Diversity, Inclusion, and Belonging Statement

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I strive to create a research and teaching environment that is not only accessible to all students, both within and beyond the walls of my classroom and lab, but also acknowledges and supports the fact that all students and colleagues enter new courses and jobs with different backgrounds, expectations, preparations, and life contexts. In this way I hope to not only foster an inclusive environment in both my lab and classrooms in which everyone feels like they can learn, grow, and achieve, but also contribute to the broader educational community around the globe.

Within the Walls of my Classroom

My hope is that my classroom is an inclusive and supportive learning environment, my office hours are a safe space where students can ask any question, and that all students feel that they belong and can succeed.

As such, I include a DIB statement on course syllabi that explicitly calls out the fact that the course staff may have blind spots and that science has historically been dominated by a small subset of privileged voices. I also ask for anonymous feedback early and often, reveal the results publicly, and course correct accordingly. I try to spread out teaching staff office hours across the week at varying times and always offer additional office hours by appointment so that all students have a chance to attend regardless of their commitments to jobs or other extracurricular activities. I ensure that students have the opportunity to see the same topic through different lenses of learning to ensure that all students can engage in content in the way that they learn best. Finally, I try to design courses around assignments and projects that align grades with students' understanding of key course concepts and not just their test taking and memorization abilities. For example, in the TinyML course I designed an assignment that asked students to construct their own Keyword Spotting model (think "OK Google"). This assignment was graded not on the final model accuracy, but on the students' explanation and design of their data collection and testing scheme.

Around Campus and Around the Globe

I want to enable the next generation of global innovators and leaders by improving access to high quality educational materials and programs on cutting edge topics. Throughout my PhD, I have spent significant time on these efforts and hope to continue to develop high quality open-source educational content and foster its global adoption and adaptation for outreach programs at your college or university.

For the majority of the summers during graduate school I have worked for the MIT/Lincoln Laboratories Beaverworks Summer Institute: Autonomous RACECAR Grad Prix program, and I would love to develop a similar offering for your college or university. This outreach program teaches high school students programming concepts and robotic algorithm design through a self driving car race project [1]. The course is free for all students and brings in a very diverse cohort every summer, for example, it achieved gender parity in 2019. We also welcome multiple international guest teams to our final race every year and I have often served as their liaison. Both for the international teams and domestic students, my main focus was to ensure that all students felt like they were achieving and contributing to their teams and left the program more excited about future studies and careers in STEM fields. We also open-sourced much of the course material to enable others to adapt and teach the course globally.

For the majority of the past year I worked to co-develop a four course series on TinyML on edX designed specifically to widen access to applied machine learning globally [2]. The series can be accessed for free, assumes no prerequisites beyond basic programming, and includes hands-on labs that leverage both Google Colaboratory's free compute for all model training and low cost Arduino microcontrollers for deployment. We have also open-sourced all of the course materials.

Based on requests from the community for further support to develop locally specific courses, seminars, and workshops on TinyML, we have excitingly launched the Tiny Machine Learning Open Education Initiative, which I co-chair. The initiative has already enabled some very successful collaborations and outreach efforts and I hope to continue to help grow its impact in the future. For example, in collaboration with professors from the Universidade Federal de Itajubá in Brazil, we have already helped launch two courses derived from our materials, taught in Portuguese, and a third will be taught in Mozambique later this fall. As another example, in collaboration with Navajo Technical University, we designed and ran an open-source outreach workshop to introduce high school teachers and students of the Navajo nation, many of whom did not have a technical background, to the opportunities and challenges of AI, ML, and TinyML. Finally, in collaboration with research scientists at the Abdus Salam International Centre for Theoretical Physics we have launched an academic network of over 20 universities from around the globe and brought on industry sponsors to supply the universities with Arduinos for a TinyML workshop scheduled for later this fall.

At your college or university I would love to continue to lead TinyMLedu and grow its global impact, while continuing to develop and open-source for the global audience additional cutting edge courses on new and exciting computer science and engineering topics.

I have also been fortunate to be able to be a one-on-one mentor, both formally and informally, while at Harvard. After having the fortune to start graduate school with a kind postdoctoral researcher in my lab who answered any and all questions I had (fellowship and job applications, academic paper writing, technical concepts, etc.), I have informally tried to be that resource to other graduate and undergraduate students I meet through teaching and research. Formally, I have also been able to support both Harvard College Women in STEM as well as the TryAI program (designed to introduce early undergraduate students identifying as women, Black, Latinx, and/or Indigenous to research in Artificial Intelligence). I would look forward to supporting and mentoring both undergraduate and graduate students as a faculty advisor, and by helping bring programs like Women in STEM and TryAI to your college or university..

Finally, given my experience at MIT in what amounted to an effective post-baccalaureate year, I was able to serve on the post-baccalaureate working group for the Harvard SEAS Committee on Diversity, Inclusion, and Belonging. Excitingly, SEAS is piloting a DIB post-baccalaureate "bridge-to-PhD" program this fall, and I would be excited to help develop similar programs at your college or university.

Through my Research

Currently, cutting edge robotics research typically occurs in a select few research laboratories. My research is centered around building bridges between robotics and adjacent fields, expanding the robotics community, and broadening access to cutting edge robotics research and applications.

At the intersection of robotics and adjacent fields, I develop open-source software solutions that enable other researchers to access and leverage high-performance parallel architectures and real-time optimal control, bringing together teams of roboticists and computer architects. For example, I recently released an open-source GPU-accelerated rigid body dynamics library, GRiD, which was built by an interdisciplinary team of researchers, and enables other robotics researchers to easily develop GPU accelerated algorithms that leverage rigid body dynamics.

I am also developing a tiny robotics research program specifically targeted at lowering the cost of, and improving access to, robotics. My hope is that through the use of TinyML[3], and low cost, palm-sized robots like the Bittle, sophisticated robotics solutions can be researched, developed, tested, and deployed globally for a fraction of their cost today.

References

[1] S. Karaman, et al. Project-based, collaborative, algorithmic robotics for high school students: Programming self-driving race cars at MIT. 2017 IEEE Integrated STEM Education Conference (ISEC).

[2] V. Janapa Reddi, B. Plancher, et al. Widening Access to Applied Machine Learning with TinyML. arXiv preprint. 2021.

[3] P. Warden and D. Situnayake. Tinyml: Machine learning with tensorflow lite on arduino and ultra-low-power microcontrollers. O'Reilly Media. 2019.