Abstract

Given the increased use of technology in education outside MLD, the increase in the breadth and depth of courses offered in MLD, and the repeated discovery of bright ideas by generations of professors and teaching assistants, it would be useful to have a serious discussion with interested students and professors (aka a committee) about these issues. A possible aim would be (at the very least) to provide constructive suggestions and channeling of ideas to new professors and new TAs when they teach new courses or adopt new methodology, and possibly (at the very most) change the content and structure of courses offered in the department, keeping in mind the aims of the MLD PhD program.

1 Introduction and Motivation

How It All Began. I was a TA for Convex Optimization, a course which had all the right flavors of a great graduate student course - it was taught by great professors, they were planning to teach sufficiently recent material, we were planning to emphasize both theory and practice in the assignments and projects, a large number of students from many departments had registered, the TAs created challenging new problem sets and an exam from scratch and also got the chance to give a full lecture on an advanced topic, the course content was made available online through the lecture slides, scribed notes by students and a video uploaded to Youtube, two recitations were scheduled every week with the same material, and office hours staggered through the week for the whole course staff.

Mixed Responses. However, as the course progressed, we got all kinds of feedback from the students, and while a lot of it was good, I choose to focus on the negatives. Many students dropped the course at different points in time for a variety of reasons. Those who stuck on often found themselves spending too much time on assignments. Many were not able to align their projects with research and felt burdened through the semester. Others did not have company to solve the assignments, review course material or team up with for
the project. Some felt that they did not have the prerequisite mathematical background for
the course. Many felt that the assignments were too tilted towards theory, and many of the
classes as well. There was mixed feedback about the usefulness of slides, scribes and videos
(it was about evenly split on which they found most useful).

Recreating Old Knowledge. All in all, after discussing various aspects of the class with
other TAs, professors and students, the entire experience of being a TA has definitely made
me understand aspects of teaching and education that weren’t apparent before and we had
many new ideas and suggestions for the next offering of the course. However, much of
this knowledge is recreated - every time a student TAs a course, they probably realize that
something should change in the next offering of the course, but this is not shared with other
professors, other TAs, and there is presently no structure for discussing a lot of these ideas
at a larger scale (and hence the adoption of new ideas and their diffusion is very slow and
strangled), and that is what I wish to address in this document.

2 Ideas Worth Discussing

Splitting Courses from Projects Presently most of our courses are 12 credits, and many
students from ML and other departments want to take these courses out of interest even
when they aren’t directly related to their research. It might be easier on everyone if we offer
the standard course minus project for 9 credits, and a lab-version solely for the project for
3 credits. This way those who want to do a project and can fit it in with their research and
time constraints, can still do so, but others will not be forced to audit or drop.

Making Videography Easy Having the lectures online can be a boon to everyone taking
the course. Students who’re ahead of the course like the freedom of skipping through parts
of lectures they know well, and students who’re behind like the ability to go back and listen
to professors repeat an interesting argument. While hiring professional videographers is
expensive, professors can do it themselves fairly easily. Perhaps the department could buy a
handful of video cameras and tripods, and occasionally have a faculty member give a tutorial
to the rest demonstrating how easy it is to take class videos and delete small parts of the
video using standard software.

Getting Students up to Speed Many courses have prerequisites and most often these
are just mentioned as some other courses that students should be familiar with. Instead, a
much more constructive idea would be to provide links to tutorials on specific topics, provide
links to videos from old offerings of the course (possibly from other universities), provide a
mini-exam of basic easy questions that one should know how to solve and terminology that
one should be familiar with. This should become a standard in all courses.
The Role of Slides  Often, professors go much faster when they have slides than if they had to write stuff on a blackboard. It is said that the time taken to write it down is the time the class takes to read it and digest it. It is also far easier to catch typos, gaps in reasoning or subtleties in an argument when it is written slowly. That said, it is easier to display images and animations and graphs and code on slides. Professors and students who’ve sat through courses recently should sit together and figure out the sweet spot.

The Role of Technology  Being a top tech school, we should be the first to experiment with new technology for education and promote the adoption of new teaching techniques. Should time be spent creating applets that repeatedly test basic concepts (taking the dual of an LP, calculating p-values or confidence intervals, etc)? Should we invert the method of teaching by making students watch short videos online and solving problems in class?

Basic Course + Advanced Seminar  If courses start to get too many registered students with varied backgrounds and have large course material to cover, it might be worth splitting it into a basic course in one semester, and an advanced seminar in the next. The advantage of this is that only the really interested students (smaller in number) would want to dig through proofs and discuss advanced topics, and it can be implemented without the hassles of a full fledged course (no homeworks, no exams, no TAs, no office hours, etc).

Discussion of Course Contents  It is my impression that most professors don’t know what kind of material is covered in many courses that they don’t themselves offer, and most students don’t know what kind of material is covered in many courses that they haven’t taken. This sometimes results in crucial topics being under-addressed (important but nobody knows that nobody taught it). This could be solved by an easily accessible public webpage listing all courses offered in the last five years, with an abstract of covered topics and a link to the course webpage. This could be skimmed and discussed in faculty meetings and referred to by students searching for electives or by professors who want to offer a new course.

Crediting and Auditing  Many crediting students who feel overloaded, tend to drop the course and stop attending rather than converting to an audit and attending lectures. This might be because they don’t know that they can convert to an audit even later in the semester, and if this is not allowed in general, perhaps we should remove obstacles to converting late to an audit, if we are interested in disseminating knowledge and accommodating those with differing schedules. On the other extreme, I personally know auditing students who did not attend a single lecture, do a single homework, scribe, take the exam or do the project. If this is bothersome, effort should be made in every course to make auditing students participate in some fashion (give them the choice to do one assignment, take an exam, be part of a project group, etc).
3 Issues Worth Discussing

The Purpose of ML Journal Club  It is my impression that while students feel that giving talks and listening to other talks in the ML Journal Club is helpful and useful, nobody really wants to take the course (and definitely not twice). Perhaps there should be a discussion about what the purpose of that course is, and how its structure can be changed while making it more interesting for the students (the fact that there is compulsory attendance is evidence that students wouldn’t otherwise attend). For example, if each person was made to teach a should-know topic in ML by giving an hour long tutorial, then they’d have practice speaking to an audience, but also the students may really want to attend to sharpen their understanding of different topics and would genuinely gain something.

The Purpose of ML Lunch  It is perhaps wrong to compare different communities with different cultures, but it is my impression that the talks at Theory Lunch are of far higher quality that ML Lunch. A large number of faculty attend theory lunch, ask interesting questions, spark discussions that other professors or students in the audience sometimes participate in, and it leads to a much clearer talk. ML lunches are characterized by complete absence of professors (unless the speaker is a visitor), the rustling of Quiznos packets for half an hour followed by silence for the next half, a lack of discussion or questions or comments or clarifications, and an overall poor experience. It is my opinion that if faculty started attending and participating in talks (at least those remotely in their area), then the entire community would gain from ML Lunches.

The Purpose of ML Tea  It is my impression that while ML Tea is fun, it does not meet its purpose. It seems to be the only avenue for students to meet professors casually and gain advice from different professors about classes, research, internships, projects, theses, post-docs, writing grants, etc as well as chat about politics, holidays, family, sports, books, etc. However, this doesn’t happen because students seem to congregate into familiar groups, and professors don’t attend or make efforts to break the ice with students.

The Purpose of Compulsory Courses  One could conjecture that if the courses are structured well, with good content and relevant material, students will automatically take the compulsory courses without being forced. Since they have to take 8 PhD level courses, they will probably end up taking most of the required courses anyway. The problem with compulsory courses is the decision of what should be compulsory and why exactly it should be chosen over another. For example, one could ask why Convex Optimization or Probabilistic Graphical Models are not compulsory and why Graduate Algorithms or Databases had more relevant breadth material, independent of the student in question? This is repeatedly discussed among CS grad students where there is a much larger amount of discontent (enough to make me and others shift out of CSD) but is worth discussing here too.