

STATEMENT OF PURPOSE

The era of artificial intelligence is being readied by not only global companies investing exorbitant amounts, but also individuals taking profound interest in the development of those devices from autonomous cars to automated quality control devices. One by one they will gather, empowered by the resolution to improve human lives, and make immeasurable strides paving a way to technological advancement. I, for one, am an individual of a computer engineering background with research interests focused on computer vision: to enhance speed and accuracy of object detection and recognition algorithms. Wearable smart devices including sleep alert devices for driving and danger detection devices are the project possibilities that I seek from the groundwork of computer vision and machine learning at the computer vision laboratory, to join those already active in research at the University of Southern California.

The internship at Samsung Electronics exposed me to scientific and practical researches, one of which, the “specialized lightweight operating system(OS) project for specific operations,” was at once inspirational and challenging. This research focused on an OS that specialized in specific operations, for which I had to develop related algorithms and other programmable factors. My expectation, based upon my previous experiences, of a smooth and successful experiment was met with unseen challenges; as a commercialized OS such as Windows or Linux had already been optimized for operations, it was difficult to improve performance algorithmically with the skills I had. Furthermore, I was not able to guarantee architectural stability of my algorithms that were heavily focused on speed. Time was eventually reduced in content switching in order to increase the speed for specific operations. That excessive concentration on one particular aspect may cause one to lose sight of the entire framework checked my attitude. Nevertheless, the internship provided opportunities to gain research skills and deeper understanding of operating systems, both valuable assets that will contribute to my studies in the field of computer vision and the development of safe and stable devices.

My presenting in various conference seminars allowed honing in on desired area of research. Especially the “Variety of Smartphone Hacking” at the INCOGNITO conference, a presentation of my research on various hacking methods—that I was able to decipher—such as pattern-lock hacking and identity theft on Kakao Talk (a popular messenger service), enabled opportunity to conceive methods of fingerprint hacking. Initially, I had predicted that this hacking method utilized simply stored images of fingerprints, but, after further research, the method employed specific algorithms derived from the computer vision field to store forms of created featured points. While my previous researches involved identifying hidden software flaws, this captivating new research at the time included creation of new

methodology, leading me to present at a joint seminar with Pukyung National University under the topic of Image Forensics—motion deblurring, undistort, and periodic noise removal—applicable computer vision algorithms that may be used for criminal investigations. In one case of research, the rate of restoration for a blurred image of a getaway vehicle and its license plate was substantially low even with the use of multiple algorithms including motion deblurring. To improve rate of restoration, I realized the need for new approaches aside from previous algorithms. My intent is to research these new algorithms, struggle through the problem solving processes, and benefit a wide variety of fields related to image recognition as well as forensics.

The capstone design project enabled me to determine exactly the topic of my intended research. I developed the automatic image tagging gallery app, which enabled automatic recognition and tagging of objects within an image on the basis of deep learning. Once tagged, images were easily and quickly made both searchable by key words and sharable in Instagram or Flickr. During development, the previous algorithm that parceled objects through regional detection was too slow for application use. To improve speed, I used the SURF and Union-find algorithms to design a new algorithm for regional detection. Professor Ram Nevatia's journal and conference presentation material were particularly helpful during this process. Near the end of my project, Qualcomm's Snapdragon and Google Photos were released, both of which were similar in nature to my research of image processing, twice as fast and 20% more accurate. I felt my limitations, but in no way am I defeated: only driven more. To overcome my limitations, I seek to join the ranks of those individuals at USC, the leaders of computer vision.

Dr. Gerard Medioni and the CV-lab researchers have dedicated computer vision research and projects to improve community. I too am eager to contribute, especially to object detection and recognition algorithms. The Paper on "Multi-Target Tracking by Online Learning a CRF Model of Appearance and Motion Patterns" is revealing in that multi-target tracking may be an integral part to pursue for my project interests. Once given the opportunity, I would like to have analyzed the design work of my object detection algorithm and develop further research on it for improvement, and also I intend to communicate freely with all lab members to share ideas, goals and passion. Beyond USC is my dream to create wearable devices built upon my foundations of knowledge and experience from computer vision, system, and even security, devices that can become the eyes and hands of those disabled and that will help improve human lives. I will challenge myself to assist in research and development of computer vision in both the US and Korea, and make accessible the use of related products in developing countries. With the knowledge and experience gained from the CV-lab and as a graduate of USC, empowered, I will make those strides of progress.