Research Centre of Information Technology

Research Centre of Information Technology is part of IT4Innovations project, which aims to build a national Centre of Excellence in the field of information technologies. The Centre will enable strengthening concentration of a wide range of scientific disciplines relating to information technologies and thus achieve development in respective spheres. Faculty of Information Technology of Brno University of Technology (FIT BUT) is involved in the project alongside the research leader of this project - VSB - Technical University of Ostrava and other partners - the University of Ostrava, Silesian University in Opava and the Institute of Geonics AS CR.

Part of the project is acquisition of a high-performance supercomputer that is planned to be put into operation in 2014, in which time it is supposed to rank among the top 100 most powerful supercomputers in the world. This supercomputer will be placed in Ostrava.

FIT BUT takes active part in the project as a leader of two work packages Multimedia Information Recognition and Presentation and Secure and Safe Architectures, Networks, and Protocols. The aim of FIT BUT in the project is strengthening the co-operation with the industry.

The **Multimedia Information Recognition and Presentation** research team will systematically investigate the processing of multimedia data, particularly the features on the level of signals acquired by means of various sensors. This will enable multimodal information identification and retrieval as well as research in techniques of efficient computing using multimedia data. The emphasis will especially be put on image, video and speech analysis, document and multimedia data information retrieval, imaging, visualization and modelling including human tissue models, accelerated computing using specialized hardware and techniques of semantic web, formal languages and grammars. The program results in the form of new methods, techniques and knowledge related to the above mentioned fields of research will not only be used to improve the parameters of the existing applications but are also expected to facilitate the creation of completely new applications that have so far been impracticable for both technical and economic reasons.

Main task of the **Secure and Safe Architectures, Networks, and Protocols** research team is systematic development of the concept of security and reliability in the field of information technologies (i.e. development of applications with respect to their security and reliability). Both intentional and accidental abuses of information technologies (IT) represent one of major threats to modern society. In the context of knowledge and IT abuse the demand on the system security becomes as important as its functionality, price or maintainability. Current increase in the complexity of computer systems along with cumulative urgency of tasks they have to cope with requires solving a crucial and highly non-trivial question of how to ensure infallible operation of these systems also in situations in which they are not exposed to potential attacks. Contemporary security and reliability-focused IT research comprises a wide range of issues starting with solving purely mathematical problems (e.g. in the area of cryptographic algorithms or formal verification) up to applied research (e.g. authentication) while making use of the knowledge from a wide range of scientific fields (e.g. biomedicine). Within the research, new methods and approaches are developed and investigated concerning the protection of computer systems against attacks, early detection and identification of the attacker, threat elimination, etc. However, these new methods are also intended for reliable computer systems that make a minimum number of mistakes and are capable of self-configuration and self-healing. Apart from software, the research pays special attention to hardware whose security, reliability and resistance to attacks need to be ensured as well. These concerns e.g. specialized embedded systems and networks providing wireless communication with the surroundings that also need to be secured against both intentional and unintentional abuse.

What are the key issues in the IT sector?

BCS, The Chartered Institute for IT published a report for digital leaders in 2018 which looked at the capabilities, skills and ethics needed in IT organisations in the near-future. It showed that business transformation and organisational change were top priorities and roles in change management, transformation consultancy and business analysis would be on the increase.

The specific skills identified by these organisations included some that would be fully expected - cybersecurity and cloud for example - through to emerging sectors - such as the 'as-a-service' model.

In the survey only 14% of organisations felt they needed bigger budgets - they were in fact looking to educate and train existing staff. That means that graduates, already in the mindset of learning, are well placed to get involved in an industry that is so focused on personal development.

Other areas ripe for careers include agile methodologies, mobile and application development, the internet of things and - increasingly in recent years - artificial intelligence and machine learning. Manipulation of data is a skill that cannot be overlooked, in its many guises - especially that of the relatively new data scientist role - and no doubt we will be hearing about roles in blockchain more and more.

There are other considerations, too, for example the effect that current or incoming legislation have on work - such as GDPR-related roles - that has an implication for big data professionals, who would need skills such things as AWS, Python, Hadoop, Spark, Cloudera, MongoDB, Hive, Tableau, Java and so on.

What is ICT?

**Information Communication Technology (ICT)** is an umbrella term used to encompass all rapidly emerging, evolving and converging computer, software, networking, telecommunications, Internet, programming and information systems technologies. Historically, many of these fields developed separately, in different companies, departments and R&D groups, and at different times. With rapid improvements in computer processing power, networking technology advances, programming interface improvements, widespread adoption of Internet Protocols, integration into organizational strategic operations, and improved workforce and user competencies, however, these fields are rapidly converging.

Once a term used widely outside the United States, ICT is becoming more recognized in the U.S. as this convergence takes place more frequently across the globe, and the demand for professionals who have the knowledge and skills to manage the growing number of intersections is increasing. A degree in ICT is the first step toward a career that will continue to evolve as technology continues to expand the way we create, store, and share data.

ICT students gain knowledge and skills needed to effectively apply, use and manage technology when solving problems specifically related to information and communication. Classes provide a human and organizational focus on technology–teaching students how to be effective users of technology. Students who major in ICT can expect to work in positions where they are the communication link between people, organizations and the technologies used to support those organizations information infrastructures.