Ren Ng – Teaching Statement

Based on my experience building a new camera company, I have seen firsthand the need for more talented scientists and engineers with a comprehensive education in imaging. I see a clear opportunity for, and have a strong interest in, building up academic concentration in camera systems engineering - including the science, art, and technology of photography.

Teaching and research in this area is challenging for at least two major reasons. First, a high degree of specialization is required, and historically much of the relevant expertise has been proprietary and hidden in industry. For example, very few academics would know how to build good auto exposure or auto white balance algorithms, as is mandatory for any digital camera. A second challenge is that digital photography requires expertise across a wide range of disciplines, including macro and micro optics, sensor devices and circuits, signal processing algorithms and systems, photometry, perception and color theory. As digital evolves into computational photography, the challenge grows with additional knowledge requirements in computing architecture, image synthesis and high-dimensional signal processing techniques. A comprehensive education would also include the artistic aspects of photography, which are often under-appreciated in technical circles.

Therefore, building academic concentrations in camera systems engineering is a major endeavor. It will require bringing diverse faculty and industry partners together, with multi-disciplinary cooperation across academic syllabi and research projects. Online education is also a critical consideration. I am excited about the movement toward open online education, because I subscribe to the philosophy that education should be a universal right. I believe that open online education will be a critical component of these new learning centers for camera systems engineering. Over my career, I would like to contribute a leadership role in the development and proliferation of such centers of learning. Success in building up bodies of knowledge and populations of expertise could define the future of cameras and photography.

As an immediate starting point, I would welcome the opportunity and new challenge of developing university courses in my areas of expertise. I would enjoy teaching undergraduate and graduate courses in digital photography, computational photography, imaging systems engineering, computer graphics, rendering, signal processing, applied math, statistics and algorithms. Lecturing tends to be a highly leveraged activity since the teacher can influence many students simultaneously (and this will increase exponentially as online education proliferates). I therefore have, and will continue to, invest considerable time and energy optimizing my teaching materials and delivery. I enjoy the process of distilling complex concepts into the key insights that streamline thinking and maximize the rate and effectiveness of learning.

My teaching experiences to date are summarized as follows. In the computer science department at Stanford University, I served as a teaching assistant for the graduate course in advanced rendering (CS348B) with Pat Hanrahan (three quarters), and an undergraduate course in automata and complexity theory (CS154). I also served as an instructor in wilderness skills classes taught through Stanford's Geological and Environmental Sciences department and the Stanford Alpine Club. I designed and gave lectures and hands-on field instruction in free climbing and anchor building. Aside from courses, I have had the opportunity to give talks about photography and applied math to a diverse set of audiences, including research conferences, undergraduate and graduate students, industry forums, board of director meetings, investors, media, and general audiences. A list of invited talks can be found in my CV.

When I reflect on my education, I am incredibly grateful to my teachers and academic advisors who opened opportunities for me by sharing their knowledge, and encouraged and mentored me to find my own path at the moment when everything was still possible. To me, it would be a privilege and joy to mentor future students at that magical moment. That is one of the main reasons I want to be a professor.