

Personal Statement (Option 1)

For 2022 Fall Jacobs Technion-Cornell Dual Master's Degrees in Urban Tech

Applicant: Lin-Hsi Tsao

Road rage, a phenomenon in which drivers refuse to give in to each other and resort to irrational quarrels since they treat each other as objects instead of subjects, is prevalent in many cities, including Taipei and New York City. Being one of the victims of this situation, I believe that more connections can be established between drivers and automobiles to create a friendlier and safer road environment. The experience triggered my passion for intelligent vehicles and propels me to step into the field of AI engineering, especially regarding Computer Vision (CV). To fulfill my dream of making driving more humanized, I am applying to the Jacobs Technion-Cornell Dual Master's Degrees in Urban Tech program because it provides me with an environment to solve urban issues with a group of outstanding members.

During my undergraduate studies, I turned my expectations into action by participating in diverse courses. For instance, I implemented the "Land and Road Detection" project in the Robot Vision course. The project established my basic concept of how automobiles perceive the world. Nevertheless, it would become more difficult for autonomous vehicles to move in a variety of environments since streetscapes change significantly. Hence, I took the Machine Learning course to understand how recent technology solves the domain shift problem, and I learned that the Transfer Learning technique could effectively handle the situation by changing streetscapes into different styles. The experience cultivated my ability to utilize CV to build practical applications, reinforcing my competence in the self-driving car industry.

To obtain a deeper understanding of advanced CV applications in intelligent automobiles, I took part in the Vision and Learning Lab led by Prof. Yu-Chiang Wang. After reading extensive information about hackers trying to attack face recognition systems, which would become an indispensable application in intelligent vehicles, I became determined to focus on Face Anti-Spoofing (FAS) as my research topic. To address the domain shift problem in FAS, I designed a disentanglement representation framework that disentangled facial liveness features and liveness-irrelevant features. The resulting liveness features exhibited sufficient domain-invariant properties and thus can be applied to perform domain-generalized FAS. My proposal significantly increased the spoofing attack detection rate from 65% to 85% on average under four cross-domain testing scenarios. The work was awarded 2nd Place in the Bachelor Thesis Award and submitted to AAAI for publication after further refinement. The research outcome shows my strong executive ability in AI research, from designing learning frameworks to conducting experiments for validation.

Other than devoting myself to academia, 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 proposed the concept of balanced facial feature matching and, based on it, designed a robust masked face recognition system. The matching has been balanced since it was performed on features extracted from corresponding facial regions, setting it apart from conventional face recognition methods which showed severely degraded performance for faces occluded by masks. The face verification accuracy was improved by 3.3% on average for three masked face datasets, which research outcome was accepted by ICCE. This project experience cultivated my ability to analyze global trends and propose novel ideas to solve real-world problems.

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In addition to delving into my major field of study, I also actively participated in a wide variety of marketing planning activities, where I cultivated the capability of collaborating with others from various professional backgrounds to come up with creative ideas. For example, I worked with a team consisting of students from different educational backgrounds in the Creativity and Entrepreneurship Program. By exchanging distinct ideas and embracing opinions from all sides, we decided to address the most urgent needs of our society. According to our observation, the COVID-19 pandemic was so prevalent that people could not join offline activities such as study groups to improve their knowledge. Therefore, my team proposed an online knowledge-based community platform for users to share useful information with others. Our endeavor paid off when the platform successfully attracted 3,000 users, and our proposal won 3rd Place in the Startup Cup Innovation and Entrepreneurship Competition.

Moreover, the experience in the Startup Intern Camp strengthened my leadership skills. My team was required to pitch a business proposal based on Blockchain technology. Being the leader of my team, I explicitly introduced the pros and cons of decentralized techniques to my teammates and mobilized everyone to think about problems that occurred in daily life, which was a good entry point to propose a business plan. After several discussions, we found that the frequency of delivery disputes escalated in recent years since it is difficult for the customers to argue whether the deliverymen have successfully delivered their meals. To deal with this issue, we proposed service to enable the deliverymen to make decentralized delivery records, allowing delivery information to be more transparent and unalterable. Our work earned recognition when we won the Best Demo Pitch Award in the final competition.

Thus far, I have achieved solid academic achievements in several CV applications and cultivated my creative thinking ability. To further approach my goal to establish a road environment full of safety, I hope to pursue the Jacobs Technion-Cornell Dual Master's Degrees in Urban Tech program, which enables me to develop extensive insights into how AI engineering improves human lives in cities. For example, the program consists of several Visual Computing courses such as VR/AR and CV, which will build up my expertise in these fields through a better understanding of fundamental theories. Furthermore, the Urban Tech topics (e.g. Mobility & Transportation) are aligned with my dream of making a friendlier and high-tech road environment. I look forward to integrating Visual Computing technology and Urban Tech knowledge to create autonomous driving systems. To make my proposal more practical in real-world scenarios, I am interested in the Product Studio course, in which I could develop an implementable tech solution by incorporating diverse perspectives from distinguished faculty and students with different majors. After graduation, I plan to assume positions in the Research and Development department in a related industry, such as Argo AI, Waymo, Tesla, etc. In the longer term, I will seek to work my way up to the managerial level, in which I will be in charge of more groundbreaking intelligent automobile applications.

Cornell Tech's diversified courses will give me an in-depth understanding of AI engineering and creative design, 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 Cornell Tech and begin a successful career in my field of interest.