Teaching Statement

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Classroom Pedagogy

I have taught a graduate level natural language processing (NLP) survey course at USC annually since 2017. In 2017 and 2018 I taught CSCI 544, a course aimed at masters students, with an enrollment between 200 and 300 each year. Starting in 2019 I taught CSCI 662, which is similar in scope to 544 but is aimed at PhD students. While the syllabus of these classes has been nominally the same, the actual content studied has changed tremendously, mirroring the growth of and radical changes to our field during this era. My general approach to teaching is orthogonal to the specific content and level, thus in the following I will primarily speak about CSCI 662, and will note changes relevant to other levels afterward.

The primary function of formal classes for adults at the university level is to enable self-learning of a topic, especially if that topic, like NLP, is rapidly evolving. My role, then, is to guide this self-learning by presenting a logical organization of the material. For NLP specifically, this has evolved over the time I have taught the class. In 2017, a reasonable organization introduced topics in a linguistic hierarchy, from data processing to syntax to semantics and ultimately to higher-order comprehension. At each stage in the hierarchy different algorithms and approaches were dominant; I introduced each in turn. In 2024, however, the notion of tasks is less distinct and nearly all approaches use the same core paradigm, so an explanation of Transformers (with suitable background) and language model training precedes a survey of applications.

Beyond organization, I provide perspective, so that when learners engage on their own they have suitable context to understand what otherwise may be mystifying topics.[1] I then highlight the key curiosities and difficulties that newcomers to the topic may encounter,[2] and provide non-obvious connections between topics that may be missing from literature as well as a personal perspective from my extensive experience working in this area.

My approach to evaluation must necessarily shift with the class level. For 662, the main focus of the PhD students in class is to conduct research, and thus heavy focus is on communicating ideas effectively, rather than recalling facts. It is also important to engage concretely with models, and to recognize the open-ended nature of research. Thus, homework assignments, which are reproductions of core models, involve coding and data processing in order to produce reasonable results, but the writeups are presented as research papers, and are graded as much on whether the material is appropriately presented as whether the work determines that the student understood the material. Students present overviews of current research papers, with mandatory Socratic questioning incorporated, so that the students are held responsible for reading their peers' material as well as understanding it well enough to discuss it extemporaneously. A group project makes up a significant portion of the grade, but the topic is not open-ended. Instead, a reproduction study of a paper from a recent conference is mandated,

[1] As an example, the topic of 'natural language inference' sounds very general but is almost always understood to mean the specific task of 'textual entailment', which itself has a very specific framing that needs explanation.

[2] For example, the shift in meaning of the terms 'alignment' and 'tuning' over the past decade

with an option to build on top of the reproduction. As most research is conducted by building off of prior work, I find this to be a usefully controllable examination of research ability.

Common to all graded material is a required 'extra mile' component which encourages students to build upon the prescribed work but in an open-ended way, such as implementing features beyond those required in a homework, or describing a connection between seemingly unrelated areas in a project writeup. The non-PhD students who take the class find this part especially bewildering, since they are used to exacting standards of what to do and how many points they'll receive for it, which is exactly the top-down pedagogy that must be abandoned at the PhD level. To ease these students and younger PhD students into the realm of research, the open-ended nature of my approach encourages creativity. The class has been described as challenging, though it is well-liked, receiving a mean of 3.665 out of 4 averaged across evaluation categories in the six years I have taught it.[3] Students have said it was 'the best class [they] took at USC,' specifically praising my lecture style, and that they learned critical skills unavailable elsewhere, that they still use in their research. In separate evaluation, I have received a mean of 4.48 out of 5 for my abilities.

At the Masters level, the class size and primary focus on non-research preparation necessitates more practical, leaderboard-based approaches, as well as exams that have fact-based components. In 2017 and 2018 students had around six homework assignments, which were a mix of programming assignments and fact-based recall that prepared them for the midterm and final exams, which largely focused on the understanding of core algorithms and concepts. I have incorporated research projects into the class before, and would do so again as an option, as a significant portion of MS students are excited to do research as part of their curriculum, though the larger scale will require a poster presentation with peer grading as an alternative to the traditional grading approach.

While I have not taught an undergraduate class, I have guest lectured on NLP topics in USC's Intro to Machine Learning, and have had undergraduates take my class in the past. It is advantageous to have smaller class sizes, as at this level the students benefit from asking many questions, and I have found that undergraduates are usually very eager to participate. I would enjoy teaching NLP at any level as well as fundamental classes like undergraduate Machine Learning (CMSC422) or Artificial Intelligence (CMSC421). Despite dramatic improvements in AI systems over the past decade, a solid foundation in fundamental principles such as planning, search, and linear models is important to understand modern techniques and emerging principles. As I do in my current class, I will incorporate ethical issues early on in the course, rather than at the end, so that they may be revisited as applications are discussed throughout, and I will include open-ended questions about ethical behaviors within the homeworks and exams, to encourage students to think deeply and consistently about the effects of the models they are learning how to build.

Going forward I would like to teach a PhD seminar on the predictive ability of natural language from human biological readings, a.k.a. 'mind-reading.' This is an active area of research and long-time fascination of mine, but is generally approached from the neuroscience and cognitive science perspective (e.g. USC's PSYC 626; the closest I could find at UMD is LING 646, though I was unable to learn too much about that class). I would like to approach it from a computer science perspective while also giving

[3] USC asks students to evaluate classes from 1 to 4 in each of five categories: Course Design, Instructional Practices, Inclusion Practices, Assessment Practices, and Course Impact. In 2024, as an example, the average of rating in those categories, respectively, was 3.74, 3.68. 3.59. 3.72, and 3.56, for an overall course average of 3.66. 2024 was a pretty typical year for me!

advanced cs students a window into the different ways research questions are posed in this area. I would use the 'role-playing' approach[4] where students focus on one paper at a time but take on different roles (e.g. 'archaeologist', 'hacker'). This format will enable deep dives on top-quality pre-selected papers and pedagogically will expose students to all the hats they have to wear as researchers.

Mentoring

I have supervised four PhD theses: Xusen Yin (2021), Nada Aldarrab (2022), Thamme Gowda (2022), and Meryem M'Hamdi (2023); three others will graduate soon: Alex Spangher (co-advised by Emilio Ferrara), Mozhdeh Gheini, and Justin Cho. I have also informally advised about ten MS students, both in research and as student workers contributing to grants with deliverables. My general goal is to provide mentees with a framework for producing effective research, outlining the key components. These are technical ability (coding, algorithmic design, debugging), synthesis of information (finding and reading prior work), vision (Why are we working on this experiment? How does this research connect to other research?), and communication (writing and speaking at the correct level of detail for the audience, structuring a narrative, creation of visualizations that present the right message). Everyone has natural strengths in some areas and room to grow in others; my job is to identify these and encourage mentees to lead with their strength areas while honing their growth areas.

The best way to accomplish this is through dialogue. Simply put, I want to know about my students' progress on a regular basis, and I treat this as a time for me to push on aspects that they aren't communicating well by suggesting how a figure may be re-made to get the right point across or a more thorough explanation of an algorithm is important to convey that they understand the work well enough to transmit it. I try to meet with each student privately each week, and encourage them to not skip weeks even if they feel they have not made progress, since doing so increases their perceived pressure to have grand accomplishments the next week, creating a vicious cycle. I eschew the hub-and-spoke group meeting approach, and instead the team chooses weeks to be leaders of the group meeting at the beginning of the semester. During the meeting, we discuss in-progress work, random ideas, interesting work by others, or really anything the leader wants. My goal is to encourage exploration and the pursuit of audacious, hopeless goals in that meeting, to get creative juices flowing and recapture the sense of wonder that encouraged us all to get into academia in the first place.

[4] e.g. https://colinraffel.com/blog/role-playing-seminar.html