James Tompkin | Teaching Statement

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I aim to instill in students an attitude of critical assessment and a creative perspective for the future. But, first, must come inspiration: "To create the ship is not to hoist the sails, to forge the nails, or to read the stars, but to give the taste of the sea" [Saint-Exupéry... who else?!]. I try to reach this ideal by first exuding my personal passion, then by nurturing student interests and abilities with patience until it (hopefully) becomes their passion, too. I have practiced this in large undergraduate and small graduate courses, in mentoring PhDs, MScs, and undergrads to publications and research positions, and in engaging the wider community with courses and workshops.

In the classroom At Brown CS, I teach the computer vision course to students all the way from sophomores to PhDs (240 students). This is a 'full service' course with lectures, written and code homeworks, workshops, discussion sections, an online forum, interactive online tutorials, office hours at almost any time of the week, and a group final project presented in a big poster session. To help, Brown CS has a 10:1 student to undergraduate teaching assistant (TA) ratio, providing a staff of 25—a class within a class. Since 2016 when I took on the course, enrollment has quadrupled and computer vision has become a topic with significant societal impact.

To sophomores, the class is often their first upper-level course. I design class time to be engaging through in-class questions, real-time demos, and visual illusions that stress why vision is interesting. To increase accessibility, I design structured written exercises that require students to show conceptual understanding and that anticipate upcoming technical challenges before code implementation. For advanced students, I set up extra credit and optional leaderboards so that they can push each other. To scale enrollment, I created an autograder that let students receive instant feedback; this infrastructure was then adopted by our large Data Science course.

For societal impact, I pose dilemmas through discussion sections with role playing exercises. For example, to design a human-AI system for mammogram screening that is comfortable to students-as-patients, or to argue as stakeholders when images from a robotic vacuum cleaner of people in 'delicate situations' end up shared on Facebook. How did it happen? Who is responsible—the vision engineers (iRobot), the image labeling service provider (Scale AI), or the gig workers labeling from an emerging economy? How could we prevent it? After defending as each stakeholder, students apportion responsibility; then, in class, we discuss the aggregated responses.

With my TAs, I teach pedagogy through practice and create a supportive culture welcoming of the breadth of students. When improving the course, I work closely with TAs to strengthening their conceptual understanding and teaching skills. For each course issue, I pose the problem to TAs, give



First day of class in computer vision in Spring 2020. A boatful of students.



In computer vision, we 3D reconstruct object shape and color from multi-view images. Here, students *Derick Toth, Zack Cheng, and Nicole Steinberg* reconstructed a phoenix statuette.



In computer vision, after learning about real-time human pose detection, I challenge students to predict the outcome of an edge case—hand-stands!

them the freedom in pairs to discuss and propose fixes, then with me we discuss the potential impacts and how best to finally implement it. While it is challenging to reach female/male parity in a CS class (vision is $\approx_{35}\%$ women), we know that women underestimate their abilities and may not promote themselves [4]. In hiring TAs, I proactively reach out to promising students to correct this, e.g., Spring 2023 had 50/50 female/male TAs.

Smaller classes I teach an upper-level computational photography course to 40 students. We focus on making *beautiful images* with a hands-on aesthetic approach [5, I]: Each week students spend half of the class time in pairs in lab exercises about key techniques, then students are challenged to go into the world with loaner cameras and create a photo using computation to be critiqued in class. An activity-filled lab at night to learn about sensors and noise is the semester's highlight [...or should that be 'lowlight'].

My graduate seminar studies state-of-the-art works in visual computing and challenges students to improve them. Themes include generative models (2019) and neural fields (2022). As how we speak is most significant in determining our success [8], this is secretly an *oral communication course*: I sit with students individually to discuss their presentations; then, after a lesson in effective criticism, the class critiques the presentations in detail to raise everyone's skill. Keen undergrads enroll and go on to research with me (n=14 so far). Four class projects have become publications.

Finally, I have also taught *How To Be a PhD Student* (Research Methods). As Brown CS grows its PhD program, I motivated the course's creation and taught its second iteration in Fall 2021. This was the first semester in person after COVID-19. Effective cohorts are important for academic success [6, pg. 83], but our new PhD students had not built a cohort nor normalized to the significant pressures that they are under with their peers [3, 2, 7]. Wholeheartedly, and with open and non-judgemental discussion, the class and I wrestled with *why* academia is like it is and how students could use this knowledge to be successful. To continue this mentorship, I held special weekly spring surgery hours for these students to discuss their trials.

One to one I have directly advised five PhD students, with one now graduated into a research scientist role at Meta. I have also mentored twelve undergraduate and MSc students into PhD positions (e.g., Stanford, Berkeley, MIT, CMU, Cornell, CalTech, UWashington, UToronto). I regularly work with undergraduates and have co-authored 11 publications with 13 Brown undergraduates since 2016. My undergraduates have placed 1st in our CS research awards; in this case, the student became a research engineer at Adobe. I also co-lead the visual computing group at Brown: since I joined and started our group Slack, we have added 250 past and current researchers—only students conducting research with us are added. Not every student is successful, especially during COVID-19: when one of my PhD students decided to leave then, I suggested a path forward for them and mentored them into becoming a US Congressional Innovation Fellow.



In computational photography's night lab, students paint light with slices of 3D objects drawn over time on tablet PCs waved through the air under long exposures. *Thomas Vandermillen*.



For the final research methods class of the semester, my students festively decorated our classroom.



Brown CS's traditional dressed rubber chicken, with my first graduated PhD—Numair Khan.



Lab dinner to say goodbye to visiting student Beatrix-Emőke Fülöp-Balogh from Uni. Lyon.

Off campus I develop and teach courses within my academic communities (peer-reviewed for inclusion). For instance, at SIGGRAPH on computational video in 2015 and VR video in 2017, and on neural fields at CVPR 2022 and SIGGRAPH 2023. The day-long course at CVPR was attended by \approx 400 people. I also co-lead the AI for Content Creation workshop at CVPR, which receives ≈50 paper submissions and in 2023 was attended by again ≈400 people. Unlike at SIGGRAPH where research and practice go hand in hand, the computer vision community does not so intimately know the impact of its AI techniques upon creatives. To help teach the community, I organized an industry panel with senior art directors from Electronic Arts (games) and Sony Pictures (visual effects and animation) to communicate AI's impact. A recent workshop highlight is that we now have travel grants for DEI students thanks to sponsorship from Google. Finally, I support the local computer vision community in New England, organizing our yearly workshop for PhD students in 2019 (100 attendees, 10 institutions) and motivating the restart after COVID-19 in 2022.



I help to run the exploreCSR program at Brown, which is funded by Google. Under-represented students in CS research from New England experience a semester-long research project with faculty and PhD student mentoring. In 2022, my student group (above) won 1st place at the Brown CS Undergraduate Research Symposium.



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Our Neural Fields for Computer Vision tutorial at CVPR in 2022 was timely and caught the attention of many attendees.



Our AI for Content Creation workshop at CVPR in 2023 also included hybrid attendees, and publishes all talks online for posterity.



I organized the New England Computer Vision workshop at Brown in Nov. 2019, with 100 students and professors visiting from 10 institutions.