Marius Iulian Mihailescu

Teaching Statement

The opportunity to teach and advise students is one of my strongest motivation to pursue the academic career. Through last 6 years of academic experience as Lecturer and Assistant Lecturer of undergraduate- and graduate-level courses and research supervision of several Masters's and Ph.D. students, I have gained a deep insight into circumstances under which students effectively learn and conduct research studies, and a teacher can efficiently facilitate their process.

Teaching is a very important and enjoyable academic duty. The most compelling and effective duty consist in passing the knowledge, ensuring that our field grows and prospers. I enjoy teaching for several reasons. *Firstly*, there is nothing more rewarding than seeing someone's eyes light up as they comprehend a new concept. *Secondly*, in the process of teaching a difficult concept to others, us ourselves tend to gain a deeper understanding of the concept.

As a growing and ever-changing field, I believe that teaching in computer security is not only about transmitting knowledge to students, but also about inspiring the students to inquire and learn independently. This is a process of collective improvement for both the students and the teacher. I want to pursue this academic career, because I am enthusiastic to engage in this exciting and challenging process with the best young talents which represent our next generation.

Teaching Methodology and Philosophy

I believe that a central goal of teaching a subject is to nurture the ability of students to inquire and learn the subject themselves with the proper guidance from their teachers. Achieving this goal is particularly important in computer security, because computer security is one of the most rapidly changing fields. Nevertheless, the ability to learn can serve a lifetime. I believe the success of a career in computer security largely depends on one's ability to keep up with the rapid innovations happening every day in both directions and fields, theoretical and applied cryptography.

To realize this goal, I will design courses that encourage and nurture "knowledge exploration" for students, and also based on "knowledge transmission". From my past teaching experience, interactive components such as open-ended problem sets and large projects will serve this purpose better. Lectures, homework, and quizzes will verify their competences based on a combination of "knowledge transmission" and "knowledge exploration". I am a strong proponent of using large open-ended team projects for teaching computer security subjects. There are at least three major benefits. *Firstly*, working on a large project encourages active learning. When I worked as a Lecturer and Assistant Lecturer, many students told me that they learnt more from finishing the large projects comparing with listening to the lectures. *Secondly*, there is always a gap between theory and practice. There is no better way to close this gap than actually to implement the learned theory. *Thirdly*, doing projects is a more attractive way for students to learn. It gives the students the satisfying feeling that they invented and created something on their own.

To ensure the success of a large project assignment, the project should be broken into many step-by-step incremental milestones, so that a steady learning curve can be achieved and the course staff can monitor the progress of each team. The project should have a unified framework for fair grading. It should impose as little technical restrictions as possible to realize the full potential of each team. More importantly, assistance and guidance from the course staff should be accessible for every student along the way so that students do not stray too far during the "knowledge exploration" process. The results were extremely successful - all participating teams in the course finished with at least working cryptography projects and all except one team implemented advanced optimization features in their projects. Some of the projects were proposed as ideas to be developed for HORIZON 2020 and not only.

Teaching Experience

My first teaching experience (*Lecturer Assistant at „Titu Maiorescu" University, 2010-2016*) in computer science started when I was a software developer and engineer for one of the most important companies from Romania and South Europe which deal with targeting online advertisements. Beside my daily basis activities, I was managing also the recruiting process of new hires. This was the moment when I realized that it is very important for the companies and universities to emerge one to another, to create a synergy and create/update courses for students that will fit easily in the companies profiles and job descriptions.

During the 6 years at „Titu Maiorescu" University (2010 - 2016) I started to teach courses and laboratories (hands-on-labs) to undergraduate- and graduate-level students that helped them to find quickly a career path. The courses were: *Applied Cryptography (I.3.5.3) and Information Security (I.2.4.14)*; *Object-Oriented System Analysis and Design using Unified Modeling Language* (I.3.5.5.1); *Design Patterns* (I.3.5.5.2); *Object-Oriented Programming* (C/C++, C#, Java, Python) (I.2.3.5); *Functional Programming* (Haskell, F#, Ocaml) (I.2.3.3); *Software Management* (Agile, SCRUM, Waterfall, eXtreme Programming, Pair Programming) (I.3.5.5); *Designing User Interfaces* (Devexpress, Telerik, Infragistics) (I.3.5.11); and *Graphs* (I.2.1.10). During the course and laboratories for *Applied Cryptography and Information Security*, I was focusing on finding connections of *Theoretical Cryptography* to real world or current academic problems. I managed to prove how most of the theoretical concepts (mathematical mechanisms) can solve real life problems. Also, I managed to create a bridge between *Theoretical Cryptography*, *Applied Cryptography* and *Ethical Hacking* practices, creating a unique course and hands-on-labs for the first time in Romania, being appreciated by the most important academic and government institutions from Romania. The results of success has been materialized into a penetration testing platform for business purpose.

Later, as *Senior Lecturer*, I started at *Computer Science Department* from *University of Bucharest* (2011-2016) to teach courses and laboratories (hands-on-labs) on *Network Application Development* (TCP, IP, Java C#, Sockets, Multi-threading, Multiplexing, CORBA, RMI, and .NET Remoting) (Li-Y2-D10) and *Advanced Programming Techniques* (LI-Y2-D3). Together with the students I was working on different projects and supervising their progress for final examinations. I encouraged them to work in teams and to have brainstorming meetings in order to improve their communication skills over the ideas.

Starting with 2015, at *Computer Engineering Department* from *LUMINA - The University of*

South-East Europe, I have taught several courses and hands-on-labs on *Architectures for Digital Signals Processing*, *Designing Graphic Interfaces*, *Formal Languages and Translators*, and *Video-audio Compression Techniques*. Together with the students, we started building a new programming language for interactive systems and its typing system. We managed to introduce a kernel programming which contains definitions for complex spatial and temporal data, cryptography modules based on searchable/homomorphic encryption, lattice-based cryptography, (ring-) learning with errors, multi-party computation protocols, arithmetic and Boolean expressions, object-oriented modules, and while-programming statements with their temporal, spatial, and spatio-temporal versions. Writing programs and algorithms using the new kernel, helped to exploit open processes located at various sites, servers and computers.

Currently (2020 - present), at *Department of Computer science* from *"Spiru Haret" University*, I am teaching two courses, *Information Security* and *Functional Programming using Haskell*.

Teaching Interests

My past teaching and research experience has covered a wide range of topics in computer security and computer science including software engineering, programming languages, cryptography and information security, graphs, data structures, algorithms optimizations, and machine learning. Given the need, I am qualified and ready to effectively teach a wide area of courses in any of these subjects. I am particularly eager to teach undergraduate- and graduate-level courses that are directly related to my research projects. Examples of such courses include Applied Cryptography, Systems Security, Network Security, Security Analysis, and Privacy Enhancing Technologies. Also, if is necessary and requested by students or staff, I can create a bridge and interconnect other topics with cryptography and security related, such as Artificial Intelligence, Machine Learning, Deep Learning, Software Engineering, Software Reliability, Compilers, Program Analysis, IoT, Cloud Computing, Databases, Big Data, and Systems Programming.

Also, I would be excited to explore new opportunities to teach Massive Open Online Courses (MOOC) in computer science given the need. In fact, I believe that many cryptography algorithms and schemes used in my past research projects could be applied to address important challenges of organizing MOOCs for computer security. For this, I build and developed my own MOOC platform, being used with my students. Examples of these challenges include how to effectively and scalably grade the assignments and how to automatically provide feedback to the students for their submitted results.

Advising Approach

I always enjoyed helping and mentoring students, undergraduate- or graduate-level. I have helped to advise several bachelor and master thesis on several topics, including cybersecurity, applied cryptography (homomorphic and searchable encryption, multi-party computation protocols, steganography, zero-knowledge proofs - constructions and proofs). One important challenge of advising is to establish an effective communication pattern with the students. For example, having regular weekly meetings might be effective for some students but unproductive for others. Another important challenge is to decide how much I should get myself involved into the technical details of student projects. When advising a student, I prefer to play a guiding role from the start and actively help the student to determine high level technical directions. Once the project is on the right track I switch to a consultant role and allow the student to take responsibilities of making all technical decisions. The goal is to nurture the ability of the students to productively and independently do

research on their own and not only.

Evaluation of Teaching

I am very proud of the evaluations that I have received from students and staff. For example, when they were asked to evaluate my overall effectiveness as a teacher, 90% of my students from Applied Cryptography course rated my performance as excellent or good. Some of my favourite student comments are:

- *„The instructor made this course my favourite this term/semester."*;
- *„I want to pursue and to take other courses that are lectured by you. Many thanks for your help and for being our instructor."*;
- *„Very good grasp of course material, great enhancements by references to advanced topics and their applications in real life (e.g. zero-knowledge proofs, searchable encryption, multi-party computation, steganography, multilinear maps cryptography"*;
- *„Very good connections of the material to real world problems or current academic problems."*;
- *„Very attractive way of presenting theoretical concepts and mathematical background, easy to follow and to fill up the gaps when we are in trouble to understand the math concepts."*.

Plan for Future

My aspiration is to become a *professor* with high quality of research-oriented university. While I thoroughly enjoy research, a great aspect of being a professor is that teaching is an important part of the career. I believe that adopting new techniques and technologies in the classroom will enhance the teaching environment, and I am very excited to see where the evolution of university teaching takes us in the future.

My future teaching plan is based as follows, for undergraduate- and graduate-level, I am interested in teaching courses and topics related to computer security, such as systems security, network security, security analysis, applied cryptography, game theory, protocols design, formal methods in security, software obfuscation, steganography, biometrics, and chaos-based cryptography. Also, if it is necessary, on request of students or staff, I will be able to organize courses, scientific seminars or training/teaching sessions having as subjects topics related and not only to cryptography and information security, for example their applicability in big data, cloud computing, AI, ML, blockchain, programming languages, databases, ethical hacking practices using Kali and other pentesting distributions.

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