Teaching Philosophy

Teaching and research are complementary activities continually supporting each other. Yet, they are generally treated as separate activities in academia. It is unavoidable that teaching fundamentals has a priority at the early stages of undergraduate education. However, the current trend of separating teaching and research creates problems at the later stages of academic education. Besides, this approach often causes significant productivity loss for both industry and academia in long terms.

My teaching philosophy concentrates on creating a synergy between teaching and research. However, creating such a synergy primarily requires a good education on computer science fundamentals (e.g., algorithms/data structures, computer networking and systems). After a solid background on these fundamentals are formed, I will devote a significant effort to combine teaching and research whenever possible. This approach aims to inspire the creativity and productivity without omitting fundamentals. My goal is to train passionate and creative IT professionals and academics who can fulfill the rapidly growing needs of both industry and academia.

I plan to realize my teaching philosophy based on the following principles:

- **Encouraging Active Participation:** Students should not be passive observers but active participants in the learning process. I will encourage students to engage the classroom activities via in-class discussions and open-ended questions.

- **Project-Oriented Approach:** I strongly believe that the best way of learning a complicated concept is to realize it on real problems. This is even valid for many theoretical subjects (e.g., cryptography) once they are properly tied with a real-life application. In this direction, I will pursue a project-oriented and take-home-based course structure. I observed that students learn much better when they put an effort to understand and realize the course subject via term projects. This approach also enables a permanent learning, which might not be achieved by classical exam-only classes. These projects will be supported by plenty of take-home assignments that include difficult questions but with sufficiently long deadlines. The assignments encourage students to investigate topics from different angles by conducting short researches.

- **Integrating Teaching, Research and Practicality:** I believe that exposing students to open problems and recent research results, even at the early undergraduate level, is highly beneficial. I observed that students are much more excited, once they realize that there is a lot of room to explore for the subjects they work on.

At the undergraduate level, I plan to present the recent research results from a high-level perspective, and then encourage students to write surveys and short technical reports on a subject of their choice. I would offer generous extra credits to increase the interest.

At the master level, I will give project-oriented approach a higher priority along with laboratory projects to strengthen the practical side. These projects will focus on state-of-art technologies such that students will have rudimentary skills to meet the needs of emerging trends in industry. At the PhD level, I will focus on research proposals, recent papers published in flagship conferences and literature scanning via comprehensive survey assignments. Depending on class size, I plan to conduct frequent one-on-one meetings with each student, providing detailed feedback on their research proposals.

Another essential point is to form the correct research habits as early as possible. Once an incorrect research habit forms, it is very difficult to remove it later. I will prevent my
students to form such habits via continual guidance. I will inform students about common mistakes repeated by researchers and how to avoid such mistakes. For example, a researcher must first identify an important problem and then seek a novel solution, instead of creating artificial problems and “solving” them with existing tools.

- **Improving Technical Writing and Presentation Skills**: A common but grave mistake is to consider the technical writing and formal presentation of ideas as a secondary task during the education process. Despite how good the idea is, if it is not presented in a correct way, convincing the reader/listener might not be possible. I will provide the same guidance that I received from my PhD advisors Prof. Dr. Peng Ning and Prof. Dr. Michael K. Reiter on this matter. This will help students to secure highly competitive industrial and academic positions in their future career.

- **Grading Fairly**: Fair grading is essential for evaluating and motivating students. My TA experiences enable me to reward the productivity without sacrificing fairness.

**Teaching Experience**

During my PhD, I served as a Teaching Assistant (TA) for various computer science courses including undergraduate, master and PhD level courses.

- **CSC 226 Discrete Mathematics (undergraduate)**: This course was a large-size class with more than hundred students. This class helped me to understand the special needs of early stage undergraduate students. Moreover, I suggested improvements on the curriculum, which modernize the course content by covering recent advances in applied mathematics. These improvements are now a part of CSC 226 offered by Prof. Dr. Robert Rodman.

- **CSC 574 Network Security (MS)**: I served as a TA for MS level network security classes for three semesters, generally mid-size classes with mixed MS and PhD students. I have learned various aspects of teaching this course, since I worked with three excellent instructors as a TA. I guided master students for their research projects, in which they proposed their own ideas and then implemented them on the real-systems. Furthermore, I helped students for mid-size laboratory exercises focusing on network attack/defense techniques. I received a very positive feedback from students and the course instructors.

- **CSC 579 Computer Networks Performance Analysis (MS)**: In this course, I gained experience on guiding students for advanced networking topics such as queuing theory and probabilistic network modeling. Moreover, I wrote some chapters of “Definitive Introduction: Computer Simulation”, which is used as one of the course books for CSC 579 offered by Prof. Dr. Harry Perros.

- **CSC 501 Operating Systems (MS)**: This class was a MS level online course on operating systems. I gained experience on teaching operating system principles and handling online courses.

- **CSC 774 Advanced Network Security (PhD)**: I served as a TA for an advanced network security class for two semesters, a small/mid-size class with PhD students as well as post-docs. I had a privilege to receive one-on-one teaching training from my advisor Prof. Dr. Peng Ning on this course for one year. I acquired an invaluable experience on how a research-oriented course can be taught in a very understandable and enjoyable way. I helped PhD students on their research proposals via one-on-one meetings during my office hours. I also helped students for laboratory exercises, which implement advanced Wireless Sensor Network (WSN) security protocols on a large WSN testbed.

- **Mentoring and Presentation Skills (Post-PhD)**: I have been guiding PhD level interns beginning from my industrial research career. I instructed interns on design, analysis and
Teaching Preferences

My expertise areas are network security, applied cryptography and computer networks. Therefore, I will be pleased to teach courses on those areas.

At the undergraduate level, I would like to teach introduction to networking as I have an experience on this course. This course will cover basic principles of telecommunication systems and networking technologies. In addition, I can also offer a course that focuses on design and analysis of algorithms. It will focus on basic data structures, fundamental algorithms (e.g., sort/search and graph theoretical) and their applications to the real life problems. Moreover, I plan to develop an introductory level information security and cryptography course. In this course, I will teach basic cryptography concepts and fundamentals (e.g., basic number theory) by giving a priority to the breath instead of the depth.

At the graduate level, I would like to teach a network security course and an advanced information security course. I will utilize my TA experience (e.g., CSC 574 and CSC 774) for these courses by adding my own improvements and teaching style. Moreover, I plan to cover recent trends and emerging technologies on security and privacy in industry, by leveraging my recent industrial research experience.

In the network security course, I plan to cover a wide range of topics including cryptographic protocols and network security basics supported by plenty of application projects and laboratory assignments. I expect that students completing this class can evaluate works in academic and commercial security, and will have essential skills in security research and industrial consultation. The course will cover topics; including but not limited to, basic elements of cryptography/cryptanalysis, network security, authentication, security protocol design and analysis, security modeling, trusted computing, key management, DDoS detection and mitigation, biometrics, web security, and other emerging topics.

In the advanced information security course, I will cover advanced security mechanisms, which can answer the security and privacy needs of recently emerging real-life applications. Some applications include heterogeneous wireless systems and sensors networks (e.g., internet of things and systems), resource-constrained networking environments (e.g., intra-car security, RFID/smart-card security protocols) and cloud-based distributed systems (e.g., cloudlets). I will cover advanced crypto methods (e.g., ID-based crypto, polynomial/self-certified key exchange), trusted execution environments, access control and privacy policies.

I will ask students to write research reports based on the recently published papers in flagship security conferences (e.g., CCS, S&P). I will provide a detailed technical feedback to each student on her research proposal with one-on-one meetings. Moreover, I will ask students to present research papers of their interest in the class and give each student a feedback on her presentation.