FACULTY OF INFORMATICS
MASARYK UNIVERSITY
Research Areas and Laboratories

FACULTY OF INFORMATICS
MASARYK UNIVERSITY

Research Areas and Laboratories

Tradition and Prestige

Masaryk University is the second largest university in the Czech Republic. Its Faculty of Informatics (FI) was established in 1994 as the first independent computer science faculty in the country. The faculty's high level of scholarship has earned it an excellent research rating in various applied and theoretical areas of computer science and information technology.

Research Laboratories

The faculty is home to a diverse group of research laboratories and centres where students at all levels participate in research under the guidance of skilled academics. Since 2018, moreover, the faculty hosts a prestigious grant from the European Research Council. Students acquire hands-on experience with leading-edge technologies and make contact with the latest findings from around the world. They have a natural opportunity to participate in research projects—even undergraduates at the faculty have published original research results in international journals.

Study Comfort

A substantial advantage is the faculty's paperless, hassle-free study planning. The Information System of Masaryk University, developed and maintained by the Faculty of Informatics, streamlines every aspect of student coursework, from course selection to electronic and e-learning study materials, to exam sign-ups and grades. Our Information System has received numerous national and international awards and is used outside the university as well.

Flexible Study

The credit system at MU offers great freedom in selecting subjects and managing studies. Unlike students at some other informatics faculties, FI students may elect to take courses from other faculties at Masaryk University to complement their essential IT skills—with foreign language abilities, for example, or soft skills. FI students may also spend part of their study programme abroad.

Faculty of Informatics Masaryk University

International Recognition of Coursework

Courses taken at the Faculty of Informatics are recognized across Europe. A Diploma Supplement, provided to every successful student free of charge, guarantees recognition of your diploma abroad. The ETCS Label then permits you to receive credit for the courses you take at FI at any university in the EU.

Real Collaboration with Industry

The Faculty of Informatics maintains industrial partnerships with more than 30 companies, giving students the chance to gain real-life practice while they study. Companies offer students specialized seminars, internships, projects and support for diploma theses. Since 2014, the CERIT Science and Technology Park has been part of the faculty, supported by both experienced and emerging companies often founded by our students and graduates.
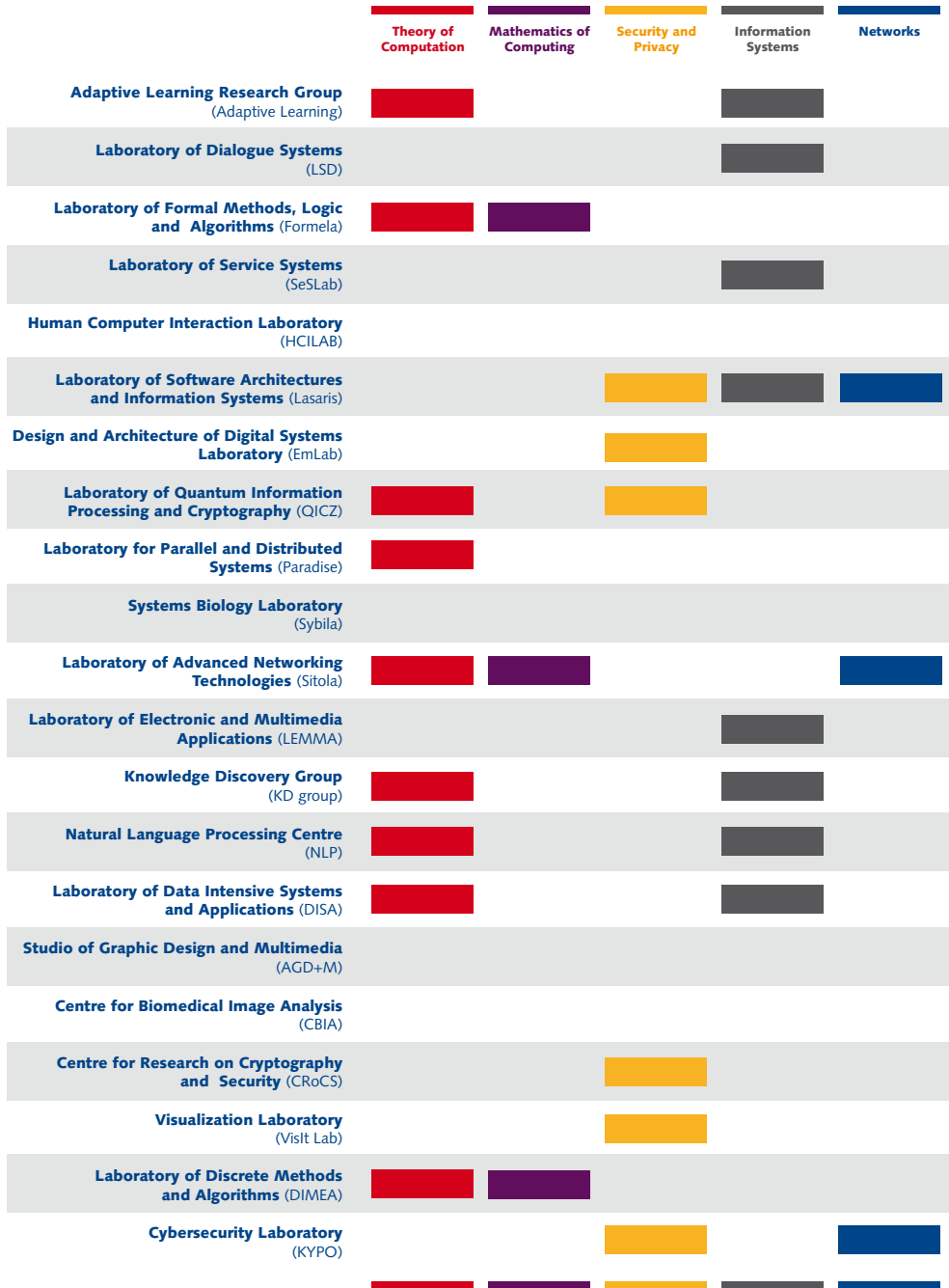
Excellent Employment on the Labour Market

Surveys show that 98% of our graduates have no difficulty finding a job in their field of study. Many start their IT careers while they are still in school. Compared to graduates of other faculties, FI graduates have the highest average starting salaries.

Stimulating Student Life

Brno is a lively university city—during the academic year, as much as 20% of the population consists of students. Masaryk University and the Faculty of Informatics operate a number of student and interest associations.

Research Areas and Laboratories

Map of FI MU Research Directions

	Theory of Computation	Mathematics of Computing	Security and Privacy	Information Systems	Networks
Adaptive Learning Research Group (Adaptive Learning)	■			■	
Laboratory of Dialogue Systems (LSD)				■	
Laboratory of Formal Methods, Logic and Algorithms (Formela)	■	■			
Laboratory of Service Systems (SeSLab)				■	
Human Computer Interaction Laboratory (HCILAB)					
Laboratory of Software Architectures and Information Systems (Lasaris)			■	■	■
Design and Architecture of Digital Systems Laboratory (EmLab)			■		
Laboratory of Quantum Information Processing and Cryptography (QICZ)	■		■		
Laboratory for Parallel and Distributed Systems (Paradise)	■				
Systems Biology Laboratory (Sybila)					
Laboratory of Advanced Networking Technologies (Sitola)	■	■			■
Laboratory of Electronic and Multimedia Applications (LEMMA)				■	
Knowledge Discovery Group (KD group)	■			■	
Natural Language Processing Centre (NLP)	■			■	
Laboratory of Data Intensive Systems and Applications (DISA)	■			■	
Studio of Graphic Design and Multimedia (AGD+M)					
Centre for Biomedical Image Analysis (CBIA)					
Centre for Research on Cryptography and Security (CRoCS)			■		
Visualization Laboratory (VisIt Lab)			■		
Laboratory of Discrete Methods and Algorithms (DIMEA)	■	■			
Cybersecurity Laboratory (KYPO)			■		■
	■	■	■	■	■

Computer Systems Organization	Hardware	Human-centered Computing and HCI	Computer Graphics	Artificial Intelligence	Software and its Engineering	Computational Biology and Bioinformatics	Applied Computing

Map of FI MU Research Directions

Theme of Computation

Theory of Computation

- **Logic and verification, modal and temporal logics**
  Kučera, Brázdil, Strejček, Řehák (Formela)
- **Logic, finite model theory**
  Kučera, Brázdil, Hliněný, Blumensath,
  Obdržálek (Formela)
- **Program analysis and verification**
  Křetínský, Strejček (Formela)
  Barnat, Brim, Černá, Ročkai (Paradise)
- **Formal languages and automata theory**
  Strejček, Blumensath, Křetínský, Řehák (Formela)
- **Higher order logic, automated reasoning**
  Horák (NLP)
- **Algorithmic game theory**
  Kučera, Brázdil, Řehák (Formela)
- **Machine learning theory**
  Popelínský (KD group), Brázdil (Formela)
  Pelánek (Adaptive Learning)
- **Quantum computation theory**
  Bouda, Gruska (QICZ)
- **Randomness, geometry and discrete structures**
  Bouda (QICZ), Hliněný, Kučera, Brázdil, Řehák (Formela)
  Kráľ, Debski (DIMEA)
- **Cryptography, information theory**
  Bouda (QICZ)
- **Computational complexity, classes and reductions**
  Hliněný, Obdržálek (Formela), Kráľ, Debski (DIMEA)
- **Design and analysis of algorithms**
  Hliněný, Obdržálek, Řehák (Formela)
  Zezula, Dohnal (DISA), Rudová (Sitola)
  Kráľ, Debski (DIMEA), Černá, Barnat (Paradise)

Mathematics of Computing

- **Discrete mathematics, graph theory**
  Hliněný, Obdržálek (Formela), Kráľ, Debski (DIMEA)
- **Mathematical optimization, integer programming**
  Rudová (Sitola)

Security and Privacy

- **Security services**
  Matyáš, Švenda (CRoCS)
- **Intrusion/anomaly detection and malware mitigation**
  Čeleda (KYPO)
- **Systems security**
  Matyáš, Švenda (CRoCS)
  Pitner, Bühnová, Ošlejšek (Lasaris)
- **Security in hardware**
  Matyáš, Švenda (CRoCS), Matěj, Přenosil (EmLab)
- **Network security**
  Přenosil (EmLab), Čeleda (KYPO)
- **Software and application security**
  Matyáš, Švenda (CRoCS)
- **Human and societal aspects of security and privacy**
  Matyáš (CRoCS)

- **Cryptography**
  Matyáš, Švenda (CRoCS), Bouda, Gruska (QICZ)
- **Quantum communicationvn and cryptography**
  Bouda, Gruska (QICZ)
- **Security visualization**
  Kozlíková (VisIt Lab), Ošlejšek (Lasaris)

Information Systems

- **Information retrieval**
  Zezula, Dohnal (DISA), Pala, Horák (NLP)
  Sojka (LEMMA/MIR)
- **Information systems applications**
  Zezula, Dohnal (DISA), Sojka (LEMMA/MIR)
- **Data management systems**
  Zezula, Dohnal (DISA), Ge (SeSLab)
- **Digital libraries and archives**
  Sojka (LEMMA/MIR)
- **Data mining**
  Popelínský (KD group), Pelánek (Adaptive Learning)
  Rossi, Bühnová (Lasaris)
- **Web searching and information discovery, web mining**
  Pala, Horák, Rychlý (NLP)
  Zezula (DISA), Sojka (LEMMA/NLP/MIR)
- **Web data description languages**
  Pala, Horák, Rychlý (NLP), Kopeček, Plhák (LSD)
- **Enterprise information systems**
  Walletzký (SeSLab), Pitner (Lasaris)

Networks

- **Network performance evaluation**
  Matyska (Sitola)
- **Programmable networks**
  Matyska, (Sitola)
- **Network monitoring**
  Pitner (Lasaris), Čeleda (KYPO)

Computer Systems Organization

- **Grid computing, cloud computing**
  Matyska, Rudová (Sitola)
- **Sensor networks**
  Matyáš, Švenda (CRoCS), Pitner (Lasaris)
- **Architectures**
  Pitner, Bühnová, Ošlejšek (Lasaris)
- **Real-time systems, embedded and cyber-physical systems**
  Přenosil, Matěj (EmLab), Pitner (Lasaris)
- **Dependable and fault-tolerant systems and networks**
  Přenosil, Matěj (EmLab), Bühnová (Lasaris)

Hardware

- **Design and architecture of digital systems**
  Přenosil, Matěj (EmLab)
- **Safety of hardware**
  Přenosil, Matěj (EmLab)

- Modelling of hardware structures
  Matěj (EmLab)
- Energy distribution, smart grid
  Pitner, Bühnová, Rossi (Lasaris), Rudová (Sitola)

Human-centered Computing and HCI

- **User models**
  Pelánek (Adaptive Learning)
- **Interactive systems and tools**
  Přenosil (EmLab)
- **HCI design and evaluation methods**
  Pelánek (Adaptive Learning)
  Liarokapis, Chmelík (HCILAB)
  Ošlejšek (Lasaris)
- **Virtual and mixed/augmented reality**
  Liarokapis, Chmelík, Sochor (HCILAB)
  Přenosil (EmLab)
- **Visualization**
  Kozlíková (VisIt Lab), Ošlejšek (Lasaris)
  Přenosil (EmLab)
- **Interaction devices**
  Liarokapis, Chmelík (HCILAB), Přenosil (EmLab)
- **Ubiquitous and mobile computing**
  Matyáš, Švenda (CRoCS), Ge (SeSLab)
- **Web-based and collaborative interaction**
  Ošlejšek (Lasaris), Přenosil (EmLab)
- **Accessibility**
  Kopeček, Plhák (LSD)
- **Collaborative and social computing**
  Walletzký, Ge (SeSLab)

Computer Graphics

- Image processing and analysis
  Kozubek, Pavel Matula, Petr Matula, Maška,
  Svoboda, Ulman (CBIA)
- Rendering, algorithms and structures, visualization
  Sochor, Kozlíková, Chmelík (HCILAB/VisIt Lab)
- Virtual reality
  Liarokapis, Chmelík, Sochor (HCILAB)

Artificial Intelligence

- **Planning and scheduling, constraint programming**
  Rudová (Sitola), Černá (Paradise)
- **Control methods, robotic planning**
  Černá (Paradise), Rudová (Sitola)
- **Knowledge representation and reasoning**
  Popelínský (KD group), Pala, Horák (NLP)
  Sojka (LEMMA/NLP)
- **Natural language processing**
  Pala, Horák, Rychlý (NLP), Popelínský (KD group)
  Sojka (LEMMA/NLP)
- **Search methodologies, metaheuristics**
  Rudová (Sitola)
- **Distributed artificial intelligence**
  Kučera, Brázdil, Řehák (Formela)

- **Multi-agent systems, intelligent agents, mobile agents**
  Kučera, Brázdil, Řehák (Formela), Ge (SesLab)
- **Computer vision**
  Kozubek, Pavel Matula, Petr Matula, Svoboda,
  Ulman (CBIA)
- **Anomaly detection, relational learning**
  Popelínský (KD group)
- **Machine learning approaches**
  Pala, Horák (NLP), Popelínský (KD group)
  Sojka (LEMMA/MIR/NLP)

Software and its Engineering

- Formal methods—model checking
  Barnat, Brim (Paradise), Strejček (Formela)
- Software verification and validation
  Barnat, Brim (Paradise), Strejček (Formela)
- Software architectures
  Bühnová (Lasaris)
- Software system structures
  Zezula, Dohnal (DISA)
- Requirements analysis
  Rossi (Lasaris)
- Software development methods
  Pitner, Bühnová, Ošlejšek, Rossi (Lasaris)

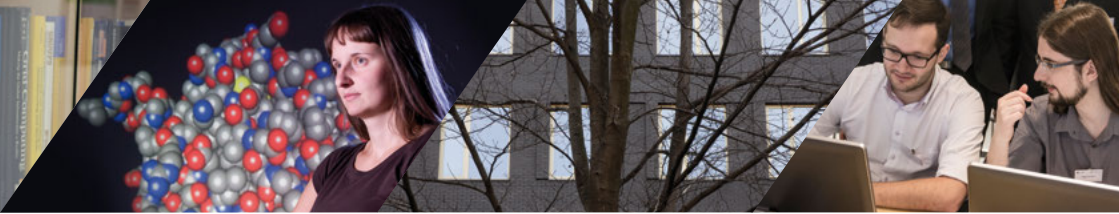## Computational Biology and Bioinformatics

- **Bioinfomatics**
  Lexa
- **Systems biology**
  Brim, Šafránek (SYBILA)
- **Biomedical imaging**
  Kozubek, Pavel Matula, Petr Matula, Maška,
  Svoboda, Ulman (CBIA)
- **Computational proteomics**
  Kozlíková (VisIt Lab)

Applied Computing

- Enterprise architectures, enterprise modeling
  Pitner (Lasaris), Ge (SesLab)
- Education—interactive learning environments
  Pelánek (Adaptive Learning), Čeleda (KYPO)
- Education—computer-assisted instruction
  Pelánek (Adaptive Learning), Čeleda (KYPO)
- Arts and humanities—language translation
  Pala, Horák (NLP)
- Arts and humanities—fine arts, media arts
  Lukášová, Kozlíková (AGD+M)
- Document management and text processing
  Pala, Horák (NLP), Sojka (LEMMA/MIR)
- Electronic commerce
  Walletzký (SeSLab)
- Social and professional topics
  Gruska, Zlatuška
- Operations research
  Rudová (Sitola), Walletzký (SeSLab)

FACULTY OF INFORMATICS
MASARYK UNIVERSITY
Research Areas and Laboratories

Content

Laboratory for Parallel and Distributed Systems

Contact: prof. RNDr. Jiří Barnat, Ph.D.
Website: *paradise.fi.muni.cz*

The Laboratory for Parallel and Distributed Systems (ParaDiSe) targets intensified basic and applied research into concurrent, parallel, and distributed systems. The mainspring of research at ParaDiSe is the application of theories that underlie, or should in future underlie, the specification, modelling, analysis, and verification of these systems. The current focus is on techniques and tools for automated verification of large concurrent systems.

Laboratory of Formal Methods, Logic, and Algorithms

Contact: prof. RNDr. Antonín Kučera, Ph.D.
Website: *formela.fi.muni.cz*

The Laboratory of Formal Methods, Logic, and Algorithms (Formela) focuses on cutting-edge research in formal methods, logic, and discrete mathematical structures in computer science. The major long-term research priorities include probabilistic systems and their game-theoretic extensions, program analysis, structural and topological graph theory, and logic and parameterized complexity. Students are encouraged to participate in the research programme of the laboratory while they are still in their bachelor's and master's programmes. Laboratory members organize several problem-oriented seminars and offer individual supervision to talented students.

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Systems Biology Laboratory

Contact: prof. RNDr. Luboš Brim, CSc.
Website: *sybila.fi.muni.cz*

The Systems Biology Laboratory (SYBILA) offers a challenging, multi-disciplinary working environment for students who aspire to be at the forefront of modern computational biology. The long-term research goal is to develop and apply computational science and technology to enhance our understanding of the molecular mechanisms underlying the behaviour of living systems and to develop scalable methods and tools for the modelling and computerized analysis of large and complex biological systems. Recent advances in systems biology, scientific computing, and the mathematical modelling of biological processes have started to fundamentally impact the way we approach drug discovery, improve diagnosis and therapy, prevent various diseases, and produce emissions-neutral biofuels.

Research Areas and Laboratories
Formal Methods
Systems Biology Laboratory
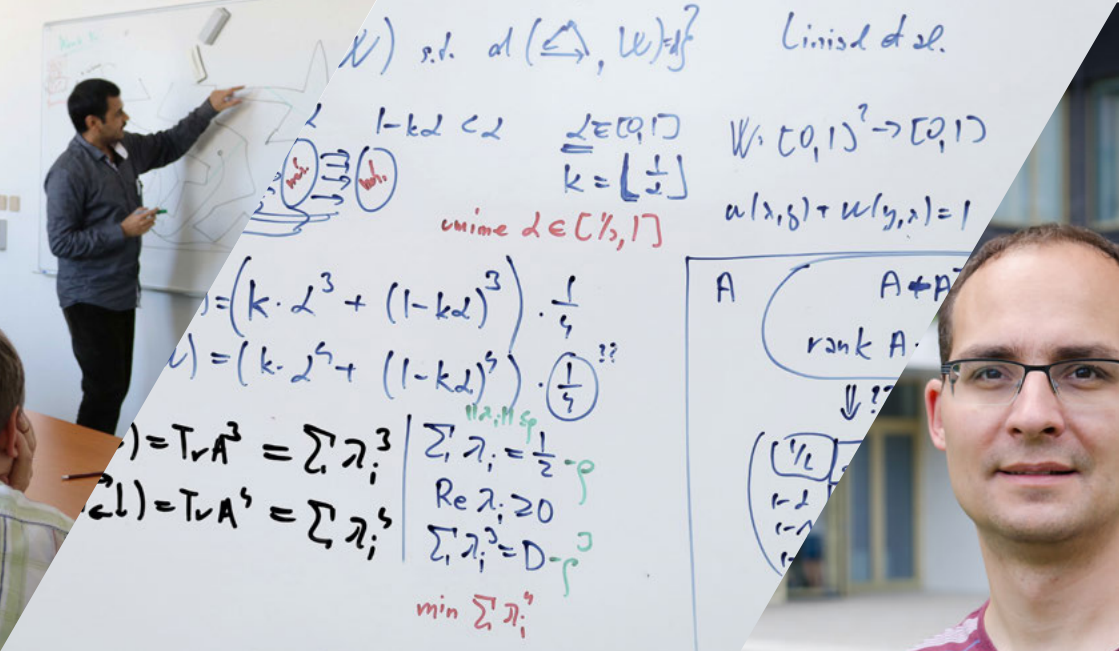
Laboratory of Discrete Methods and Algorithms

Contact: prof. RNDr. Petr Hliněný, Ph.D. and prof. RNDr. Daniel Kráľ, Ph.D., DSc.
Website: *fi.muni.cz/research/laboratories/dimea.html*

The Laboratory of Discrete Methods and Algorithms (DIMEA) focuses
on problems from discrete mathematics underpinning computer science
and their applications to the design of discrete algorithms. Our research
areas include in particular algorithmic, geometric, structural and topological
graph theory, and analytic representations of large discrete structures.
The members of the laboratory have an intensive network of collaborators
(e.g., they coauthored papers with more than 150 researchers), and their
research is supported by various national and international grant agencies.
The laboratory welcomes all students of the bachelor, master and doctoral
levels to participate in its research seminars and to join its research activities.

Knowledge Discovery Group

Contact: doc. RNDr. Lubomír Popelínský, Ph.D.
Website: fi.muni.cz/kd

The main research areas of the Knowledge Discovery Group are anomaly detection and graph mining. The group also focuses on pre-processing methods for data mining, including deep learning and frequent patterns as new features, as well as on text mining—particularly text summarization and the detection of anomalous documents. Collaboration with industry and the public sector is emphasized. Members of the group teach most courses on machine learning and data mining, including natural language learning and text mining.

Research Areas and Laboratories
Artificial Intelligence
Knowledge Discovery Group

Adaptive Learning Research Group

Contact: doc. Mgr. Radek Pelánek, Ph.D.
Website: *fi.muni.cz/adaptivelearning*

Adaptive learning systems are computer applications that adapt to the knowledge of individual students. Our research group deals with both the practical development of such systems and with the theoretical research that supports it. Example systems include Slepé Mapy (geography), Anatom (anatomy), Umíme Česky and Umíme Anglicky (language learning). Adaptive behaviour is based on mathematical models of knowledge and uses machine learning techniques. Participation in the activities of the research group may take many different forms, ranging from theoretical research into the properties of statistical models to the development of educational applications using JavaScript. The results of this work often have an immediate impact on thousands of users.

Research Areas and Laboratories
Artificial Intelligence
Adaptive Learning Research Group

Natural Language Processing Centre

Contact: prof. PhDr. Karel Pala, CSc., doc. RNDr. Aleš Horák, Ph.D.
Website: *nlp.fi.muni.cz*

The Natural Language Processing Centre at the Faculty of Informatics, Masaryk University, conducts theoretical and applied research in the following areas: analysis of written texts at all levels—morphological, syntactic, and semantic; corpus management and lexical databases; semantic representation of natural language expressions; semantic web, ontologies, knowledge representation and reasoning; applications of machine learning techniques to text processing; dialog representation and management; synthesis and recognition of speech (spoken Czech). In addition to its research objectives, the NLP Centre targets training for undergraduate and postgraduate students in the interdisciplinary specialization of "language engineering".

Research Areas and Laboratories
Artificial Intelligence
Natural Language Processing Centre
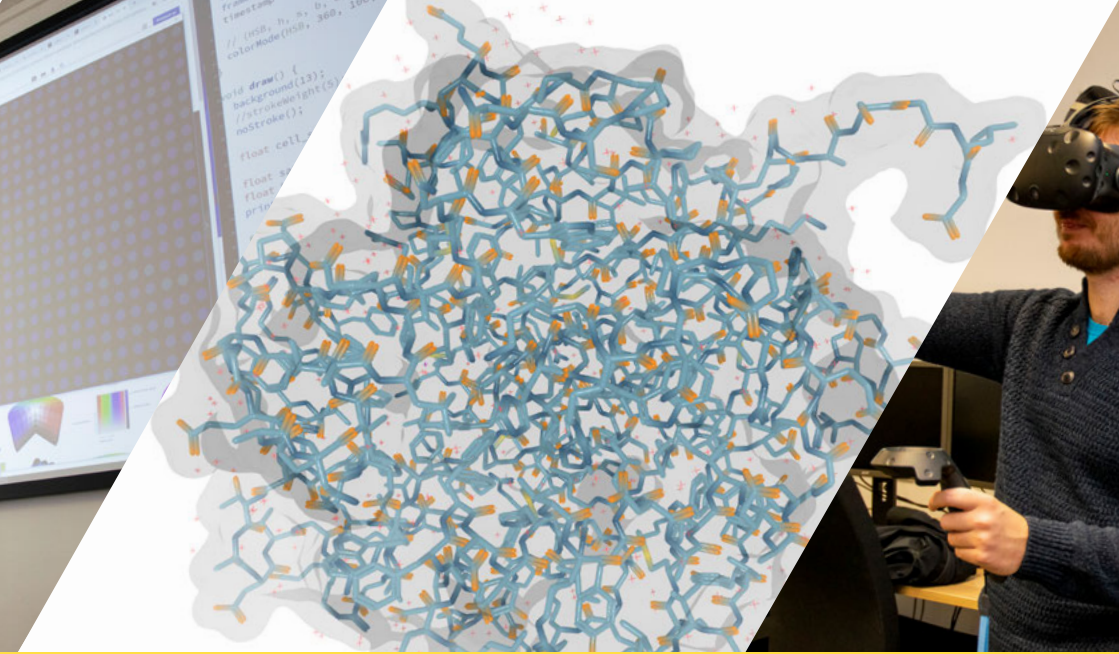
Visualization Laboratory

Contact: doc. RNDr. Barbora Kozlíková, Ph.D.
Website: *visitlab.fi.muni.cz*

VisIt Lab is a newly established research laboratory, focusing on fundamental and applied research in visualization, visual analysis, and computer graphics and their relation to virtual environments and graphic design. Currently, our research interests and projects are covering the fields of molecular visualization and security visualization, but we are open to collaborating on projects in other application areas as well. Our lab has strong connections with the visualization groups at TU Wien, University of Bergen, Ulm University, and University of Tübingen. Students of our lab will get insight into visualization, visual analysis and computer graphics on undergraduate, graduate, and Ph.D. levels.

Research Areas and Laboratories
Computer Graphics and Image Processing
Visualization Laboratory
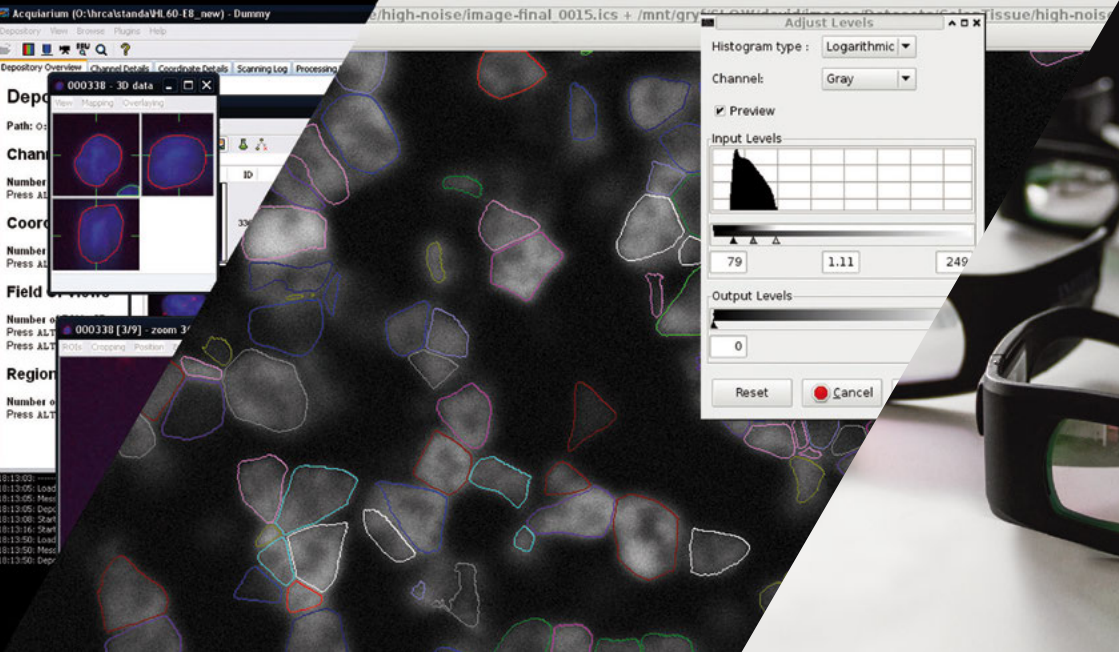
Centre for Biomedical Image Analysis

Contact: prof. RNDr. Michal Kozubek, Ph.D.
Website: *cbia.fi.muni.cz*

The Centre for Biomedical Image Analysis (CBIA) is a well-established interdisciplinary research unit whose primary focus is on developing and benchmarking algorithms for the analysis and synthesis of cell microscopy image data. A secondary focus is the analysis of biomedical image data produced by other imaging instruments and the use of computers in optimizing and automating the image acquisition process. CBIA brings together experts not only from computer science, mathematics, and physics, but also from biology and medicine. Our ultimate goal is to describe the spatiotemporal behaviour of cells and how it changes in carcinogenesis, knowledge which is crucial for diagnostics and therapy. To this end, our main immediate goals centre on developing reliable, ideally automatic cell segmentation, quantification, and tracking algorithms.

Research Areas and Laboratories
Computer Graphics and Image Processing
Centre for Biomedical Image Analysis

Human Computer Interaction Laboratory

Contact: doc. Fotis Liarokapis, Ph.D.
Website: *hci.fi.muni.cz*

The research focus of our group is on various aspects of human-computer interaction, including augmented and virtual environments, scientific visualization, brain-computer interaction, procedural modelling, and serious games. Members of the group participate in several long-term, multidisciplinary projects in collaboration with research groups in areas as diverse as anthropology, archaeology, cartography, chemistry, and psychology.

The laboratory itself is equipped with state-of-the-art hardware, including a motion capture system, 3D projection system, haptic devices, head-mounted displays, brain-computer interfaces, and 3D printers. It's open to both undergraduate and graduate students and allows them to gain knowledge and practical experience in modern HCI methods and technologies.

Studio of Graphic Design and Multimedia

Contact: MgA. Helena Lukášová, ArtD.
Website: *agdm.fi.muni.cz*

The Studio of Graphic Design and Multimedia (AGD+M) offers
an education in graphic design and related disciplines. The major
focus of AGD+M is digital media, which has now gained dominance
over print media. Digital and print both follow the same graphic
design rules, but digital technologies have opened up a host of
new possibilities for communicating with consumers. That means
student assignments can be interpreted in new ways and using varied
approaches. Students' knowledge of informatics and programming
is a great advantage. AGD+M promotes interdisciplinarity through
such themes as generative design, the creation of interactive media
applications, animation, video, 3D digital modelling and 3D printing,
e-publishing, web design, font development, computer games,
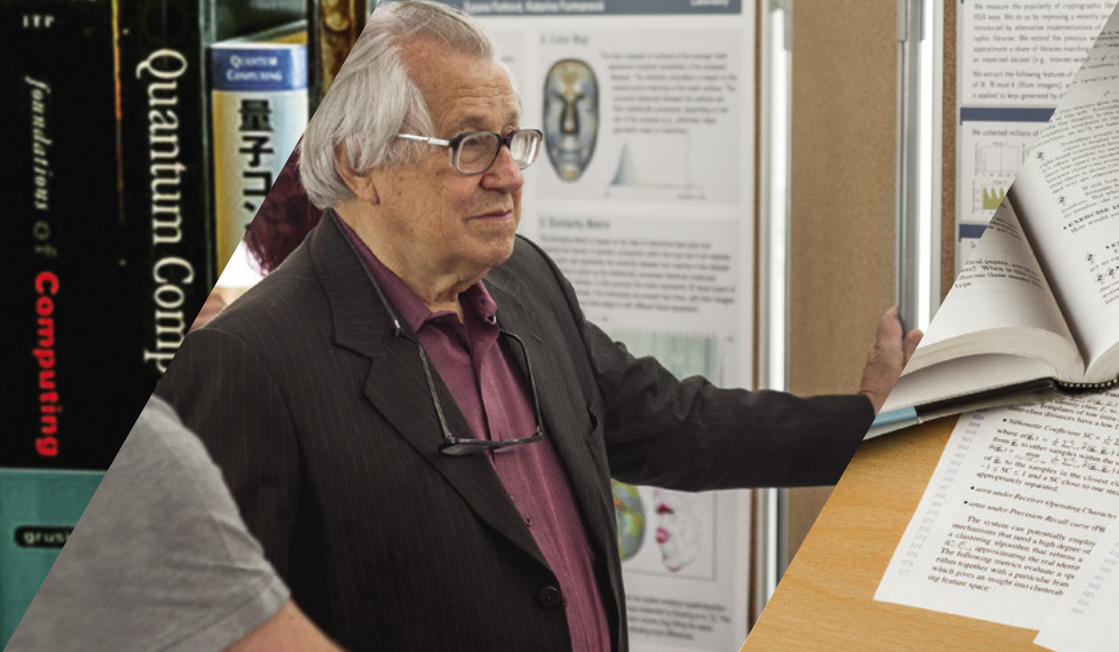and interactive information design.

Research Areas and Laboratories
Computer Graphics and Image Processing
Studio of Graphic Design and Multimedia

Centre for Research on Cryptography and Security

Contact: prof. RNDr. Vašek Matyáš, M.Sc.,Ph.D.
Website: *crocs.fi.muni.cz*

CRoCS enables students to gain practical experience with current security and crypto solutions and technologies. The main areas of interest are user and data authentication based on various methodologies—cryptography, biometrics, the secure use of smartcards and crypto methods using smartcards, crypto methods in wireless sensor networks, and uses of crypto in creating and operating secure systems. Our goal is to create an environment that lets students gain hands-on experience with the available technical solutions and allows them to explore various types of attacks in lab courses or in their theses. CRoCS laboratory is open to students working within FI industrial partnership framework or on projects carried out in cooperation with governmental entities.

Research Areas and Laboratories
Security and Embedded Systems
Centre for Research on Cryptography and Security

Laboratory of Quantum Information Processing and Cryptography

Contact: prof. RNDr. Jozef Gruska, DrSc.
Website: *qicz.fi.muni.cz*

The Laboratory of Quantum Information Processing and Cryptography is focused on the information aspects of quantum information processing, especially on quantum cryptography, the theory of information, quantum communication, and algorithms. The laboratory is also involved in theoretical aspects of cryptography, particularly using the theory of information to solve security problems.

Design and Architecture of Digital Systems Laboratory

Contact: prof. Ing. Václav Přenosil, CSc.
Website: *embedded.fi.muni.cz*

Our laboratory is outfitted with the SW, HW, and equipment used to develop digital systems. This provides students with the opportunity to learn how electronic systems are designed, including the use of development tools and resources. They gain knowledge specific to working with programmable structures. Laboratory activities provide a balanced grounding in theory, along with practical skills used in the design, implementation, analysis, testing, and operation of embedded systems. Integral to the student's education is experience working on a project with a small team. The project explores experimental solutions and prototypes for practical problems of interest that are prompted by the faculty's research or from collaborative activities with potential future employers.

Research Areas and Laboratories
Security and Embedded Systems
Design and Architecture of Digital Systems Laboratory

Cybersecurity Laboratory

Contact: doc. Ing. Pavel Čeleda, Ph.D.
Website: *kypo.fi.muni.cz*

We are an expert research laboratory that specializes in a wide range of cybersecurity topics. For students at all levels (Bachelor, Master, and Ph.D.), we offer the opportunity to explore the field of cybersecurity and gain valuable theoretical knowledge and practical skills. We connect theory with practice and educate future security professionals. Our research interest spans multiple areas: network security, network monitoring, training environments, and cybersecurity education. In these areas, we have broad experience from successful research projects and collaborations with academia, industry, and government partners. The research activities are performed in KYPO cyber range, a state of the art scientific computing facility for cybersecurity research and education.

Laboratory of Advanced Networking Technologies

Contact: prof. RNDr. Luděk Matyska, CSc.
Website: *sitola.fi.muni.cz*

The Laboratory of Advanced Networking Technologies is a research laboratory specialising in advanced network protocols and applications requiring high-speed networks. The laboratory is the result of a joint effort by the Faculty of Informatics, the Institute of Computer Science of Masaryk University, and CESNET, a non-profit organisation responsible for the national research and education network and its applications. The laboratory is equipped with state of the art visualisation facilities, including a 3D projection system, several 2D projection systems, and audio equipment, all interconnected by a network-accessible programmable switcher. These facilities have enabled the lab to become the first Czech Access Grid point.

Research Areas and Laboratories
Large Scale Distributed Systems and Networks
Laboratory of Advanced Networking Technologies

Laboratory of Data Intensive Systems and Applications

Contact: prof. Ing. Pavel Zezula, CSc.
Website: *disa.fi.muni.cz*

In the Laboratory of Data Intensive Systems and Applications (DISA), we study and develop modern techniques for effective and efficient data management. We focus mainly on the problems of big data indexing and similarity-based searching. We develop techniques for the traditional client-server approach, as well as for modern distributed and cloud-computing infrastructures. The results are presented in several publicly available prototype applications that demonstrate various multimedia processing approaches. Laboratory members participate in national and international research projects, and we also cooperate with several industrial partners. The laboratory is open to students at any level, and we are always looking for new members willing to participate in a wide range of research and development tasks.

Research Areas and Laboratories
Data Management
Laboratory of Data Intensive Systems and Applications

Laboratory of Electronic and Multimedia Applications

Contact: doc. RNDr. Petr Sojka, Ph.D.
Website: *lemma.fi.muni.cz, mir.fi.muni.cz, gait.fi.muni.cz*

The Laboratory of Electronic and Multimedia Applications (LEMMA) develops applications and technologies for processing big collections of data (mostly documents for digital libraries), including the production and post-production of films. These new technologies are intended mainly (but not exclusively) for free-to-use software. LEMMA is a playground where research is currently being done in three areas:

• Information Retrieval: the representation, similarity and indexing of STEM documents for digital libraries and plagiarism detection
• Machine learning methods for high-dimensional data—gait recognition
• Multimedia production

Research in the laboratory is highly multidisciplinary and application-driven. The laboratory cooperates with NLP Centre (text processing), DISA (gait and multimedia indexing), Sitola (video), AGD+M and HCI (animations, graphics, interaction design) laboratories.

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Laboratory of Software Architectures and Information Systems

Contact: doc. RNDr. Tomáš Pitner, Ph.D.
Website: *lasaris.fi.muni.cz*

The Laboratory of Software Architectures and Information Systems (Lasaris) primarily investigates software architectures and the security and reliability aspects of computer systems and critical infrastructures, namely smart grids.

The lab explores the design and development of information systems and services, system implementation, and relevant software technologies, including enterprise and mobile platforms.

The lab is very active in teaching and supervision of graduation theses. Students at all levels (bachelor's, master's, and Ph.D.) are involved in most projects.

Lasaris collaborates with CERIT Science Park, Czech Cybercrime Center of Excellence, and numerous industrial partners, as well as with renowned universities and research institutions abroad like the University of Vienna.

Laboratory of Service Systems

Contact: Ing. Leonard Walletzký, Ph.D.
Website: *seslab.fi.muni.cz*

Nowadays, innovative solutions such as Smart City, Industry 4.0, Service Complexity, Internet of Things, Big Data Analytics or Digital Service are becoming more prominent in everyday life. The Laboratory of Service System (SesLab) conducts its research on new approaches, models, platforms related to these concepts. We also explore practical usage of modern technologies to be able to recommend the best practices in service design. We are an enthusiastic and growing team who attempts to tackle the research challenges from multidisciplinary domains named above. Our practical implementations include the design of information system applications with the specific focus on Enterprise Resource Planning systems provided as a service. In our research, we often focus on the communication to the users and customers of such systems. By using advanced managerial, marketing and operational research methods we aim to bring an optimized utility and value.

CERIT Science Park

Creativity / Security / Partnership

CERIT Science Park is a scientific and technical park and a business incubator of Masaryk University. The park is run by Faculty of Informatics and it is also located on its premises.

The interconnection of the university and corporate environments at a single location brings into being a unique ecosystem, enabling:

• Dynamic collaboration between the university and companies in key areas (mobile and data network security, the security of energy facilities and other critical infrastructure, institutional and public protection against cyber attacks, and other areas).
• The rapid transfer of research and development outcomes from the university to practice.
• An environment to be systematically built and supported that encourages creativity, innovation and unique IT.
• Daily contact by students with the business environment while they study, giving them an advantage in the labour market and expanding the exchange of knowledge between the university and the corporate world.

CERIT Science Park was launched in September 2014. The total space in the park available for use by the corporate sector is 2 200 m^2, with the capacity for up to 20 companies.

CERIT Science Park

Association of Industrial Partners

Contact: doc. Ing. RNDr. Barbora Bühnová, Ph.D.
Website: *fi.muni.cz/for-partners*

The Faculty of Informatics, Masaryk University (FI MU) established the Association of Industrial Partners of FI MU (AIP) in 2007 to strengthen the cooperation between the university and the industry. Major AIP activities include:

- **Day with Industrial Partners:** A regular all-day event popular with students as well as companies that facilitates direct contact between FI MU students and AIP companies. The companies present their activities and opportunities for student involvement, individual discussions then happen in booths.
- **Competition for talented students:** A competition that targets students at the beginning of their bachelor studies. The finalists are offered positions as student researchers in FI MU labs with topics co-defined by industrial partners, and with scholarship support.
- **Cooperation on the supervision of final theses:** More than 100 theses are yearly successfully defended in cooperation with industrial partners, which is an excellent indicator of the extent of the collaboration.
- **Participation of industry experts in teaching** — from individual lectures and seminars to entire courses.
- **Ph.D. positions sponsored by companies:** Co-supervision of doctoral students, supported with expertise as well as funding from both the university and the industrial partner.
- **Various other opportunities for students,** including innovative and research projects, competitions, internships, job offers, student workshops, and conferences.

Association of Industrial Partners

The ERC Consolidator Grant LADIST

Contact: prof. RNDr. Daniel Kráľ, Ph.D., DSc.
Website: *fi.muni.cz/research/ladist/*

The European Research Council (ERC) was set in 2007 to fund excellent scientists and their most creative ideas. The award of a grant from ERC is among the most prestigious funding a researcher can receive. The ERC Consolidator grant LADIST held by Dan Kráľ at the Faculty of Informatics aims at introducing new mathematical methods to analyze and approximate large graphs, mathematical objects representing large networks in computer science. A need for such methods comes from computer science applications, where the sizes of input structures are often enormous. The research supported by the grant has resulted in progress on many difficult problems in mathematics and computer science. For example, the recent joint work with Andrzej Grzesik (Kraków) and László Miklós Lovász (MIT) led to new substantial insights into the structure of large graphs appearing in extremal graph theory.