Reflections on Videos

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1 Motivation and Content Choice

Each semester, close to 400 students attempt to take the introduction to machine learning classes for graduate students (at the masters and PhD level). These students come from varying mathematical backgrounds from around the world. Recently, a self-test was created for the students to see if they were comfortable with the pre-requisites for the course.

The start of the semester is very hectic, and students have often decided that they want to take this class (for whatever reason - compulsory course required by their departments, their last semester at CMU, the hype of machine learning, etc). Not all students take the self-test, and among those who do, students that are not comfortable with some of the material have nowhere to go to refresh their memories.

These videos were meant to be a short quick review (almost a reminder) of some of the basic material that they should have learned in their undergraduate classes. Two of these topics (multivariate calculus and probability) are good for reviewing at the beginning of the semester (a total of 6 short videos, 3 on each topic, totaling less than 1.5 hours). The other two topics (real/functional analysis, singular value decomposition) are good for reviewing in the middle of the semester, once they have committed to taking the course (again, a total of 6 short videos, 3 on each topic, totaling less than 1.5 hours).

These videos recap a large amount of content in a short span of time - such are the constraints we decided upon are most reasonable - we thought students would be unlikely to watch videos spanning hours and hours in total, but they still need to recollect a large amount of material given the breadth of topics that machine learning touches upon.

We anticipate that the students would feel more comfortable taking the self test and the course after watching the videos on the first two topics, than they did before seeing these videos. Also, we anticipate that the load on the TAs and instructors will go down, allowing the course to run more smoothly because the students would be on a slightly more even footing, and instructors can assume a basic common level of knowledge when starting the course (a wrong assumption, that will now hopefully be more correct than before).
2 Reflection

Creating videos was harder than I thought. Even if the video itself is 10-15 minutes, I found that a lot of time goes in

1. Deciding exact content from broad topics (which were clear).
2. Researching content, creating the slides from scratch.
3. Thinking about the best ways to explain something succinctly.
4. Recording the videos, and re-recording parts of videos.
5. Post-processing or editing videos, and re-watching them to see the flow.
6. Uploading to Youtube, creating playlists, and maintaining a website.
7. Following up with errata, keeping track of statistics, promoting their use.

I would say in total, each 10-15 minute video took several hours of preparation and management. This was more than I had initially expected and budgeted.

If I was to teach a course in Machine Learning, I would make it clear on the first day of classes that the material reviewed in the videos (and on the self test) will be so frequently used in classes that it is absolutely essential that students not only know the material but are also comfortable with it. I would make it clear that being graduate students, a large chunk of responsibility lies with them to ensure that they are taking a course that they have sufficient technical proficiency to successfully complete.

I would even consider making the self-test compulsory to submit at the beginning of the second day of class, for no grade, and spend a large chunk of the first class discussing these pre-requisites and perhaps outlining what these videos contain, reducing the barrier to actually viewing them. I would make sure my first week’s recitation also referred to material from multivariate calculus, probability and linear algebra, so that by the end of the first week (due to videos, self-tests, recitations and class) the students are indeed ready to dive into the details of the course.

Some may feel that too much time and emphasis is being placed on pre-requisite material - the fall semester is short and an entire week dedicated to this purpose is excessive. However, it is my opinion that it is better for the majority of students have a competent understanding in slightly fewer topics than to rush through a course with a large number of students being lost in the class. In fact, once the students have a sense of confidence (rather than fear) in their own technical abilities, I would anticipate more students spending time on their own learning more advanced material out of their own interest.

Overall, making these videos has been a great experience to think more deeply about the purpose and process of imparting knowledge and will definitely help me grow as a teacher.