Teaching Statement

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My teaching philosophy can be expressed simply: I seek to eliminate fear, both of the unknown learning material and within the students themselves. This allows students to learn new subjects even without the "proper" background or prerequisite knowledge. This statement is very personal since I began a PhD in ECE with no background in the subject. My first meeting with my advisor, he asked me if I even knew what a CMOS transistor was. When I replied no, he simply responded, "That's ok, you will learn." I have embraced the courage to forge ahead in learning without having the traditional background. I truly believe in investing in students' unique, diverse backgrounds and experiences to catapault them towards life-long learning.

Pedagogically I emphasize the fundamentals and concepts underlying a new body of knowledge, using key examples or hands-on experience to practice applying these fundamentals, and challenging and inspiring students to believe in themselves and their ability to learn. I strive to create a reasonable learning path through carefully chosen motivating examples, interesting homework and project examples, and above all else, dedicated encouragement for young students as they make mistakes and learn.

Teaching Background

I have an extensive background in teaching through my undergraduate and graduate career. As an undergraduate, I was a tutor at the Math Assistance Center at the University of Pittsburgh for my last year. I averaged 12-15 hours a week tutoring and I never turned down a question even in courses I had never taken such as topology or quantum physics. This is because even asking students to clarify basic principles underlying a question led to genuine understanding for them. A frequent issue was students lack of confidence in their mathematical abilities. I helped students overcome this by constant encouragement, support, and enthusiasm. I commonly said, "Lets try this problem together" and was not afraid to show students when I myself would get stuck on a problem. This showed students that computational thinking takes time and energy to cultivate, but is fulfilling in the end. In addition, I was an undergraduate teaching assistant for an honors course in applied statistical methods where I contributed to the student solutions manual for the textbook being written by the professor.

In graduate school, I volunteered to TA for ECE 2100 Introduction to Circuits. At that time, I had never personally taken an intro circuits class, and I was nervous about teaching the material. However, I took this as a challenge, and I could easily relate to the students since I was "teaching from the front lines". I was the main TA in charge of the labs, and enjoyed helping students learn to debug their breadboards, an experience that teaches persistence and determination over seeming failure. My teaching evaluations included high scores for command of subject material (4.83/5.00) and enthusiasm for teaching material (4.85/5.00). One student wrote "Suren is one of the best TAs I've had in college. His politeness and energy really make him easy to work with. Also, he answers questions with remarkable clearness and can make a complex issue appear simple; few people (even some professors) can do that!" As a result of this course, I received the award for **Outstanding PhD TA in Cornell ECE**.

In my final year of graduate school, I was the co-instructor for the Digital Signal and Image Processing course. I created lectures, written assignments, tests, and supervised final projects. The syllabus was redesigned to include more applications in image processing, audio processing, and a brief intro to machine learning. I used Piazza, an online forum to handle questions, which helped improve class inclusiveness and student participation, and my average post response time was 21 minutes.

Students were also given considerable freedom and feedback in choosing their final projects. These projects included creating a suite of Photoshop effects for image processing, building a sonar detector on a laptop, designing a visual querying system for postage stamps, and visual tracking using optical flow for sports videos. Students learned the design process of iteratively refining their application and communicating their findings to their peers.

Research Mentoring and Outreach

In addition to formal teaching, I have mentored several undergraduate and graduate students in research. We explored projects both inside and outside the realm of traditional research such as building a glasses-free 3D display using LCDs and microlenses, designing virtual worlds for the Oculus Rift (v2), and using recurrent neural networks to compose drum tabs automatically. I treat every student I mentor as a unique individual with a diverse background, and I try to design a research plan and give feedback tailored towards their own intrinsic motivations. Several of my students have become co-authors on my papers [1, 2, 3, 4], and have graduated to pursue a PhD or positions in industry.

I also perform a lot of outreach activities to spread knowledge of computational imaging to a non-technical audience. In addition to organizing student-run workshops in deep learning for Pennsylvania State University and the University of Pittsburgh, I have taught Lego Robotics to elementary students in Ithaca, NY as an afterschool program (a true test of teaching patience). I love the intellectual challenge of conveying complex ideas in a simple way, and I want to continue these outreach programs as a professor in ASU to the broader community.

Curriculum Development and Teaching Goals

ASU's transdisciplinary approach to research and teaching is something that mirrors my own ideals, and is evidenced in my background. I am comfortable teaching engineering and science concepts to a non-technical audience as I reject the notion that one must have a proper "background" to understand great ideas. This philosophy is inclusive, regardless of gender, race, socioeconomic status, or idealogical diversity, and I'm excited to interact with several different students on ASU's campus.

I can contribute in teaching courses in fundamental topics such as computer vision, computer graphics, and signal and image processing. While still covering the basic mathematical and physical principles underlying these fields (e.g. linear algebra, geometry, Fourier analysis), I also would emphasize new approaches that incorporate machine learning and data-driven methods which are increasingly being applied to these domains. A strong emphasis would be placed on implementation of algorithms on real-world data and problems. If there is a departmental need, I can also teach introductory circuits and digital VLSI with some preparation.

In addition, I want to develop two new courses which can be cross-listed between ECEE and AME. The first course would be a upper level undergraduate/graduate course on the interdisciplinary topic of computational imaging and displays. This course would start with the basics of physics-based vision and light sensors, and then extend to topics in high dynamic range imaging, compressive sensing, plenoptic imaging, depth sensing including structured light, LIDAR and time-of-flight systems, and finally explore computational displays such as head-mounted displays, vision-correcting displays, and virtual/augmented reality. A key focus would be on understanding both the hardware and algorithms necessary to make these systems work in practice. The course would have several chances for students to work with computational cameras and their data, and would feature a final project to explore interests further.

The second course would be entitled "Understanding and Designing Visual Experiences", and would

explore the role of the visual experience, and how it is changing in our modern world. We would start with theories of vision and perception based on philosophical and cognitive science traditions (structuralism, gestaltism, constructivism). From this conceptual background, we would learn about human vision and perception, and then conclude with machine vision and understanding. The course would be designed to be accessible for non-computationally oriented students, but would delve into interesting visual phenomena such as illusion, hallucinations, and color science. In addition to case studies of different technologies for capturing visual experience ranging from paintings, displays, and virtual/augmented reality, design will be emphasized through an open-ended final project where students will explore a topic they are curious about in applied visual perception.

In conclusion, my teaching experiences and background are, I believe, a great fit for ASU. I am excited to explore teaching topics which cross between different disciplines, and interact with students. ASU would be a perfect place for me to expand and grow my teaching philosophy and empower students to embrace learning without fear.

References

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[3] M. Gupta*, **A. Jauhari***, K. Kulkarni, S. Jayasuriya, A. Molnar, P. Turaga, "Compressive Light Field Reconstructions using Deep Learning", (in review)

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(bold font = student author, * = equal authorship)

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