# Ramakrishna Vedantam                  Teaching Statement

Interacting with, and moulding the next generation of researchers and professionals through teaching and mentorship is one of the principal draws of an academic career for me. As a teacher, I would summarize the modes of teaching I want to pursue as follows:

- **Slow learning**: An integral part of instruction for me is the old fashioned way of using a chalk and a board to explain concepts from scratch. This "slow" mode of teaching is (still) a very useful mode to engage deeply with the concepts at hand.

- **Fast Learning or Learning by playing**: Especially in computing, where one can play with concepts very quickly by simply simulating a program, there is a lot of understanding to be gained through quick experiments and open exploration, essentially "playing" in a sandbox to explore the subject matter.

- **Learning in groups**: In a university, it also makes sense to leverage peer learning to improve the instruction and content delivery. To that end, in courses I teach, I would want to host open discussion sessions, group projects and other collaborative exercises to enhance the effectiveness of the courses I teach.

## Teaching Experience

**Teaching at Facebook AI Research (FAIR).** At FAIR, we had the privilege of hosting residents in artificial intelligence for a one year program, where we often inducted promising students graduating from their undergraduate program, or researchers with Ph.D's in fields outside of machine learning (*e.g.,* neuroscience) to provide them a platform for bootstrapping their research careers in ML. I volunteered on multiple occasions to provide feedback on the structure of this program, and also taught lectures to the residents on the topic of Meta-Learning (or learning-to-learn). After one of the lectures a student messaged me internally:

*"I really enjoyed the lecture on Meta-Learning, I did not know that such cool techniques existed! I cannot wait to see how to apply it to my problem."*

**Graduate Teaching Experience.** During my masters program at Virginia Tech, I served as a graduate teaching assistant (GTA) twice for an introductory undergraduate level course on Computer Engineering (ECE[1] 2504). The course covers the foundations of hardware and software, including topics related to starting from digital logic circuits to assembly level programming. My duties and responsibilities included reviewing and grading assignments, conducting weekly lab sessions and, holding regular office hours to address any doubts or difficulties faced by the students. Interacting with students on a one-on-one basis to address and understand their doubts and difficulties was a really rewarding experience, and helped me appreciate that every student has a different point of view and perspectives they bring to a concept.

During my Ph.D. (Computer Science) at Georgia Tech, I also started and ran a reading group (for over 1.5 years) called "UnArXiv" where the idea was to study books and seminal papers in applied mathematics, optimization and machine learning. UnArXiv had a simple rule: namely that only whiteboard explanations of topics were allowed, and one was not supposed to use slides. The idea was that this would enable us as a group to delve more deeply into any equations or concepts

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[1]Electrical and Computer Engineering

as opposed to presenting topics in slides where one might feel a rush to finish the slide deck, or an equation might be animated all at once, or the audience might be reluctant to ask questions. In words of one of the students:

*"At UnArXiv, Rama would seed a discussion about how to perhaps connect two seemingly disparate topics or view them from a shared perspective. To this day, discussions at UnArXiv continue to influence my approach to research."*

**Mentorship.** I have had the privilege of mentoring two AI residents, and three summer interns during my tenure at FAIR. Further, I co-mentored two students on their projects at New York University (NYU) and another two students during graduate school. Eight out of the nine projects have led to publications at top-tier conferences in Machine Learning. Going beyond research, I enjoy engaging with my mentees holistically – understanding their motivations, strengths and weaknesses and taking a personalized approach to mentoring. One of my AI Residents Yann Dubois (who went on to start his Ph.D. at Stanford) wrote in his final feedback:

*"You recognized early on that I needed the space to make my own mistakes and come up with my own research ideas, while also always making time for thought-provoking discussions. This balance was important in allowing me to develop my skills and make progress in my research."*

*"Your care for my well-being as a person, not just as a researcher, meant a lot to me."*

One of my summer internship mentees Sirui Xie (a Ph.D. student at UCLA) wrote:

*"Your influence on me has been profound, and I believe that my current philosophy would not have developed without your inspiration. I am particularly aware of three dimensions of your influence: first, you helped me break free from the authorities of language; second, you taught me to reflect on what I can control; and third, you showed me the art of experimental design. These skills are not only important for me to be a better scientist, but also to be a better human being."*

Another AI resident I mentored, Daksh Idnani (current CTO of his startup) wrote about me:

*"Rama placed a strong emphasis on personal growth as a researcher. He provided regular feedback and guidance to help me develop my skills in ideation, systematic evaluation, and effective communication of our research. "*

Going somewhat against the grain of fast-paced AI research, I encourage my mentees to take time in understanding foundational issues they are engaging with, and to write high quality meaningful papers that stand the test of time. One of my summer interns, Karan Desai (a Ph.D. student at University of Michigan) writes:

*"Rama's mentoring style demonstrates his commitment to fostering a deep understanding of the fundamentals instead of merely rushing to achieve empirical results, a trend that is becoming increasingly common in the current fast-paced landscape of AI research. Rama believes that pursuing a disruptive research idea requires reading recent research papers as well as seminal papers and textbooks that have stood through the test of time – both are crucial, one cannot replace another."*

Daksh Indani writes:

*"Rama consistently encouraged me to think beyond the local research direction we were considering and to position our research within the related space of literature to come to a principled view of why our research direction was meaningful."*

Finally, I also connect my students and mentees with other colleagues and researchers to give

them a broader exposure to different research topics, researchers and their thought processes.

Karan Desai writes:

*"Rama invited me to his 1:1 interactions with senior AI researchers such as León Bottou, where I had the opportunity to pitch my work and receive direct feedback from them."*

Yann Dubois writes:

*"I also appreciated the way you connected me with other researchers at FAIR and helped me develop my peer-reviewer skills."*

**Undergraduate Teaching Experience.** I also had the opportunity to serve as a teaching assistant twice in my undergraduate studies at IIIT-Hyderabad – first as a lab instructor for an introductory course on Digital Logic and Processors (DLP), and second, for a course on "Introduction to Humanities". My responsibilities included grading assignments and, exams and, holding office hours to clarify any doubts that the students had.

I also started and ran an Entrepreneurship Cell (E-Cell) with a social-good mission at IIIT-Hyderabad (for an year). I was responsible for characterising the vision of E-cell and organizational aspects of getting the world out within the IIIT community, organizing guest lectures from socially focused entrepreneurs in Hyderabad, and field trips to nearby villages to foster awareness of issues on the ground. On one occasion we also visited an orphanage and interacted with kids who were staying there. This was one of the highlights of my undergraduate career.

**Academic Service and Mentorship.** Finally, I also view service activities such as area chairing and reviewing as teaching opportunities, to provide feedback and ideas to improve a submission (not just to critique it for the sake of it). My work as a reviewer has been awarded thrice with best reviewer citations (at ICLR 2021, ICCV 2019, and CVPR 2017). Moreover, I also participated as a mentor for the WiML (Women in Machine Learning) mentorship program to guide a Ph.D. aspirant with her Ph.D application process. I found this to be a thoroughly enjoyable experience.

## Future Courses

I am interested in teaching foundational courses on "Intro to Machine Learning" (covering Bishop and Murphy's textbooks), an introductory course on "Deep Learning" (covering the Goodfellow, Bengio and Courville textbook, with a primer into large language models (LLMs) and Transformer sequence models), as well as courses on "Computer Vision" (covering classical topics such as multiview reconstruction to more modern deep learning based approaches). I will also offer a more advanced course on "Vision and Language", covering developments over the past decade.

I would also like to teach seminar style courses covering the application level advances in "Multimodal AI and Foundation Models", as well as a foundational seminar-style course on the "Science of Deep Learning" covering empirical and theoretical efforts towards enhancing our understanding of deep learning, and generalization. I envison a part of the latter course to have a component that involves simple, accessibe demos that students can play with to gain insights, while the former course will have a project component for students to gain hands on experience in building prototypes.

As needed, I am also able to teach introductory courses on "Statistical Learning" (covering Hastie and Tibshriani), and advanced courses on "Machine Learning Theory" (covering Shalev-Schwartz and Ben-David), and "Information Theory and Machine Learning" covering McKay's book.