Ata Turk - Teaching Statement

Overview

I believe teaching is a vital ingredient of a successful academic career in computer science and engineering, as it strengthens the ability to track and stay up-to-date with recent developments in our field. As such, I challenge myself to improve my teaching constantly.

I had the opportunity to gain experience both in ***curriculum development*** and ***in-class teaching*** during my PhD and postdoctoral researcher positions. During my PhD in Bilkent University, I ***helped in designing a senior/graduate-level course on Algorithms*** and served a TA for a variety of courses including Algorithms, Distributed Systems, Data Structures, Operating Systems, Algorithms and Programming, and Database Systems. As a postdoctoral researcher in Boston University, I ***co-designed a senior/graduate-level course on Cloud Computing*** and I have been ***co-teaching the Cloud Computing course for the last three years***. I also designed programming projects for the senior/graduate-level Advanced Data Structures course and evaluated these projects.

I believe in fostering engaging teaching environments by utilizing ***active learning*** and ***just-in-time teaching*** techniques. As such, I engineered ***student-led teaching practices*** and ***early in-class evaluation mechanisms*** into the courses I helped design. I also believe that computer science and engineering is a field that provides ample opportunities to connect fundamental science and engineering knowledge with real-life applications. Therefore, I opt to adopt ***project-oriented course designs*** with ***hands-on experience opportunities***. Feedback from students about these teaching philosophies has been very positive so far.

Teaching Approach

I start teaching with a broad view of the subject field to contextualize the topics to be covered and to provide perspective and motivation. For example at the beginning of my cloud computing course I explain the set of problems companies like Google, Facebook, Yahoo, and Amazon have to address to be able to provide their services. I refer back to the top-down look to the course at the beginning of each class to put the topic of the day into context. For each topic, I cover the fundamentals in detail so as to establish a firm ground for students to rely on. I utilize carefully prepared slides combined with planned questions and discussion points to initiate engagement.

I strongly believe in the value of ***hands-on application of the learned topics*** and imbue courses I design/teach with projects/homeworks that connects covered subjects with their real-life applications. For example, for the cloud computing course, my co-instructors and I introduced projects offered by industry mentors where student teams build a product that lives in the cloud. Students were asked to prepare short ten minute presentations every two weeks to demonstrate their progress and receive feedback.

Teaching Experience

Feedback from students about my teaching style has been very positive. Student evaluation scores of courses I designed have been well above the average department norm. Below I provide examples for my teaching style and how it is received by the students detailing the ***Cloud Computing*** course I now regularly teach and the ***Algorithms/Data-Structures*** courses I helped in designing/teaching.

- **Cloud Computing: Boston and Northeastern Universities - (2015-2017 - Enrollment ~90)**

This is a senior/graduate-level course offered in parallel at both Boston University and Northeastern University by three instructors. In this course we aim to give students an understanding of ***Cloud Computing*** in general along with an understanding of key cloud-based ***BigData platforms***. We also aim to equip students with experience of working as part of an ***Agile Development*** team, participating in planning and

project review sessions, and building an artifact/product that is part of a broader initiative. To this end, the course combines ***lectures by instructors*** and by ***invited speakers*** and ***discussion of influential publications in cloud computing***, with a large ***course project proposed by industry mentors*** and implemented via ***Agile Programming*** methodologies. I designed this course from scratch together with Prof. Orran Krieger. I led the course structure design and selection of the covered topics/materials and I teach ~35% of the lectures each year while attending all the courses for in-class evaluation and discussions.

Each week we cover on average two seminal research papers on Cloud Computing. We expect students to read, review, submit a written review of one paper prior to the class (the other paper is presented by instructors), discuss the papers in the class, and after the class (online over Piazza). Each student is expected to lead one or more of the class discussions by summarizing one paper in class and seeding discussions with questions and observations based on the paper. This exercise enables students to improve their academic material reading/presentation/discussion skills, which are crucial skills to have in a fast-developing topic such as Cloud Computing. The class projects are done by teams of 3 to 5 students working with an industry mentor or a researcher that act both as a client and a technical mentor. Projects are developed and operate on public clouds (e.g. Amazon AWS, Microsoft Azure, Google Compute Engine, Massachusetts Open Cloud, etc.)

In addition to department-prepared course evaluations, we designed surveys to measure success in course-specific targets. The students indicate that the cloud computing course helped them prepare for the workforce in general, and cloud computing careers in particular. Last year, more than 30% of the students in the class felt they were more prepared to enter industry than before the course, and the percentage of students that felt that they are unprepared for job market went from 23% at the start of the class to 0% at the end of the class. 94% of students felt that they can articulate key cloud computing technical skills, versus 19% at the start of the course. Moreover, around 87% of the class felt they could apply for a position in the area of cloud computing, while only 16% did before the course started.

In department evaluations, the students who take this course state that they enjoy the interactive nature of the course as well as the opportunity to learn about cloud computing systems as practiced in the industry. Some of the students' comments for this course's evaluation reports include:

> *"The instructors are very knowledgeable about course content and clearly have a great deal of experience in the field. The knowledge and insight they brought to this class is the best I've seen yet at BU. During class the instructors do their best to engage the class in discussion. Overall, I really liked these instructors and hope they teach this course again!"*
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> *"We learned a lot of paper reading skills throughout this course."*
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> *"The instructors were very knowledgeable and made the class very interesting. I also liked the idea of having a mentor from the industry who guides us with our project."*
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> *"Learned a lot of new technologies and how to apply them. Talks by guest speakers were very helpful in understanding current state of the cloud. Course gave students hands-on experience with various cloud technologies."*
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> *"The instructors were extremely knowledgeable and passionate about the topic. A lot of effort outside of the classroom to organize mentors and prepare content was evident."*
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> *"This course was difficult and challenging but at the end of the day it has been one of the best courses I have taken at BU."*

- **Data Structures: Boston University - (2014-2015 - Enrollment ~45)**

During my time as a postdoctoral researcher in Boston University I was asked to help in teaching the senior/graduate-level ***Advanced Data Structures*** course by devising course projects and evaluating those projects. Examples of projects I designed include building: Dropbox-like client-server storage systems that require chunking on the client-side and efficient/intelligent de-duplication of chunks for efficient storage, Waze-like shortest-path suggestion systems that require ability to query shortest path between any given two points in a road network, Google-like distributed search engine result-page caching systems that synchronize top result pages received by multiple search front-ends to minimize hits to the back-end, etc. The projects I designed required students to build functioning systems similar to applications they use in their everyday life and realize the importance/benefits of the data structures they covered in the course.

- **Algorithms: Bilkent University - (2004-2012 - Enrollment ~90)**

I TA'd the senior-level ***Algorithms*** course taught in Bilkent University during my MSc and PhD. This course introduces techniques for the ***design and analysis of efficient algorithms***. Some of the topics covered include: ***complexity analysis, sorting, trees, heaps, hashing, divide-and-conquer, dynamic programming, amortized analysis, and graph algorithms***. Early on in the course we encountered challenges such as: (i) polarity among the students success levels – some were very successful while many failed to achieve beyond average – and (ii) polarity in success levels among covered topics – students had significantly higher success levels on early taught topics but understanding seemed to sharply decrease as the academic year progressed. To address these, we restructured the course to include in-class homework sessions where each week in a homework hour we asked students to answer company interview level questions that can be answered using the topics covered in that week.

In-class homework sessions constituted a significant part of the overall course grade (~40%). I was responsible for organizing the in-class homework sessions, which included tasks such as preparing the questions, administering the sessions, and evaluating the student responses. By introducing Algorithmic problems encountered by large companies students are familiar with, we managed to increase the interest and understanding among students. By providing early feedback about their understanding (right after each topic) we enabled students to focus more on topics they did not fully understand. This approach significantly increased both the success rate (reducing the course failure rate 80%) and the overall average grade (from C+ to B) in the course.