Teaching Cloud and Sustainable Computing
Teaching Statement

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The significance of a good teacher is universally acknowledged. A positive influence emanates not only on the individual student but also resonates throughout society. Since my undergraduate studies, I have been instructing introduction to computer science and related disciplines such as Linux and Internet to students and elderly people. Throughout my studies at various universities around the world, I was fortunate to have exceptional teachers and mentors who encouraged me to extend my learning beyond the confines of textbooks. I now aspire to instill the same enthusiasm and inspiration in my own students. My background includes valuable experiences in teaching and preparing courses, mentoring students, and leading lab and discussion sessions, both during my undergraduate studies, my PhD within multinational projects, and finally my postdoc. My hands on approach and experiences have uniquely prepared me for the role of an educator. Importantly, they have ignited a passion to replicate the engaging and enjoyable learning experiences provided by the teachers who influenced me during my academic journey.

1 Goals

While the foundational principles of computing are well defined, the boundaries of the area are undergoing rapid transformation. The expanding application of computing across various fields necessitates adaptations to the curriculum that align with current developments, specially with fast advances in Artificial Intelligence and tools such as ChatGPT. As an aspiring faculty member, I recognize the significance of being versatile and adaptable in guiding discussions and addressing the intricacies of pedagogical evolution. In this dynamic landscape, it is crucial for students to comprehend the value of embracing change as a means to overcome specific challenges. As a teacher, I hold a set of important goals and values that guide my approach to education:

1. **Enhancing Curriculum.** I will actively contribute to curriculum development through the integration of a *Systemnability* course.

2. **Diversity.** I plan to integrate diverse perspectives, voices, and experiences into course content. By incorporating different teaching practices, case studies through relevant examples, we can create an educational experience that reflects and respects the diversity of the student population.

3. **Recruiting and Retaining Faculty.** I will actively participate in faculty recruitment efforts, advocating for hiring practices that prioritize diversity in research. Additionally, I will support the development of mentorship programs and initiatives that promote the success and retention of faculty members.

My past efforts to empower students allow me to create future plans to enhance diversity at the university and foster an inclusive excellence that recognizes and celebrates the richness of a diverse faculty and student population. By working collaboratively, we can create an educational environment that embraces diversity, fosters

equity, and prepares students for success in an increasingly interconnected, competitive, and more importantly, diverse world.

2 Teaching Experience

Figure 1: Introducing Computing (green shirt, right) in the Linux For All Program (Rio de Janeiro, 2013)

My teaching experience began before my Computer Science studies, during my undergraduate studies in Mathematics (2006). In Brazil during the 2000s, computer and internet access was limited to less than 50% of the population due to built-in, hidden increasing computer prices. This served as a barrier to digitization efforts, limiting educational opportunities for students and restricting access to social services for low-income individuals. At the Federal Fluminense University (UFF)[1], where I pursued my undergraduate studies, I contributed to developing free introductory courses covering computers, the internet, free software, and computer programming for university students and low-income people. Over five consecutive years, I aided in preparing more than 200 university students to manage the university computer laboratories, assisting fellow students in accessing study materials. Most importantly, we facilitated computer access for low-income community members, enabling them to access various services and information.

More recently, during the last two years I again had the honor of co-directing a three-week summer outreach program for high school students in Western Massachusetts[2]. Our primary objective was to instill the belief that CS is an enjoyable field. This experience provided me with the opportunity to take a leading role in the organization, coordination, and instruction of a condensed course covering various introductory CS topics. In this program, I took charge of teaching the fundamentals of Python programming, exploring the concept of sustainable computing, and facilitating hands-on lab sessions involving sensors and self-driving cars. Through these activities, we aimed to engage students and ignite their passion for CS by showcasing its practical applications and real-world impact. I collaborated closely with a team of instructors to develop an engaging curriculum that catered to the students' interests and skill levels. I guided the high school students through interactive lessons, encouraged active participation, and provided individualized

Figure 2: Introducing Programming to high school students (Amherst, 2023)

support to ensure a meaningful learning experience. Moreover, I assumed responsibility for managing the available resources and optimizing the learning environment to foster a collaborative and inclusive atmosphere. By implementing innovative teaching techniques, such as project-based learning and interactive demonstrations, we aimed to cultivate a sense of excitement and curiosity among the students. This hands-on approach allowed students to apply theoretical concepts to real-world scenarios and develop problem-solving skills.

3 Proposal for Courses

There is a widening disconnect between theory and application, primarily attributed to the intricate and lean user abstractions facilitated by complex computing systems. In particular, my research studied problems in large computing systems, with developed research prototypes extensively evaluated in real production environments.

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[1] https://international.uff.br/
[2] https://lass.cs.umass.edu/turing/

Together with students, the research has resulted in several high-quality publications in well-known research and student conferences. But more importantly, my work has crossed the gap to real-world usage benefiting hundreds of academic supercomputer users. This first hands experiences allow me educate students to achieve real impacts for their careers.

3.1   Cloud, Edge and IoT

I am enthusiastic about instructing a diverse array of foundational courses, encompassing operating systems, parallel and distributed programming, and software engineering, for both undergraduate and graduate students. Given the increasing interest among students in cloud and edge computing, driven by its increasing relevance in the job market, I am particularly keen on offering courses in these domains, particularly in distributed systems, queuing theory, concurrent programming, and systems' design. Furthermore, I bring familiarity with various mobile and web technologies, which positions me to also teach courses in these dynamic areas. My research and expertise extend to the intersection of cloud and edge computing, and the Internet of Things (IoT), making me well-suited to guide students in understanding these cutting-edge technologies. I look forward to creating an engaging learning environment that not only imparts foundational knowledge but also fosters a spirit of curiosity and exploration.

3.2   Sustainable Computing

In the future, the fundamental challenge of exponential AI growth poses a significant problem for decarbonization efforts. Technical education in sustainability is key to prepare an emerging workforce that is well aware of sustainability issues and the environmental considerations of the generation and consumotion of energy. As such, sustainability and concepts should be integrated into the computer science and related disciplines' curriculum. By developing software engineering courses or modules specifically focused on sustainable computing, student skills can be forged to apply energy-efficient design when developing algorithms and applications, integrating renewable energy and lifecycle assessment into computing systems.

3.3   Merging Sustainability + Systems: Incentivizing Research in *Systemnability*

Recognizing the importance of staying current with the latest advancements in the field of cloud-edge systems and sustainability, I am eager to design new seminar courses centered around impactful "systemnability"[3] projects based on cutting-edge interdisciplinary research on sustainable systems. This approach not only keeps students abreast of state-of-the-art research but also encourages them to think critically and expansively beyond established knowledge. I look forward to creating an engaging learning environment that not only imparts foundational knowledge but also fosters a spirit of curiosity and exploration. My knowledge in operating systems enables me to reason across various levels of the software stack, allowing me to guide students over various directions that suit their own interests.

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[3]Portmanteau with the words systems and sustainability