Teaching Methodology

Teaching in a university should serve at least the following purposes: (a) knowledge sharing, (b) student mentoring, (c) self enrichment, and (d) complementation to research.

Preparing lectures is one of the crucial components in knowledge sharing. Typically, diverse educational backgrounds of the students pose a tremendous challenge. In my “Introduction to Machine Learning” course, I had students from different disciplines of engineering as well as science. To complicate the matter further, the course demanded a fair amount of mathematical, statistical and computational skills as prerequisite. Although the students were required to have preliminary introduction on these subjects, practical teaching experiences suggest that majority of the students almost always have a gap in understanding these basic requirements. Thus, I had to carefully design some background materials. As background materials can be a distraction for students as well as a time killer, I preferred to divide these materials into several segments and I delivered them right when such a segment was required for a particular topic. This way the distractions for the students were minimized and the lecture materials did not feel bumpy.

I prefer to deliver lectures principally by powerpoint presentations, because my experiences suggest that this mode has at least two advantages. First, I save a significant amount of time by not using the white board that maximizes the breadth of the class materials being covered. Second, my students also prefer this mode as they can familiarize themselves with the materials beforehand. In algorithm-centric classes or where there is more intense theory to be assimilated by the learner, a supplementary chalk-and-talk methodology helps in addition to the powerpoint slides. In a mature class, especially towards the second half of the term/semester, a few topics/papers can be chosen to be presented by the learners either individually or in groups to have a grasp on the particular depths. Here, the teacher plays the role of a mentor. For an advanced learner, lecture notes in abbreviated form help to grasp the subject matter quickly. Then, an advanced student can get back to details as and when necessary using appropriate references. Spoon-fed notes are avoided to help develop the culture of self inculcation among the students.

I have found that recapitulation/repetition of course materials is an excellent tool for teaching. I typically try use two modes whenever possible: continuation of present homework assignments with the past ones and class recapitulation in terms of quizzes and/or relevant laboratory work. Course projects (for senior undergraduate and graduate courses) are a means (albeit limited) of recapitulations of the course materials. Course projects also serve an excellent purpose for preparing students toward research of their interests. The students face the difficulty of solving large scale/real-life problems. Such exposure broadens the scope of teaching and experiences of the students.

In my experience, both the students and the instructor are most benefitted when teaching is complementary to research. Because of the hands on experience of the instructor with the subject materials, students receive practical advises and guidance that in turn makes student mentoring very effective. Creation of innovative course materials becomes less demanding for the instructor.

I believe that teaching is an excellent opportunity for knowledge exploration by which a researcher (here, the teacher) expands his or her own horizon. My own experience stands as concrete evidence for this belief. Although I am an image analysis and computer vision researcher, I ventured into teaching machine learning. Through this unique teaching experience, I found several key connections and applications in my research areas. A direct consequence is that I have designed and taught a graduate level course: Applications of Machine Learning in Image Analysis. Some of my advisee students and I are now involved in exploring the scope of machine learning in various image analysis applications. Thus, to me, teaching is a superb way toward self enrichment.

I believe my teaching to a class is successful when my knowledge of the subject matter prior to my teaching the same class has increased. This comes from tough questions/problems I have to face from the students on the topic, different views or perspective or way of thinking that students may have on a topic compared to mine or the ones in the text book, fresh ideas from the students and so on.

Teaching is an iterative learning process. Student feedback plays an important role here. Several key questions arise: how frequently should an instructor receive the feedback? How should the feedbacks be received – in terms of formal evaluations or with informal suggestions? How to analyze student feedback toward motivating students in the best possible way? How do I know if my students have received the right message I have intended to deliver? At this stage of my teaching career I am still exploring and experimenting with this learning process.