Teaching Statement - Igor Kadota

My passion for research, teaching, and mentoring is what draws me into academia. At Columbia and at MIT, I had the opportunity to supervise research projects of several M.S. and undergraduate students, co-advise two M.S. theses, give multiple lectures in graduate and undergraduate courses, contribute to the NSF COSMOS-NewLAW Research Experience and Mentoring for Teachers (REM/RET), serve as a Teaching Assistant (TA) for four terms, complete the Kaufman Teaching Certificate Program, mentor Latinx high school students wishing to pursue careers in STEM as part of the Mentoring Young Talents Brazil (MYTB) program, and volunteer as a Math teacher for Latinx middle school students. Next, I elaborate on some of these experiences and then I discuss my teaching philosophy.

At MIT, I was the TA for the course Communication Systems & Networks for four consecutive terms. In the first term, I served as a regular TA, giving a few lectures, holding office hours, and assisting in the design of problem sets and exams. At the end of this first term, I proposed to create a Radio Lab that would complement the theoretical lectures with hands-on experiments. With the support of my Ph.D. adviser, I selected the equipment, purchased sixteen teaching Software Defined Radios, and designed a sequence of five experiments that closely follow the lectures. In the following three terms, I had the unique opportunity to lead the Radio Lab. Figure 1 shows the equipment utilized during the lab that explored Multiple Access techniques (see the lab slides here). For my work on teaching at MIT, I received the **2018 MIT AeroAstro Graduate Teaching Assistantship Award**.

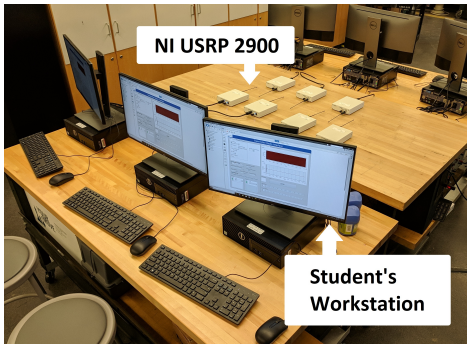

Figure 1: Radio Lab

At Columbia and at MIT, I directly supervised research projects of at least fifteen M.S. and undergraduate students from a variety of backgrounds. Many of these students were admitted to Ph.D. programs at top universities, e.g., Lilly Clark (USC), Lisa Zahray (Georgia Tech), and Eray Atay (Caltech), or joined top technology companies, e.g., Azhaan Zahabe (Amazon), Saravanan Govindarajan (Meta), and Leoni Lu (Qualcomm). For Saravanan's contributions to our research project, he received the 2022 MS Research Award from Columbia's EE Department. Just a few months ago, Leoni Lu - an M.S. student currently working with me on opportunistic weather sensing using millimeter-wave signals - received the inaugural Women in Spectrum Scholarship from the National Spectrum Consortium. Advising such talented students from different backgrounds in oftentimes cross-disciplinary research projects at Columbia and at MIT has certainly helped me improve as a mentor. For my work on teaching and mentoring at MIT, I received the **2020 MIT School of Engineering Graduate Student Extraordinary Teaching and Mentoring Award**.

At MIT, I completed the Kaufman Teaching Certificate Program from the Teaching & Learning Lab. This certificate program consists of a number of workshops designed to improve the participants teaching skills. Some of the topics were: Designing a Course and Constructing a Syllabus, Interactive Teaching & Active Learning, and Teaching Inclusively. During the M.S. in Brazil, I volunteered as a Math Teacher and gave weekly lectures for a talented class of underprivileged middle school students for three semesters.

Future Plans. I am looking forward to lecturing academic courses with a mix of theory and practice. My background makes undergraduate courses on Computer Networks, Internet-of-Things, Embedded and Real-Time Systems, Signals and Systems, Inference, and Machine Learning appealing to me. Graduate level courses on Digital Communications, Wireless Networks, Probability and Optimization are also a great fit.

Teaching Philosophy

One of the most instructive exams I have ever taken was in Introduction to Thermodynamics. The exam had only one question: determine the temperature of equilibrium of a microchip that lies inside a PC and suggest a modification that would reduce its temperature. Surely, the instructor[1] was not expecting us to optimize the design in a two-hour exam; neither was the instructor trying to assess if we remembered a minor detail mentioned during a class. The goal was to engage us in a (close to) real-life setting and to evaluate how well we could apply the core concepts learned throughout the course. Even though such an exam can be challenging to grade, I strongly believe that this type of thoughtful experience can facilitate learning.

[1] Prof. Ezio Castejon Garcia from ITA in Brazil.

Some factors that I think have a special role in promoting long-lasting learning:

a) planning the course around core learning objectives for the students;
b) designing the classes as to engage students and promote retention of knowledge;
c) acting on feedback from students and colleagues to improve my teaching.

Learning Objectives. "Our lessons, units, and courses should be logically inferred from the results sought". This quote is from [1, Chapter 1] where the concept of Backward Design is discussed. The main idea behind Backward Design is to begin any teaching planning by defining clear learning objectives for the students. This methodology facilitates the prioritization of topics, allowing us to remove inessential material and invest more time on the core concepts that we want students to retain. I always apply this method when preparing talks and lectures, for it helps me to make clearer presentations and to focus on the pieces of information that I would like the audience to take away.

Engaged Students. When carefully planned, expository lectures are very effective for presenting new concepts and information, especially in fundamental/theoretical courses. However, I believe that making an effort to diversify lectures and to introduce activities to engage students can have a positive impact on learning [2]. When designing lectures, I make sure to add at least one activity such as an in-class question or short demonstration. For a class on Quantization, I created a MATLAB demonstration in which I run a song through different quantizers and play the song for students to appreciate the effects of quantization. This demonstration is surprising for it shows that the song is distinguishable even when it is encoded using a single bit per audio sample. The engagement boost after the demonstration was evident and grabbed students' attention for the key mathematical proofs that followed.

Constructive Feedback. Even the most well planned and executed course can be improved by feedback from students and colleagues. It is essential to carefully listen students' feedback (What are their interests? Expectations? How to make lectures more engaging?) as well as seek feedback from colleagues (How do they teach? What are their thoughts on how you teach?). After the first instance of the Radio Lab a few students pointed out that the laboratory scripts were "too procedural". In the following year, I rewrote the scripts replacing some step-by-step instructions by hints and adding more links between theory and practice. The students' experience and feedback for the laboratory improved significantly. In fact, the third instance of the Radio Lab had no negative feedback.

I believe that it is important to continually look for ways of improving my teaching. From the experience in the teaching certificate program, I take more than the state-of-the-art in teaching methodologies, a key lesson was that there will always be plenty of room to improve as a teacher and I will only improve by actively seeking for feedback. I certainly welcome those learning opportunities in order to become a better teacher and researcher.

References

[1] G. Wiggins and J. McTighe, *Understanding by Design*. Pearson, expanded 2nd ed., 2005.

[2] C. E. Wieman, "Large-scale comparison of science teaching methods sends clear message," in *Proceedings of the National Academy of Sciences*, pp. 8319–8320, 2014.