

When I was 14, I fell in love with visual arts. I believed it was the best way to reach to our insides and bring us together. Then, I entered Pomona College as a film studies major. As I delved deeper into the field, I gradually realized the importance of technology on the development of visual art. As I saw the visual effects in movies like *The Curious Case of Benjamin Button* and *Avengers*, I was attracted by how graphics technology could be waived into storytelling. I realized that technology and art are related rather than separated. Thus, I wished to explore new ways to enrich storytelling and interactions with graphic technologies.

I first looked into computer graphics, but there was not much research opportunity in my college, so I switched my studies to computer vision. I self-taught the contents with Jeff Heaton's Keras lectures, Stanford CS231 Convolutional Neural Networks and CS330 Meta Learning. I also took math courses that were helpful to my understanding of neural networks, such as probability, advanced linear algebra, differential equations and math of big data.

In order to gain a deeper understanding in the subject, I started my first research project in facial recognition with professor Weiqing Gu at Harvey Mudd College. I proposed to use a joint network combining the prediction of face shape recognition and CNN recognition on extracted areas. To accelerate the progress, I registered the project in a college-wise machine learning club and recruited three students through the organization. As the group leader, I led the research direction, held group discussions and distributed research works. Based on what I learned, we implemented the distance recognition with Gaussian model clustering. Although it did not reach to an ideal result, I learned to read the papers, set the research goal, do presentations and academic writings. I was determined to go on doing research in computer science after this experience.

Another thing I learned was that researchers must keep in track with new results in their respective fields. Earlier this year, in Vincent Sitzmann's twitter, I read about the exciting work of NeRF: Representing Scenes as Neural Radiance Fields for View Synthesis. The method could generate high-quality rendering, but the training procedure was too long for interactive 3D graphics or training on a full video. I thought of accelerating the training with meta-learning, so I began to look for relevant articles. As I saw MetaSDF, which applied a Model-Agnostic Meta-Learning (MAML) model to a neural rendering function for computer-generated scenes, I confirmed my idea that first-order meta-learning methods could have great effects on accelerating the training of neural rendering tasks. However, after I implemented MAML-NeRF, it performed only slightly better than a blank model, and became worse as the iteration increased. Rather than giving up, I continued looking for other meta-learning methods. I soon discovered Reptile, another optimization-based meta-learning algorithm. Since this method could have many more inner steps, I was able to make Reptile-NeRF treat each scene as an inner task, and thus shuffle the rays to decrease the variance of inner training data. On December 3rd, the original NeRF team published their work *Learned Initializations for Optimizing Coordinate-Based Neural Representations*. They used the exact same method as mine, and were able to achieve a good result with a much larger dataset. I was scooped. Though I failed to publish, I experienced the whole process of research. This was also my first time writing a paper as the first author. Learning from the best, I carefully read through NeRF and MetaSDF quite a few times to learn their paper structures. I also learned to alleviate my frustrations at each obstacle and come back with fresh energy. Furthermore, this project made me wonder if a wiser choice of the rendering

function could also improve the training efficiency. I was thus inspired to start my math thesis project - a survey on rendering functions for neural rendering on view synthesis. I plan to explore further in neural rendering.

Previous experience gave me a solid understanding on computer vision and computer graphics. In August, I began a project in augmented reality with professor Misha Sra at UCSB. Our goal was to investigate the effect of location-based memory in AR language learning. We let our participants walk around an outdoor area holding a smartphone, through which they would see word tags in the foreign language attached to the real objects. Apart from learning the AR implementations, I also learned about designing experiments that involved human participants. Designing the first user study in my life was quite challenging, so I went through every detail in relevant studies and learned the HCI study principles behind them. In this way, I finished experiment setup and testing metrics. I successfully designed a pipeline that could demonstrate the effectiveness of AR learning in fair comparison, and implemented an Android AR app with cloud anchors to give participants a comfortable user interface. The actual experiment is postponed due to COVID, but we have all the details set at this point. I had no experience with Android development before this project, but I learned everything in a short time and was able to finish the app for experiment by myself. I am grateful for prof Sra as she guided me through the design of experiments, writing interview questions and analyzing users' reviews.

At this point, my research spans from machine learning to graphical display to human computer interaction. As I proceed in research, I felt the importance of building a strong foundation of knowledge in machine learning and computer graphics. The machine learning masters program of EPFL is outstanding in both fields. After I finish the masters, I wish to go on working with EPFL professors as a PhD. My ideal advisors are prof Mark Pauly and prof Ronan Bulic, and I am open to other EPFL professors in related fields. Therefore, I am highly interested in the MSc program. I believe I will thrive as a researcher in EPFL.