Esteban Carisimo | **Teaching** Statement

Teaching Philosophy

My teaching philosophy places students at the heart of a collective learning journey. I believe that knowledge is constructed collaboratively, and every student brings unique perspectives that enrich our shared understanding. My primary goal is to cultivate a lifelong love for learning by creating an inclusive and supportive classroom where every student feels valued and empowered to contribute.

In my courses, I actively engage students by explaining concepts from multiple perspectives and employing diverse teaching methods that address various learning styles. These methods include interactive lectures, hands-on assignments, and real-world problem-solving activities. For instance, I design assignments where students simulate modern data center architectures and utilize industry-standard technologies to develop programs for managing traffic flows. This approach bridges theoretical concepts with practical applications, fostering deeper understanding and sustained motivation.

To understand the students' educational needs, and I bring a personal and approachable personality to the classroom. By constantly sensing the classroom dynamics, I adjust my lectures to better engage students. As one student noted, *"Esteban's passion for networks and teaching could be felt every day of this 9:30 class, which was honestly impressive."* Contributing to my students' educational and personal growth motivates me to continually refine my methods and stay updated with the latest developments in the field.

Teaching Experience

Over the past seven years, I have had the privilege of teaching a diverse range of students at two prestigious institutions: Northwestern University and the Universidad de Buenos Aires (UBA). This experience across different educational systems has equipped me to adapt to varying academic environments and effectively address different educational needs.

At UBA, as the equivalent of a tenured teaching-track instructor, I fully restructured a senior-level computer networks semester course to align with contemporary educational approaches. I redesigned the curriculum based on the textbook *"Computer Networking: A Top-Down Approach"* by Kurose and Ross, incorporating engaging, practical assignments that emphasized hands-on experience. For instance, I introduced projects using Software-Defined Networking (SDN) tools such as Mininet and OpenFlow, allowing students to experiment with data center technologies. These changes had an immediate positive impact, with the course ranking second in "most interesting topics" and "best lecture sessions" in the Department of Computer Science during its first quarter.

As an instructor at Northwestern University, I focused on incorporating modern Internet protocols into the introductory computer networks course. Despite the course's introductory nature, I updated the content to include recent concepts such as SDN, DNS over HTTPS (DoH), and QUIC. This balance of fundamental and advanced topics prepares students for the rapidly evolving landscape of computer networks.

Mentoring Experience

Throughout my academic career, I have mentored numerous students across various programs, helping them advance their careers. I have supervised 14 master's and engineering degree students on their final projects and theses at Northwestern University and UBA. My mentorship involved guiding them through research topics, methodologies, and tools, ensuring they received the support needed to achieve their academic goals. Many of these students have transitioned into industry, joining international and local companies such as Meta in London and Dialpad - for example, Camila Bojman is now at Meta in London, and Manuel Ruiz Echazú is at Dialpad. A few have pursued graduate programs overseas, including Santiago Klein, who is now a Ph.D. student at Northwestern University.

In our lab at Northwestern University, I have helped mentor three PhD students: Rashna Kumar, Caleb J. Wang, and Kedar Thiagarajan. I guided them through different stages of their doctoral studies, assisting with defining research questions, selecting appropriate datasets and methodologies, and navigating the publication process. For example, under my guidance, Rashna Kumar examined governments' content delivery strategies across 62 countries, which led to a publication at the prestigious ACM IMC conference [1]. My mentoring approach focuses on academic excellence while considering each mentee's personal goals and well-being.

Proposed Courses

I am prepared to teach a wide range of courses, from introductory to advanced levels, aiming to influence the development and enthusiasm of future professionals—both users and innovators of Internet technologies. However, when teaching courses in my area of expertise, I can more effectively address the growing complexities of computer networks. Recognizing these challenges, I aim to help fill the gaps in current computer network education programs. Drawing upon concepts from my research and deep knowledge of the field, I would like to develop and teach courses that address these needs.

Internet Network Topology

There is a clear need to develop a lecture-based course on Internet Network Topology, a topic extensively covered by the research community but with no existing textbook or formal course. The course will explore traceroutes to discover paths between sources and destinations, alias resolutions to identify IP addresses linked to the same device, and Multiprotocol Label Switching (MPLS) for implementing traffic engineering. The course will also cover key infrastructure, such as peering facilities and Internet Exchange Points (IXPs), focusing on network interconnection and traffic exchange.

Students will learn the Border Gateway Protocol (BGP) and its impacts, including path asymmetries and inflation. The course will also explain Content Delivery Networks (CDNs), Points of Presence (PoPs), off-net caches, modern cloud networks, and the transition to IPv6, including DHCPv6.

Students will engage in hands-on projects using real-world data to map and analyze network topologies, equipping them with practical skills and a deep understanding of the Internet's structure.

Target Audience: Advanced undergraduate and graduate students who have completed a foundational computer networks course.

Related Courses: It is worth noting that several courses at various universities have developed advanced network courses with some overlaps, such as Stanford CS249i, Georgia Tech CS8803, Columbia ELEN6774, Northwestern CS445, none of these courses either offers a lecture-based course or exhaustively focuses on network topology.

Modern Internet Protocols

This course focuses on the latest protocols and technologies shaping today's Internet, their implementation, and their impact on security and performance. The course will explain HTTP/3 and QUIC, the latest web communication protocols designed to improve performance and security. The course will also cover DNS over HTTPS (DoH) and discuss the implications and benefits of securing DNS queries via HTTPS. Students will also learn about the Resource Public Key Infrastructure (RPKI), a security framework designed to secure the Internet's routing infrastructure.

Through a combination of lectures and laboratory exercises, students will experiment with configuring these protocols and assessing their effects on network performance and security.

Target Audience: Graduate students and advanced undergraduates interested in deepening their knowledge of computer networks, with prerequisites in computer networks and familiarity with cryptography and security concepts.

Related Courses: This course will have close overlap with Stanford CS249i.

Future Goals as an Educator

I aim to continue enhancing my teaching practices by integrating more active learning strategies to promote critical thinking and teamwork. I plan to develop interdisciplinary courses that connect computer networks within and outside the department. I will integrate my courses with cybersecurity, data science, machine learning, and social sciences as I do in my own research.

As a Latino, I would also like to expand outreach initiatives to encourage underrepresented groups to pursue studies in computer science. By establishing relationships with institutions rooted in these communities and organizing workshops and mentorship programs, I hope to foster a more diverse and inclusive community within the field.

Conclusion

In summary, my passion for teaching and computer networks drives me to inspire my students. I look forward to the opportunity to contribute my experience and enthusiasm to your institution, supporting its mission to cultivate the next generation of innovators and leaders in computer science.

References

[1] Rashna Kumar[†], Esteban Carisimo, Lukas De Angelis Rivas, Mauricio Buzzone, Fabián E. Bustamante, Ihsan Ayyub Qazi, and Mariano G. Beiró. Of choices and control - a comparative analysis of government hosting. In *ACM IMC*, nov 2024.