Interview

Professor Alexander Meduna, Brno University of Technology, Czech Republic

What are your main areas of research?

I am a mathematically oriented computer scientist. I have been always primarily interested in the theory of computation, including automata, languages, grammars, computability, decidability, and computational complexity. A full grasp of these topics obviously assumes a solid familiarity with discrete mathematics, including concepts from the theory of sets, relations, functions, graphs and logic. Therefore, I have also investigated purely mathematical topics as well.

I am the author of eight international-level books and over seventy scientific papers. Regarding my papers, they all discuss quite specific topics concerning computer science and engineering. In fact, they are so specific that it is almost impossible to explain them generally and informally to anybody out of computer science world. On the other hand, concerning my books, most people can easily follow them if they wish and have the patience.

In essence, all my books represent theoretically oriented treatments of mathematical concepts underlying computation. As a rule, they introduce all formalisms with enough rigor to make all the definitions and results quite clear and valid. Every complicated mathematical passage is preceded by its intuitive explanation so that even their most complex parts are easy to grasp. Similarly, every new concept is preceded by an explanation of its purpose and followed by some examples with comments to reinforce its understanding. All applications are given in a quite realistic way to clearly demonstrate a strong relation between the theoretical concepts and their uses. Apart from their theoretical explanation, they pay a special attention to the implementation of all the mathematical concepts to make quite clear how to encode them in computational practice. All computer programs they contain are written in some high-level languages, such as Java or C++, which belong to the most common programming languages at present.

Have you ever worked or conducted a piece of research together with someone from Spain?

I have published a paper of two together with computer scientist from Spain. Based upon my collaborations with professors from the UVa, I have also gained a lot of knowledge concerning research and, more significantly, teaching computer science. Recently, I have closely and intensively worked with Prof. José Ignacio Farrán Martín in this respect. In the past, I worked with professors María Luisa González Díaz and Valentín Cardeñoso Payo.

Why did you actually choose teaching at university?

Because I enjoy teaching—that's how simple it is (*smiles*). I taught theoretical computer science at various European, Japanese and American universities, including the University of Missouri, where I

spent a decade teaching advanced topics of formal language theory. Currently, I am a Professor of Computer Science at the Brno University of Technology.

There are several reasons for being a teacher. Teaching is one of those professions that keeps you on your feet and keeps you young at heart. It is a great commitment, not just a regular job. You have to use your brain and continue learning each day. It allows you to be creative and work with a large variety of different people. Each day is a brand new day in school. When you enter your classroom, you have only a rough idea what is going to happen. One day, you can have some students complaining about some teaching material, and the next day, you can find out that your whole class passed their exam with flying colors. Something is always going on- from lesson plans to field trips, from planning student parties to holding teacher conferences. Indeed, a teaching career never ends. You continually learn every single day. As a teacher, you are always a beginner. You learn new strategies, ideas and skills. You learn a lot about yourself, not only as a teacher but as a human being, too. You learn how much you can handle per day. You learn how to communicate with your students. Teaching is not just the students' learning, but as a teacher, you are studying as well. Teaching has its own purpose. You get the opportunity to touch the lives of your students. Teaching allows you to express yourself. You can do things that you would never do in front of other adults. Your classroom is your domain, a place where you are free to show off your personality and create anything that you wish. As opposed to most other careers, a teaching career has the opportunity to inspire students, not only academically but also personally. If you think back to when you were a child, I am positive you can recall at least one teacher that really stood out and made a difference in your life. Teaching might be a very stressful and demanding job, but it also allows for time off over the vacations. This time gives you a great opportunity to travel, have fun with friends, and spend time with your family. One of the best reasons to love your job is that it gives you the time off that you deserve.

Do you notice any difference between studying Computer Engineering in Brno and Valladolid?

Not really. Perhaps, as I have learnt from my friends and colleagues at the University of Valladolid, they present Computer Engineering primarily as the systematic study of algorithmic methods for representing and transforming information, including their theory, design, implementation, application, and efficiency. The roots of computer science extend deeply into mathematics. Other important topics include computer graphics, databases, networks, protocols, numerical methods, operating systems, parallel computing, simulation and modeling. At the undergraduate level, programs cover a broad range of computing topics and allow students to engage in projects across multiple areas. For graduate studies in computer science, it is typical to focus on one area.

At the Brno University of Technology, we mainly concentrate our attention on the design of computing devices and systems. While sharing much history and many areas of interest with mathematics, we concentrate our effort on the ways in which computing ideas are mapped into working real systems. It is slightly more of a hybrid role that focuses on how computer science, computer engineering and mathematics come together. As such, it concerns the computer engineering considerations of how microprocessors function are designed and optimized, how data is communicated among computational components, how integrated systems of these components are designed, and how they operate. We teach students to identify and respond to emerging technology, models, methodologies, systems, and trends, including social networking, gaming, modeling, and simulation. We explain how to apply logic and mathematical principles to the design, development,

and verification of secure, high-performance, and reliable computing systems. Furthermore, we want students to analyze, design, develop, and document secure technical solutions for computing systems and networking infrastructure. We teach students to plan, design, and optimize computing architecture, software applications, data, and systems. We provide students with an overview of the foundational principles needed to design and build tomorrow's computer hardware and software. Specific outcomes and learning objectives consist of the ability of being a solid modern computer engineer. More precisely, this consists of the ability to apply probability and statistics appropriately, a knowledge of scientific and mathematical principles necessary to analyze and design complex digital systems, the ability to identify and solve engineering problems, the ability to design and conduct experiments, and the ability to analyze and interpret data.

But once again, there is only a slight difference between studying and teaching computer engineering in Brno and Valladolid.

How many students are taking a Degree in Computer Engineering in Brno? Does your academic offer include Postgraduate Courses?

We offer a great variety of postgraduate courses. You may want to visit our faculty website to learn the details. I do not know the precise number of students taking a degree in Computer Engineering in Brno. You might want to contact our public relation office to obtain the exact numbers.

In your view, is the European Higher Education Area better than the previous system? Why?

Yes, it is definitely better in today's cosmopolitan Europe. In essence, EHEA wants to establish some general and essential lines in higher education. More specifically, EHEA aims to promote the mobility of students and professors throughout Europe. It enables new graduates to get involved into a unified European labor market. It provides students with the knowledge and the strategies they need for lifelong learning.

EHEA also adapts their teaching system in terms of the structure, contents and definition of the competencies resulting from learning. It wishes to strengthen the position of students and put them on the same level as their European counterparts with whom they will have to compete in the labor market, in postgraduate education and in the field of research. EHEA rightfully believes that it is fundamental to follow the new system of official degrees, structured in these three degrees. First, Bachelor's degrees prepare students for the labor market quickly and effectively. Second, Master's degrees provide students with appropriate specialization. Finally, Doctoral degrees provide students with training in research. Concerning these degreese, EHEA has to specify the workload required for students to carry out all the learning activities, from attending classes, writing essays, doing practicals and sitting exams. EHEA provide us with a standardized model of information, personalized for each university graduate, which contains such information as the course studied and the skills acquired. It has to provide us with a comprehensive and transparent information for the purpose of accrediting and recognizing credits throughout Europe. EHEA gives particular importance to guidance as a key element in university education. Academic tutoring is the tool by which this guidance is put into practice. The process, developed by university teachers, is educational and overarching. The aim is to provide students with all the tools and the help they require if they are to successfully respond to the academic, personal and professional challenges of university life.

Is the Erasmus + Programme successful in your country? How many outgoing and incoming students does your faculty send and receive per year?

In my opinion, it is successful in all countries that are involved, of course, including both Spain and the Czech Republic. It offers a wide range of opportunities in higher education, vocational education and training, school education, adult education, youth and sport. It has links with the labor market and learning world, providing opportunities that prepare young people for the job market and for participation in civic life. Yes, I am a strong Erasmus supporter.

You might contact our public relation office to obtain the information how many outgoing and incoming students our faculty send and receive per year.

How many languages do you speak? Has this fact provided you with more job opportunities?
Apart from my native Czech, I speak English pretty well because I taught and lived in US a decade. I am terribly sorry I cannot speak or read anything in Spanish. If I could, I would read books by my favorite Spanish writers in original. They include Teresa de Cartagena, St. Teresa of Ávila, St. John of the Cross, St. Ignatius of Loyola, St. Francis de Borja, Fray Luis de León, Venerable Mary of Jesus of Ágreda, Fernando de Herrera, Luis de Gongora, Blessed Ramon Lull, and Unamuno. I read books by St. John of the Cross almost every day—sadly, in English, not in Spanish.

If you are Spanish, is it likely to find a job as a computer engineer in your country?

Yes. It would be helpful if you speak some English or Czech.

From your point of view, what will be or should be the future of Computer Engineering?

To answer your question, let us first agree that most people struggle to make our world more human. That is, they try to make it a place where we do not behave like beasts. We want to live in the world full of opportunity, respect, patience, justice, mercy, tolerance, kindness, thoughtfulness, commitment, engagement, and discovery. Computer engineering should help us make a world like this. It should not destroy it.

Many of the basic principles of computer science and engineering were known only by a few of us some forty years ago. Today, they are known by significantly more people, and many of them are out of computer engineering world. Compared to the situation in 1980s or so, the core of the computer engineering will be introduced at earlier levels of education. This core will contain computation theory, programming, data structures, algorithms, and machine architecture. Algorithms and data structures will represent quite essential elements for expressing rational thought. Therefore, most likely, the body of computer engineering will further expand in the future.

More importantly, we need to understand the world we live in at the present. It is the world for which we have a deep responsibility. I am not talking in any abstract way whatsoever now. I am talking about the world of ordinary people around us, including our neighbors, colleagues, and friends. We have to deal with the production of food and goods for these people. We must be also strong enough to fight again all those diseases of our time. We need to learn how to deal with the distribution of wealth. As the information and industrial worlds merge, we need to figure out a better way to live than we did in the past. It might help us to figure out how we fit into life locally, on the planet, and in our universe.

We may be tiny, but we are significant. Our world is full of varies barriers, and frequently, it is far too crueler than it was in the past. We need to figure out how to be productive and, simultaneously, good.

There are plenty problems to solve, and computer engineering can be of a huge help. You can go outside, look around, and be simply thankful you are alive. You can work with other good citizens and persons. Yes, you can, and you should. Make sure to get a little help from your friends as the Beatles sing. To paraphrase this quote, make sure to get a big help from computer engineering, too. Then, putting our strengths together, we all can get after those challenges I mentioned.

Will you personally get involved into solving the problems you have just mentioned? What are your plans now?

I already have, and I intend to go on being involved. But right now, I plan to take some nice Spanish *siesta* after such an interesting interview (*smiles a lot*).

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