workforce. I am confident that my persevering and creative personality will allow me to make contributions to UCSD and begin a successful career in my field of interest.