# Teaching Statement

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July 6, 2025

My past experiences of serving as a faculty member at UC Davis and USC, postdoctoral training at UPenn and doctoral study at UCLA have formed my principles of teaching and mentoring, and have strengthened my resolve to inspire the younger generations to contribute to the advancement of computer science. As a research mentor and lab director, I have accumulated substantial experiences in creating a collaborative lab environment and advising different levels of students to conduct successful and impactful research. As a course instructor, I practiced with innovative teaching methodologies through both in-class teaching in the university and cutting-edge tutorials at major conferences. The rest of this statement summarizes these experiences that have led to my teaching philosophy, as well as my plan about what I envision to teach.

## 1 Research Mentoring

My goal of mentoring students has been to foster their personal development into fully independent researchers who could make groundbreaking contributions to their fields. During the past five years, I have established the Language Understanding and Knowledge Acquisition (LUKA) Lab, which has become one of the leading university labs focusing on robustness and safety issues of LLMs and NLP systems. The lab has so far graduated five PhD students. Three of the PhD graduates join Google Deepmind as research scientists, one joined Meta as a research scientist, and one joined Oracle as a machine learning scientist. The lab is currently hosting nine PhD students. As a research mentor, I focus on cultivating their self-motivation, encouraging them to identify practical solutions to scientifically meaningful problems through critical thinking, and training them to present their research outcomes in a professional way. As a lab director, I emphasize on peer-teaching and mutual learning with the students. Following are some examples I would give to illustrate my philosophy of mentoring.

Besides mentoring PhD students, my practice on developing *self-motivated research* can be particularly exemplified with my past experience of working with more junior students in the undergraduate and Master's levels. I worked closely with these junior student researchers, starting from gathering the background knowledge, brainstorming with them to formulate new problems, to experimental design for the attempted solutions. Particularly, I focus on cultivating their interest in cutting-edge research, creating the momentum of seeking for novel solutions and sharing new ideas, and building their confidence in making in-dept investigation like PhD students. Through this mentoring process, eight of the undergraduate students and three M.S. students have published as the first authors at top-tier NLP/AI conferences or journals. These junior mentees have won three Provost's Fellowship, four CURVE Fellowship, one Hertz Fellowship, and one honorable mention for the CRA Outstanding Undergraduate Research Award.

*Peer-teaching* is a process that I particularly promote in my lab. In every of our weekly group meetings, I always let all PhD students share their views about one or two papers they recently read, and on their recent research progress using two brief pages of slides. Through this efficient paper and progress sharing process, the ideas and thoughts brought by one student often inspire other students to improve their research. Besides, while every student has their own focused research problems, I often coordinate to let multiple students sharing relevant research interests (not limited to those in our own group, but sometimes including external collaborators) synchronize their work in smaller groups. This allows students to bring different expertise and complementary knowledge to the discussions, and often leads to solid and comprehensive solutions to challenging problems. One example could be our previous work on indirect supervision from summarization

for relation extraction tasks,[1] where distinct members of the team contributed respectively with expertise of information extraction, abstractive summarization and constrained generation to collaboratively produce an efficient and generalizable relation extraction system. Moreover, I also intend to team up junior student researchers with PhD students. This allows less experienced junior students to quickly learn about research from PhD students, while providing to PhD students the practice for mentoring younger peers.

In addition, I always pay attention to *mutual learning* with students. I believe that every meeting for project discussion and paper sharing is a chance to learn about recent advancements in the field. The discussions about literature, assessment about research problems, and analyses on experimental results with students are all important mutual learning opportunities where we collaboratively think about problem settings, dig into technical details of new methods, and discover noteworthy phenomenon reflected in experiments. Mutual learning has been particularly important when I co-advise students in other areas, such as medicine and biology. Through instructing these students about my own discoveries in NLP and machine learning, I also learn from them about important problems in genomics, proteomics and clinical diagnostics. This mutual learning process has eventually leads to successful interdisciplinary research published in *Bioinformatics*, *NAR Geonomics and Bioinformatics*, and *JBI*.

## 2 Teaching Experience and Plan

The goal of teaching is to help students internalize the disciplinary knowledge in a coherent, explicit and systematical way. In my experience, three factors are particularly important. First, materials and instruction should always ensure high-level understanding. Second, interactions should be actively made inside and outside the class. Last, the instructor should always encourage students to learn and think beyond classroom contents. In addition, I have a keen interest in experimenting with innovative methodologies of teaching, and teaching students about both the history and the new frontier of the field.

I had several opportunities to practice the above principles of teaching. I have been teaching NLP and Machine Learning courses presently at UC Davis, and previously at USC prior to Fall 2023, all of which have received at least 4.2 out of 5.0 in student reviews. In addition to in-class teaching, I have also organized eight tutorials at AAAI, ACL, EMNLP, NAACL and KDD conferences, where I lectured about new advancements in information extraction, event-centric NLP, transferable representation learning, and bridging between NLP and tabular data. The in-class teaching and conference tutorial experiences have made me well-prepared for transmitting knowledge to both newcomers and colleagues in the field.

In my experiences of teaching, I have always aimed at encouraging students to learn beyond the classroom contents. I believe teaching one course should be accompanied with helping students practice with their knowledge in real-world problems, and extending the students' further studies. When teaching NLP, in addition to lecturing about foundations and advancement of NLP technologies in the past 30 years, I also introduced leading research in various areas of NLP in the past three years, such as robust and minimally supervised NLP, machine commonsense, knowledge incorporated language modeling, and narrative understanding, which are typically not covered by many existing NLP course materials. I gave students creative and exploratory course assignments such as ciphertext classification and preconditioned commonsense reasoning. One unique teaching approach I have made is to organize in-class workshops, which encouraged students to do creative research and share their work with others through poster and oral presentations. A few of the students were in fact motivated to participate in lab research, and further expanded their interest towards individual research projects and paper publications, as I have mentioned in the Research Mentoring section.

Another of my assets for teaching is the ability to make sophisticated technical contents accessible to audiences without much related background. This skill has partly reflected in my current lecturing experiences on the NLP course. I found it important to help the students build a high-level picture of what they

[1] Luke Lu, I-Hung Hsu, Wenxuan Zhou, Mingyu Derek Ma, Muhao Chen. Summarization as Indirect Supervision for Relation Extraction. **EMNLP**, 2022

have learned in the class. One way to realize this is to describe a couple of real-world problems related to the course subject at the beginning. This could later serve as concrete running examples along the instruction, and help the students put what they had just learned into a clear context. Besides, I always seek to explain the intuitions behind the concepts before going through rigorous definitions or proofs. While technical details and abstract concepts are harder to manifest and easy to forget, the intuitions can establish a lasting impression to the students, giving a reference to the knowledge system in their mind. Moreover, it has been beneficial to connect any new, less accessible contents to what the audience are already familiar with. For example, when introducing *domain adaptation* in *multi-species genomic data analysis* in the AAAI-20 tutorial, I referred to the analogous approaches on cross-lingual transfer learning for low-resource languages, which were generally better known to the audience.

My research focuses on NLP, data-driven machine learning, and knowledge discovery and management. I envision to teach courses related to these areas at various levels of depth. I have taught the following courses since I became a faculty member:

- ECS 289G: Advanced Natural Language Processing. Enrollment: around 40
- ECS 271 Machine Learning & Discovery. Enrollment: around 40
- CSCI 544 Applied Natural Language Processing (at USC). Enrollment: over 300

I am also enthusiastic about developing undergraduate-level NLP or graduate-level LLM courses that are still rarely instructed by departments. I am also willing to teach undergraduate and graduate level courses in machine learning, artificial intelligence, data mining and knowledge discovery. In addition, I am also interested in teaching more advanced topics such transfer learning, information extraction, knowledge base construction, and scalable learning systems.