Teaching Statement

Leilani H. Gilpin (lgilpin@mit.edu)

My objective as an educator is to provide students with a **technical foundation** to be able to tackle difficult (high-impact, interdisciplinary) problems. My philosophy is that when students are **engaged** in learning, contribute to open-ended projects, and are provided with the opportunity to be **creative** in solving problems, they are **empowered** to be successful students.

Teaching Experience

Throughout my education, I have been a teaching assistant for **8 courses at the undergraduate and graduate level**. This included technical classes, with programming assignments and implementation-based projects, as well as more theoretical classes with proof-based assignments. My educational philosophy is to ensure that students have the **technical and theoretical intuition** to work on high-impact problems.

As a lecturer, I believe it is important to **start with an example** to provide intuition and motivate current problems. For example, as the lead instructor for "AI and Global Risks" every lecture started with a motivating problem; from autonomous vehicle accidents, to drone warfare. This engages students from the beginning, and the example provides a common theme and anchor for the remaining technical details of the lecture.

From my prior experience as a student and instructor, I believe having regular assignments and a **course project** ensure that students are **empowered** to master the material and become creative in problem solving. Since open-ended research can be difficult to manage, it is also essential that the course project has weekly check-ins and milestones that coincide with the course material. For example, in my "AI and Global Risks" course, lectures began by stating: *what we know*, by providing a literature review of the topic. I encouraged students to start their literature review for their project topic at that time. In more technical courses, I demonstrate the power of going through small examples when beginning large research projects. I take a similar approach when mentoring students.

I also believe that teaching is a 2-way process; when I give feedback to students, I also give them the opportunity to provide me with feedback. I uphold this philosophy in office hours, where I always try to ask the student if there is anything that I can help them with, or if they had a problem, what else would be helpful for them moving forward.

Experience with the Supervision of Undergraduate and Master's Students

As a PhD student, I mentored **11 undergraduate students**, 2 of which were thesis students. I also mentored **1 master's student**, and **co-authored 2 papers** with these students, one of which was a full journal paper [3].

As a preliminary supervisor, I start students with a small piece of an ongoing research project. I provide them the technical documentation or latest paper, and we will discuss together after they review the code and/or paper. I also make sure that in the beginning, we tackle technical problems together, since I want to be sure they feel supported (especially technically). For example, with SuperUROP Evelyn Floretine, she and I reviewed the existing reasonableness monitoring [1] system together, and we worked together to fix a small software bug. After she was familiar with the system, I provided her a small part of the

system to work on herself, and we met weekly to discuss progress, blockers and other aspects of the research progress. Evelyn contributed to a journal paper on the system [3], and she was the lead on evaluating the system.

I also have experience leading large groups. I worked with a small group of undergrads on a group project during IAP/spring 2018, and I lead our review paper on explanations: a joint effort among 6 authors [2], which is widely cited in the field. I have also started and lead **3 discussion groups**: the machine learning interpretability reading group, the privacy, security, and policy (PSP) research meeting, and the AI and ethics reading group.

Future Courses

I believe the key to producing impactful research is being able to teach the findings. Many of my research contributions are interdisciplinary: between computer science and society. I am particularly interested in co-instructing courses or providing the technical instruction for an ethical, policy, or societal-based course. Given my technical work in explanatory artificial intelligence, I could teach the introduction and graduate courses in artificial intelligence theory and/or implementation. I also utilize techniques from discrete mathematics and reasoning, and would be able to teach courses in discrete math, commonsense reasoning, and knowledge representation. As an interdisciplinary researcher, I could also co-teach courses on narrative intelligence, cognitive modeling, or explanation-based methods.

I am also interested in developing seminar courses. As outlined above, I have a strong interest in engaging undergraduates in research projects and will encourage students to conduct **independent studies** in my lab to gain research experience. Finally, I'm open to teach basic introductory courses; I have tutored many introductory computer sciences, and many of these techniques are fundamental parts of my research agenda.

Overview of Mentored Students

Unless explicitly stated, all students are co-advised with Gerald Jay Sussman.

Thesis students (12+ month fulltime student)

Tianye Chen	MIT MEng : 2018-2019 (co-advised with Lalana Kagal)
Evelyn Florentine	MIT SuperUROP : 2017-2018
Zoe Lu	MIT SuperUROP : 2017-2018

Research project students (6 month semester course)

Vishnu S Penubarthi	MIT UROP: Fall 2019, IAP/Spring 2020
Marla E. Odell	MIT UROP: Spring 2019
Elizabeth Han	MIT UROP: Spring 2019
Obada Alkhatib	MIT UROP: IAP/Spring 2018
Michal Reda	MIT UROP: IAP/Spring 2018
Ishan Pakuwal	MIT UROP: IAP/Spring 2018
Matthew Kalinowski	MIT UAP: Spring 2017 (co-advised by Danny Weitzner)

Other Advising

Yunxing (Lucy) Liao	MIT UROP: IAP 2019
Project Mentor	MIT 6.805 : Fall 2017 (Foundations of Information Policy)
Project Mentor	MIT 6.805 : Fall 2016 (Foundations of Information Policy)

Overview of Teaching Experience

Lead Instructor

MIT	Artificial Intelligence and Global Risks (IAP 2018)
Stanford University	SMASH Institute - Calculus (Summer 2015)

Lectures

MIT 6.905/6.945: Large-scale Symbolic Systems
MIT 6.S978: Privacy Legislation in Practice: Law and Technology

Teaching Assistant

MIT	6.905/6.945 : Large-scale Symbolic Systems
Stanford University	CS 348A : Geometric Modeling (PhD Level Course)
UC San Diego	COGS 5A (beginning java), CSE 8A/8B (beginning java), CSE 5A (beginning C), CSE 21 (discrete mathematics), CSE 100 (Advanced Data Structures), CSE 101 (Algorithms)

References

[1] Leilani H. Gilpin. Reasonableness monitors. In *Thirty-Second AAAI Conference on Artificial Intelligence*, 2018.

[2] Leilani H. Gilpin, David Bau, Ben Z Yuan, Ayesha Bajwa, Michael Specter, and Lalana Kagal. Explaining explanations: An overview of interpretability of machine learning. In *2018 IEEE 5th International Conference on data science and advanced analytics (DSAA)*, pages 80–89. IEEE, 2018.

[3] Leilani H. Gilpin, Jamie C. Macbeth, and Evelyn Florentine. Monitoring scene understanders with conceptual primitive decomposition and commonsense knowledge. *Advances in Cognitive Systems*, 6, 2018.