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Teaching Statement

I love the energy of academic institutions: Discussing ideas with my peers, collaborating on new research efforts, and then riding the wave of excitement after project kick-off for as long as possible. For me as a scholar, there is nothing more valuable than the buzzing creative minds in this world coming together at a university, and I now want to be part of this community as a professor.

My goal is to equip the next generation of computer scientists with practical skills, preparing them to solve real world problems using computational methods. To this end, I have shared my knowledge and experience with high school students, undergraduate and graduate students, as well as large online communities. I am convinced that effective learning is active, not passive. Therefore, my teaching style follows a *learning-by-doing* philosophy and supports theoretical foundations with a multitude of examples and applications.

Lectures and Workshops

In my classroom, high school students use red cups to request assistance, and white cups to offer help to their peers. This allows me to quickly scan the room and it reduces the students' feeling of being put on the spot. (Concept by Doug McGlathery)

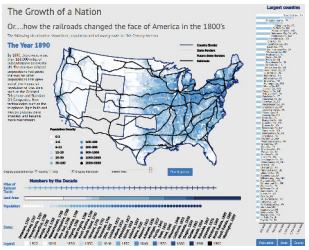
High School. I am a volunteer for the Technology Education and Literacy in Schools (TEALS) program supporting the Advanced Placement Computer Science course at the Cambridge Rindge and Latin School. This course aims to create a solid foundation of coding skills for motivated high school students. In this setting, I can see the immediate impact of my teaching: During assignments, students use colored cups to signal whether they are making progress, request my help, or are able to offer assistance to their fellow classmates. There is great reward in watching students pass on skills, that I had just imparted to them, to their peers with excitement.

Students program the MEXLE circuit board to dynamically control a magnet to hover a soccer ball on a goal line. (Rudolf Kern)

College. The Microcontrollers in EXperiment and LEarning (MEXLE) initiative at Heilbronn University provides a hands-on learning experience of computer science with low-cost microcontrollers and circuit boards. As a teaching assistant for this platform I designed and taught programming tutorials used by 300+ undergraduate students in the engineering department and at international workshops. With access to extensive documentation and resources, students enjoyed combining software and hardware and delivered impressive final projects.

At Harvard, I helped teach Visualization to 200+ college students. As a teaching fellow, I headed sections for over twenty students, taught tutorials and coding sessions for individuals as well as smaller groups, and offered regular office hours. Some students were experienced coders, while others had minimal working knowledge. With humor and the ability to relate to individual skill levels, my goal was to build confidence in the students and to keep them motivated. When grading, I thought it was just as important to explain students' mistakes in detail as it was to praise good work. I followed the same approach when mentoring five final projects–of which one was selected as the runner-up of the course.

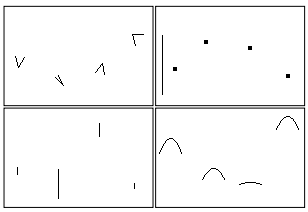
1-on-1 Mentoring



Interactive visualization of how railroads changed North America, a runner-up awarded student project for the Visualization course at Harvard. (Lauren Wood)

Pre-College Students. I mentored four high school students during individual research projects at Boston Children's Hospital and at Harvard. These young researchers were very motivated but easily overwhelmed due to little prior practical experience. I assessed each students' skill level and then proposed carefully tailored micro-tasks to keep them motivated while gradually directing them towards a final delivery. This approach worked well and the students succeeded to achieve their individual project goals. I am especially proud of two students who added significant research contributions as co-authors of publications and I was delighted when they later decided to concentrate in computer science as undergraduates at Columbia University and the University of Washington.

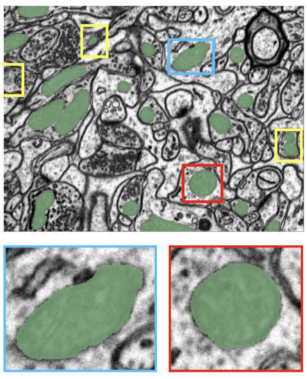
Undergraduate and Graduate Students. At Harvard, I was fortunate to supervise two undergraduates and one graduate student (MSc). Each individual required a custom mentoring approach, however, I always let the student drive and I emphasized creative freedom while regularly touching base. All three students became co-authors of my research papers.



Pre-college research evaluating the 'graphical perception' of artificial neural networks on multi-stimuli data. (Ian Svetkey)

Online Communities

I am an avid supporter of open science and open source software. One of my projects, XTK, the first web-based neuroimaging framework, reached 500+ stars and 180+ forks on Github. For developers, I created contribution guidelines, and for users, detailed tutorials. I also answered 70+ Stack Overflow questions for XTK, helping more than 28,000 people. As a member of the National Alliance for Medical Image Computing, I won the first prize for my 3D Slicer tutorial demonstrating how to segment and visualize coronary arteries using only software and data that was freely available.



My graduate student developed efficient segmentation methods for mitochondria in microscopy images. (Vincent Casser)

Future

I want to establish professor-student relationships that break away from traditional hierarchies, emphasizing guidance and a supportive environment. As a teacher, I want to continue to be approachable for my students through regular meetings that are more often brainstorming sessions rather than progress reports. I want to motivate young minds and instill a level of confidence and critical thinking that allows them to leave the beaten path behind, abandon rigid research directions, and to think out-of-the-box. I envision a fluid learning environment with a soft boundary between teacher and student, where everybody involved is continuously growing. I also want to prioritize interdisciplinary research collaborations because working together is the key to solving real world problems efficiently. Ultimately, my motivation to becoming a professor is anchored in my core belief that knowledge has to be shared and I am ready to teach courses in scientific visualization, biomedical image processing, and web-based computer graphics.