Informatics and Computational Science

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Faculty	Faculty of Electrical Engineering and Computer Science
Type of study	Doctoral
Language of instruction	English
Code of the programme	P0613D140033
Regular period of the study	4 years
Coordinating department	Department of Computer Science
Coordinator	prof. Ing. Jan Platoš, Ph.D.
Keywords	HPC Computing, Optimization methods, Artificial Intelligence, Big Data Analysis and Processing, Computer Vision

About study programme

The doctoral program aims to train highly qualified experts capable of further developing their field by finding new original solutions, methods, and procedures and applying the most demanding known techniques. Students can profile themselves in many different areas, such as computer science, computer vision, machine learning, artificial intelligence, HPC computing, computational chemistry, nanorobotics, and many more. Graduates can quickly get a job in the research and development of high-tech companies or start an academic career in universities at home or abroad.

Graduate's employment

"During their studies, graduates absorb the maximum amount of knowledge within their chosen field of study. Their knowledge gives them the basis for solving the most complex problems in research and development activities in large companies, universities or institutes of the Academy of Sciences. Thanks to their experience of studying literature in a foreign language and their ability to assimilate this knowledge, they are able to apply it in their work. In addition, they are able to defend their views, even in international forums, and are able to participate fully in research and multinational companies.
Therefore, the graduates can be employed within the development teams of companies to solve the most complex tasks, as leaders of research teams, researchers in industry and academia. Examples of employers include Microsoft, Avast, ABSA, Google, SAP, Siemens, CGI, and others."

Study aims

The aim of the PhD programme is to train highly qualified experts capable of further developing their field by finding new original solutions, methods and procedures, as well as capable of applying the most demanding known methods in new areas. Graduates are typically employed in research and development and higher education. It is also typical to work internationally, for example, participating in international teams and defending results to the international community, participating in the research departments of multinational companies or as independent consultants. The programme aims to draw on the links between the Faculty of Electrical Engineering and Computer Science and the IT4Innovations Research Centre, which is involved in the programme, to ensure that students have maximum research opportunities and access to world-class knowledge and computing infrastructure.

Graduate's knowledge

The graduate has a professional overview across the entire field of Computer Science and other involved areas, in the breadth and depth beyond the level of a graduate student. Theoretical knowledge of the core disciplines (e.g. mathematics, discrete mathematics, theoretical computer science) are deepened in ways that are directly applicable to applied and basic research in the chosen subfield. The graduate has a deep theoretical and practical knowledge of especially in the specific chosen subfield according to the focus of

their research work. Understands scientific methods used in the field of his/her specialization and can apply them himself/herself. Typically, the knowledge of graduates covers computer science and mathematics, as well as one or more application areas such as industrial digitisation, supercomputing, but also chemistry or biology.

Graduate's skills

The graduate can design new, effective and well theoretically justified solutions based on original ideas that are accepted by the international scientific and professional community in the field. He/she can implement, evaluate and compare even very complicated existing procedures. Can solve interdisciplinary problems, requiring knowledge not only from computer science and mathematics, but also from a collaborating discipline (e.g. biology and medicine, engineering, economics, etc.). Can anticipate directions of development in his/her field. He can also implement very large and complex works, usually as the leader of a research team. He or she can choose the appropriate solutions procedures and appropriate technologies, based on the use of the latest knowledge. He can independently develop extensive technical texts in a foreign language, especially English, presenting even very complicated and abstract ideas. He/she can defend the proposed solutions in a professional discussion at international level.

Graduate's general competence

Graduates are able to use the scientific approach to problem solving, set goals, determine strategies, choose theoretical backgrounds, choose alternative solutions, communicate with people in problem solving, e.g. manage the work of a team of researchers, present and defend their views and chosen solution methods in a foreign language in an international forum, communicate with top experts in the field in a foreign language, especially in English, popularize their field, influence developments in in their field, take responsibility for their decisions and the work of their team, and take into account the social impact of the decisions they make.

Professions

- Consultant
- Academic staff member
- Researcher
- Data analyst
- Analyst
- Specialist in science, research and development
- Research team worker
- Developer of image analysis systems
- Data scientist
- Research and development specialist
- R&D engineer in automotive
- Mathematician
- Data scientist
- Data analyst (specialist)
- System architect
- Senior SW architect
- Analyst – specialist
- Programmer - specialist
- Academic staff member
- Big data analyst
- HPC specialist
- Developer industry 4.0 application
- Industrial data analyst
- Computer programmer - specialist

Hard skills

- Statistical data analysis
- Work with data (big data)
- CUDA
- PyTorch
- Programming techniques (C, Java...)
- Optimization methods
- Deep learning
- MPI
- Parallel programming
- Algorithms and data structures
- Data analysis
- Mathematical methods and analyses
- Regression analysis
- Mathematics - knowledge of arithmetic, algebra, geometry, calculus, statistics and their applications.
- Methods of complex network analysis
- Explorative analysis

Study curriculum

- form Full-time (en)
- form Part-time (en)
- form Distance (en)