University *of Ljubljana*
Faculty *of Computer and Information Science*

2021/2022

Doctoral Study Programmes

Computer and Information Science • Biosciences

An Adventure Awaits You

The world of today is in need of qualified professionals who are capable of developing new computer and information technologies and implementing them in innovative environments. Computer and information science is changing the economy, education, culture, administration and other disciplines. Have you got what it takes to be a part of it?

At the Faculty of Computer and Information Science we offer a doctoral study programme in Computer and Information Science that meets the needs of young people who intend to carry out demanding and innovative research or intend to pursue a career in academia.

The study is designed to further your knowledge of computer science and information technology, combining scientific and professional areas with elective courses and an academic mentor programme. The main focus is on research, interdisciplinarity and cooperation with domestic and foreign experts.

Each student is free to find and propose his or her own relevant research topic and devote to it. Whatever you choose will be the key to your own adventure and career path.

State-of-the-art courses

Research-focused programme

Lectures are held in English

Modern facilities

Doctoral Study Programme in Computer and Information Science

The Computer and Information Science doctoral study programme comprises organised forms of study, research and the doctoral dissertation. It is a four-year programme performed entirely in English.

Mandatory Courses

The two mandatory courses are Scientific Skills 1 and Scientific Skills 2, which include topics such as paper writing, preparing good oral and poster presentation, copyright and patent laws, ethics in science, writing project proposals and the like.

Research and the Doctoral Dissertation

The students' time is mostly devoted to carrying out their own scientific research with guidance from their mentors. The final result, the doctoral dissertation, should be an original contribution to science and must be written in accordance with the university's policy on doctoral dissertations.

Elective Courses

The candidate chooses four elective courses, two of which are selected from these elective courses: Incremental Learning from Data Streams • Mathematics for Machine Learning • Modern Cryptography and Computer Security • Predictive Analytics for Structured Data • Advanced Topics in Network Science • Contemporary Approaches to Algorithm Design • Heterogeneous Computing Platforms • Approximate Arithmetic for Media Processing and (C)NNs

The other two elective courses may be chosen from the above list or from other doctoral study programmes at the University of Ljubljana or other universities with combined workload of at least 10 ECTS credits.

Seminars

Seminars are a compulsory part of the study programme and serve to ensure regular doctoral student meetings and discussions about their research. There are five seminars in total: one in each of the first four semester and one in the last semester of the study programme. The seminars are closely related to the students' research work; at these seminars the students present their work (e.g., papers, theses) to each other and to their mentors.

1st Year

The first study year comprises two elective courses, the Scientific Skills 1 course and Seminars 1 and 2. Candidates establish the focus of their research with the guidance of their mentors and start with their research.

2nd Year

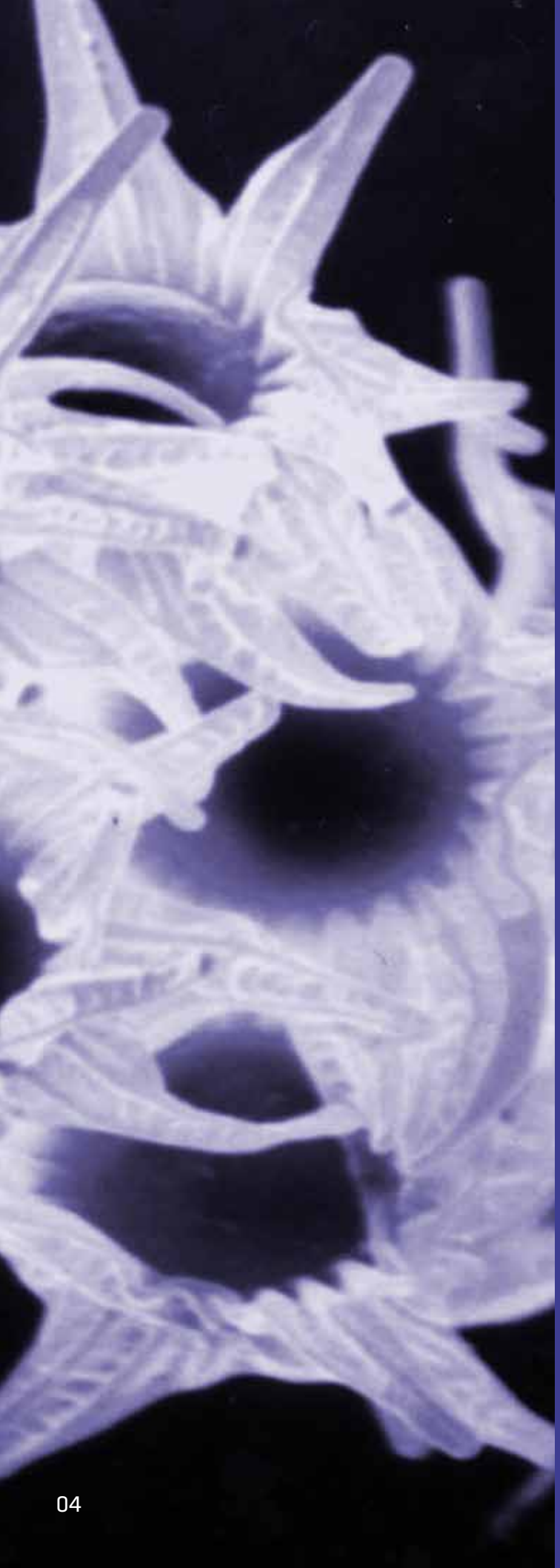
In the second year, the candidates take part in two elective courses and Seminars 3 and 4, but primarily focus on research that is guided by their mentors and on which they work closely with their chosen laboratory. In order to progress to the third year, candidates must have an approved thesis topic, which includes a written description and a defence.

3rd Year

The third year is reserved for research.

4th Year

The fourth year is reserved for research and preparation of the doctoral thesis, which the candidate presents in Seminar 5. The candidate also learns how to write a project proposal in the Scientific Skills 2 course.



Interdisciplinary Doctoral Study Programme in Biosciences

In addition to our core Doctoral Programme Computer and Information Science, we also offer the Interdisciplinary Doctoral Study Programme in Biosciences.

The programme is provided together with the Biotechnical Faculty, the Faculty of Electrical Engineering, the Faculty of Health Sciences and the Faculty of Mechanical Engineering. The study programme consist of organised learning (lectures, practicals, presentations of doctoral thesis topic, etc.) amounting to 60 ECTS credits, while the remaining 180 ECTS credits are devoted to individual research work for doctoral dissertation.

More information on:
http://bioznanosti.si/en

1st Year

2nd Year

3rd Year

4th Year

Research Work

The research work at the faculty is carried out by 120 researchers in 19 laboratories and is very diverse. Doctoral students are an important part of it, gaining international experience as a result.

The research is made through more than 100 various research projects each year funded by the European Commission, the Slovenian Research Agency, industrial partners and other funding agencies. We cover a wide range of research topics with a focus on certain specialised areas of computer and information science.

Our work is particularly intense in the field of artificial intelligence and related disciplines, such as machine learning, data mining and computer vision, and applied to different domains from bioinformatics and cognitive modelling to intelligent robotics. Another important research area is data acquisition and management as well as integration of information systems. Various other research fields and projects can also be seen on the next pages.

Computer science, engineering, software development and statistics not only contribute to capital gains, but also fuel deeper understanding of society and the environment.

Over the years, I have been involved in designing mathematical models of processes within living cells - gene regulation, interactions with the environment and their diversity in humans and other organisms. Machine learning and data analysis play a key role in medicine, ecology, and - nowadays crucial - public health. The graduate programme allows for significant freedom, but also responsibilities in research conduct. By far the largest value are connections to several international experts, with whom we collaborate on a daily basis.

dr. Martin Stražar
Broad Institute of MIT and Harvard, Cambridge, MA, USA

The doctoral programme has enabled me to research a variety of interesting scientific topics, contribute to the scientific community, gain valuable knowledge from the experts and learn about the cutting-edge innovations. My research is devoted to gait analysis using inertial sensors, step length estimation in particular. Unlike the master's programme, the doctoral programme is less structured and therefore more challenging. Even though it requires a great amount of dedication and commitment, it can present a fulfilling, diverse and rewarding career, especially when your knowledge is applied in creative problem solving.

Melanija Vezočnik
doctoral student of Computer and Information Science

Research Projects

Machine Learning and Data Mining

Orange Data Mining – open source machine learning and data visualization tool

Predicting Cognitive Diseases – machine learning tools for diagnostic practice

Society

Tourism 4.0 – enriched tourist experience, managing tourist flows

Micreate – ICT tools and digital storytelling for integration of migrant children

GETM3 – improvement of employability and global management of young talents

Biomedical research

BioPharm.si – next generation of biologics

SilicoFCM – platform for in silico clinical trials of familial cardiomyopathies

scOrange – single cell gene expression analysis

Smart Blood Analytics – flexible and scalable approach for medical diagnosis

Biometry

Ear Biometrics – ear detection and person recognition

Biometric Recognition Based on Eye Information – deep learning methods

Deindentification of Faces – using generative neural networks for privacy protection

Language Resources and Technologies

Thesaurus of Modern Slovene – responsive dictionary

Internet of Things

EkoSmart – a smartcity ecosystem

vitabits – health platform for remote patient monitoring

Computer and Machine Vision

Visual Object Tracking (VOT) Challenge – leading an international initiative for evaluation of visual trackers

GOSTOP – robotics for the factories of the future

Obstacle Detection for Unmanned Suface Vehicles – detectors for robotic boats

High Performance Computing

cHiPSet – high-performance modelling and simulation for big data applications

Joint Chinese-Slovenian HPC laboratory – analysis of biomedical data and image analytics

Join our existing research groups!

Doctoral students and doctoral study candidates are welcome to join existing research groups. Follow open calls for research positions on Career at the Faculty webpage

https://fri.uni-lj.si/en/career-faculty.

Research Laboratories

Laboratory for Mathematical Methods in Computer and Information Science
Assoc. Prof. dr. Žiga Virk
TCSMM

Laboratory for Ubiquitous Systems
Dr. Andrej Brodnik
TCSMM SN

Computer Structures and Systems Laboratory
Prof. dr. Nikolaj Zimic
SN CB

Bioinformatics Laboratory
Prof. dr. Blaž Zupan
CB MLAI

Laboratory for Biomedical Computer Systems and Imaging
Prof. dr. Franc Jager
CB MPM

Visual Cognitive Systems Laboratory
Assoc. Prof. dr. Danijel Skočaj
MLAI MPM

Computer Vision Laboratory
Prof. dr. Peter Peer
MPM

Artificial Intelligence Laboratory
Asst. Prof. dr. Aleksander Sadikov
MLAI

Laboratory for Cognitive Modelling
Prof. dr. Igor Kononenko
MLAI

Laboratory for Data Technologies
Prof. dr. Marko Bajec
SEI MLAI

Software Engineering Laboratory
Sen. Lect. dr. Igor Rožanc
SEI

Information Systems Laboratory
Assoc. Prof. dr. Damjan Vavpotič
SEI

Laboratory of Algorithmics
Prof. dr. Borut Robič
TCSMM

Laboratory for Cryptography and Computer Security
Prof. dr. Aleksandar Jurišić
TCSMM SN

Computer Communications Laboratory
Assoc. Prof. dr. Mojca Ciglarič
SN

Laboratory for Adaptive Systems and Parallel Processing
Prof. dr. Branko Šter
SN MLAI

Laboratory of e-media
Prof. dr. Denis Trček
SN SEI

Laboratory for Computer Graphics and Multimedia
Assoc. Prof. dr. Matija Marolt
SEI MPM

Laboratory for Integration of Information Systems
Prof. dr. Matjaž Branko Jurič
SEI

TCSMM Theoretical computer science and mathematical models
SN Systems and networks
CB Computational biology
SEI Software engineering and informatics
MLAI Machine learning and artificial intelligence
MPM Machine perception and multimedia

More information on
https://fri.uni-lj.si/en/research/laboratories

Mentors

Selecting the right mentor is one of the most important decisions you can make at the start of your doctoral study. The role of the mentor is to help you choose your field of research, to formulate the topic, select courses, to monitor your work and provide helpful advice.

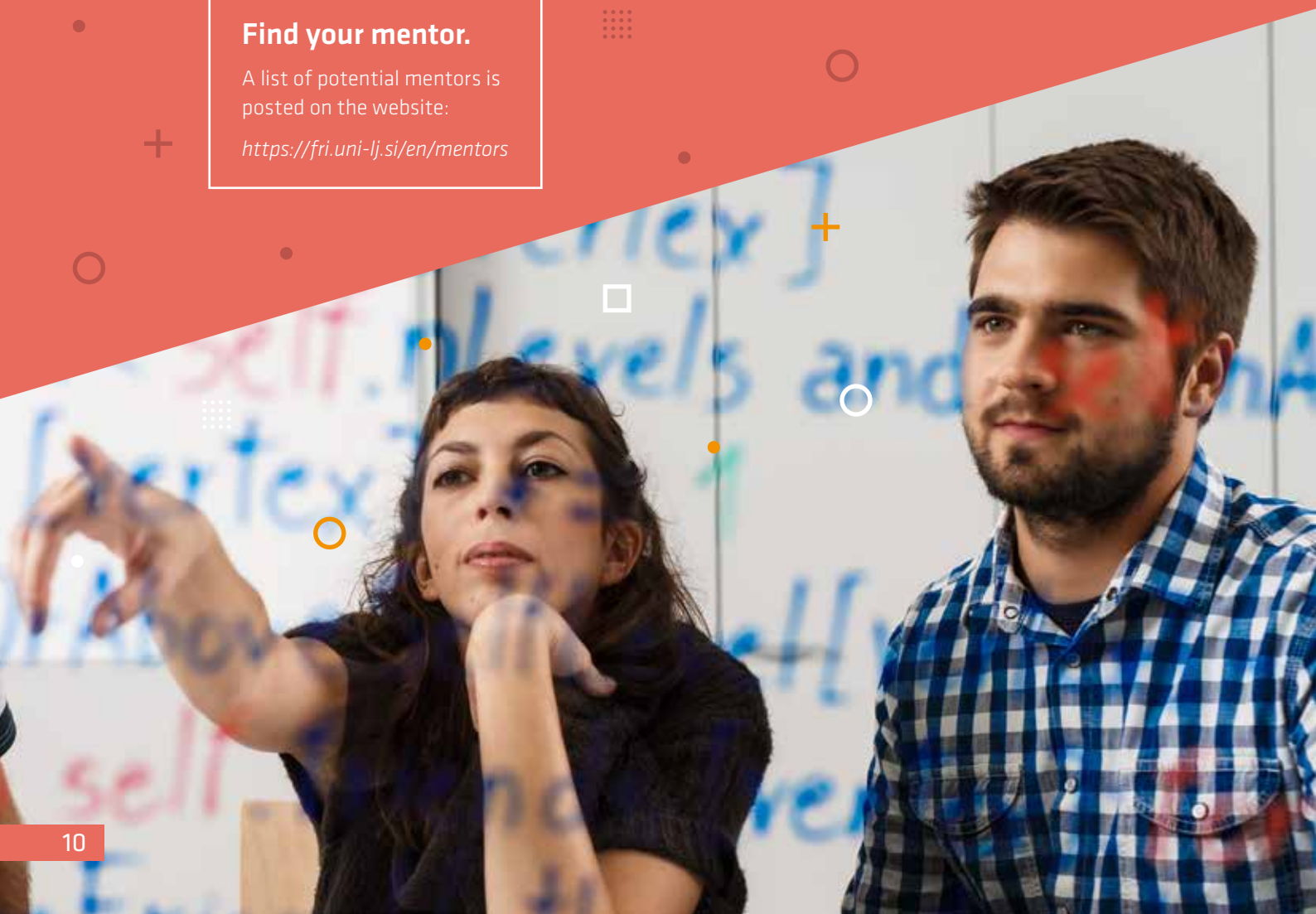
You will be in continuous contact with your mentor; you will collaborate with members of the laboratory and use the equipment it offers. The mentor will help you formulate your doctoral thesis so that your original contributions to computer and information science will be evident in it.

Make your selection in relation to your field of interest. Before your final selection, talk to the mentor, familiarise yourself with their laboratory, read through some of the mentor's most recent articles and consider whether the field they are involved in is appropriate and of interest to you.

Find your mentor.

A list of potential mentors is posted on the website:

https://fri.uni-lj.si/en/mentors



How to Apply?

Students apply for studies via eVŠ web portal at *http://portal.evs.gov.si/prijava*. The application deadline is 1st June 2021. Application process includes recognition of foreign education. Detailed information regarding application process is available in the call for enrolment.

Tuition Fees

In the academic year of 2021/2022 the tuition fee for the Doctoral Study Programme Computer and Information Science is 4200€ for the first two years and 3000€ for the last two years. Whereas for the Doctoral Study Programme in Biosciences the tuition fee is 3800€ the first two years and the 2200€ for the last two years.

Admission Requirements

Candidates that have completed the following can enrol in the third-cycle study programme:

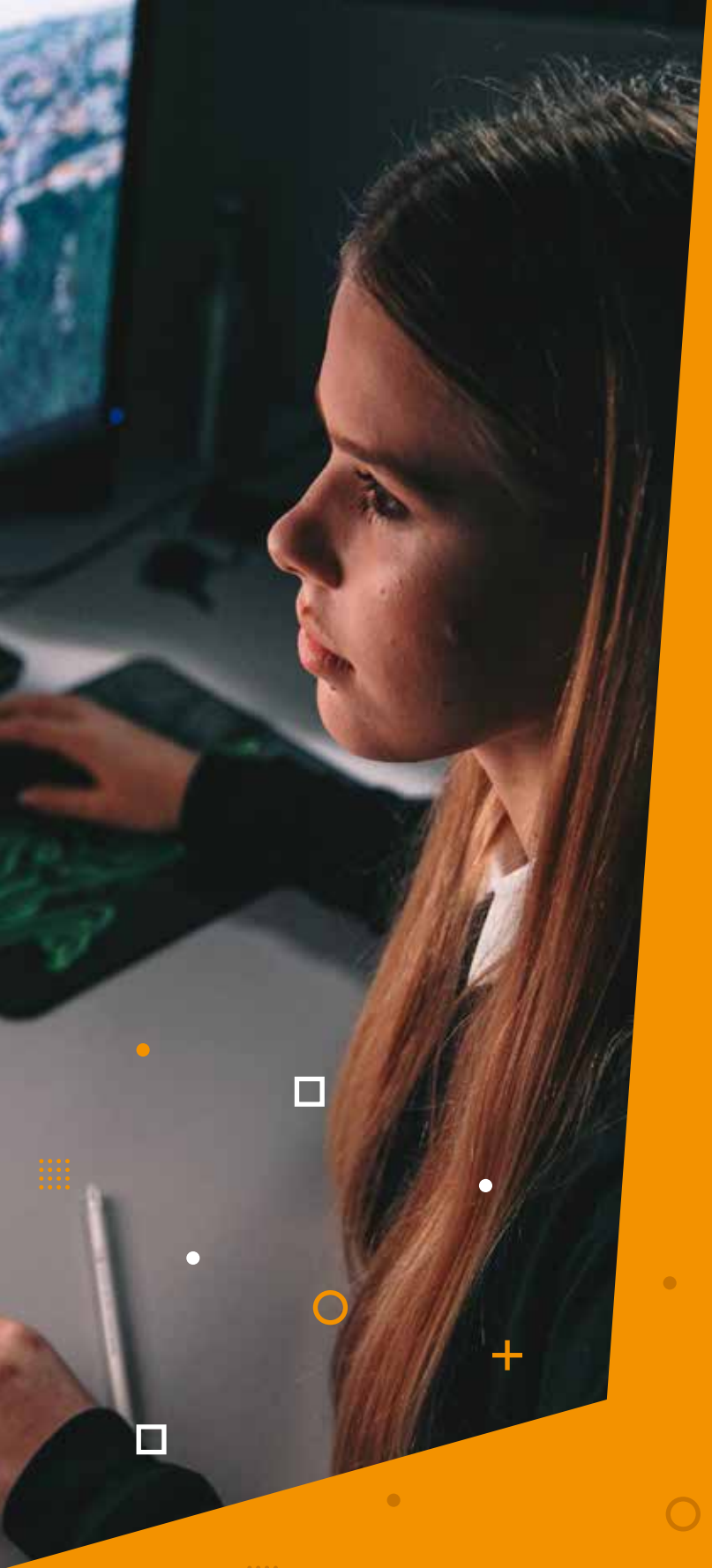
(a) A second cycle master's programme; (b) A vocational study programme regulated by EU directives or any other uniform master's study programme evaluated at 300 ECTS; (c) A university study programme adopted before 11 June 2004; (d) A professional study programme adopted before 11 June 2004 and study programmes leading to specialization. Prior to enrolment, candidates must complete study requirements in the scope of up to 60 ECTS from the second-cycle Computer and Information Science study programme. Their study requirements (a list of courses) will be determined by the Faculty's committee, in view of the candidate's prior education (completed programme); (e) A study programme leading to a MSc degree. Candidates will be accorded credits up to 60 ECTS.

Given that they have completed an equivalent level of education abroad, foreigners applying for doctoral programmes are subject to the same conditions as Slovenian citizens. The equivalence of education with the purpose of continuation is determined in accordance with the University of Ljubljana statuses. The procedure is led by the authorized person at the University of Ljubljana, with the content managed by the Senate of the member faculty of the University of Ljubljana Senate.

Application Enclosures

- CV, motivation letter and two recommendation letters
- Original or the duplicate of the final certificate, representing general requirement for access to higher education in the country of issue, legalized on the basis of: the 1961 Hague Convention (at the court with territorial jurisdiction where the certificate or diploma has been issued); with properly filled in apostille form affixed of the Authentication of Documents in International Traffic Act. Countries for which no legalization is required: Austria, Bulgaria, Bosnia and Hercegovina, Cyprus (for documents issued by public higher education institutions and universities), Czech Republic, France, Greece, Croatia, Hungary, Republic of Macedonia, Romania
- Certified Slovene or English translation of the certificate or diploma
- Photocopy of the original certificate or diploma
- Certified copies of the evidence on the contents and duration of education and the requirements fulfilled during the educational programme (Diploma supplement, annual report cards, transcripts or others)
- A short chronological description of the entire education prepared by the applicant
- Mentor's statement of accepting mentorship in doctoral studies and a short conceptual design of the research work

Application process includes recognition of foreign education, documents needed are described above. Detailed information regarding application process is available in the call for enrolment.



Scholarships and Research Positions

There are several scholarships available for doctoral students. The Public Scholarship, Development, Disability and Maintenance Fund of The Republic of Slovenija and other agencies offer several scholarships to foreign citizens for doctorate studies in Slovenia. Please carefully read the requirements published on website *www.sklad-kadri.si/en/*. If you have any questions, do not hesitate to contact our student affairs team at *international.office@fri.uni-lj.si*.

In 2021/2022 there are several scholarship programmes available for students from Western Balkan States.

The Faculty offers positions for:

Teaching assistants
Junior researcher positions
Researcher positions

Employment Opportunities

Employment opportunities for Computer and Information Science doctoral graduates are very broad. Students who have completed their doctorates found jobs without any difficulty.

Primarily, the programme trains doctors of science who become high-level professionals working in enterprises and social institutions that develop computer or IT solutions. These institutions also use solutions for innovation purposes to gain competitive advantages or to improve the quality of business and work. Typical roles are leadership, research and development.

The employability of doctoral students who complete the programme is very high, due to a great need for such professionals at home and around the world. This is an additional motivation to enrol in this study programme.

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We are working in a knowledge-intense sector of HPC and HPDA, where the need for highly educated professionals is more than obvious. The alumnae of the Faculty of Computer and Information Science are our first choice when we are hiring such a staff. With an excellent doctoral programme, the Faculty of Computer and Information Science offers a good option for those who want to dig deeper and fly higher. Many years ago, I had a privilege to sharpen my research potential during my doctoral study at the Faculty of Computer and Information Science, but unfortunately had to give priority to family and business just before finishing it. Nevertheless, the gathered knowledge helped me to establish a R&D oriented company that competes with big players on a global market.

Tomi Ilijaš, CEO and founder of Arctur

International Collaborations

We have expanded our network of international partners to more than 200 universities, research institutions and companies. This enables us to share knowledge and join resources to tackle bigger challenges.

Joint Research Centre of European Commission (Italy) – doctoral partnership on cybersecurity and biometrics

The European Organization for Nuclear Research – CERN (Switzerland)

Chinese Academy of Sciences (China) – joint Chinese-Slovenian virtual laboratory for high performance computing

Kyungpook National University (South Korea) – joint research in computer vision and wireless computing and a double degree study programme

University College London (UK) – joint research in bioinformatics and mobile computing

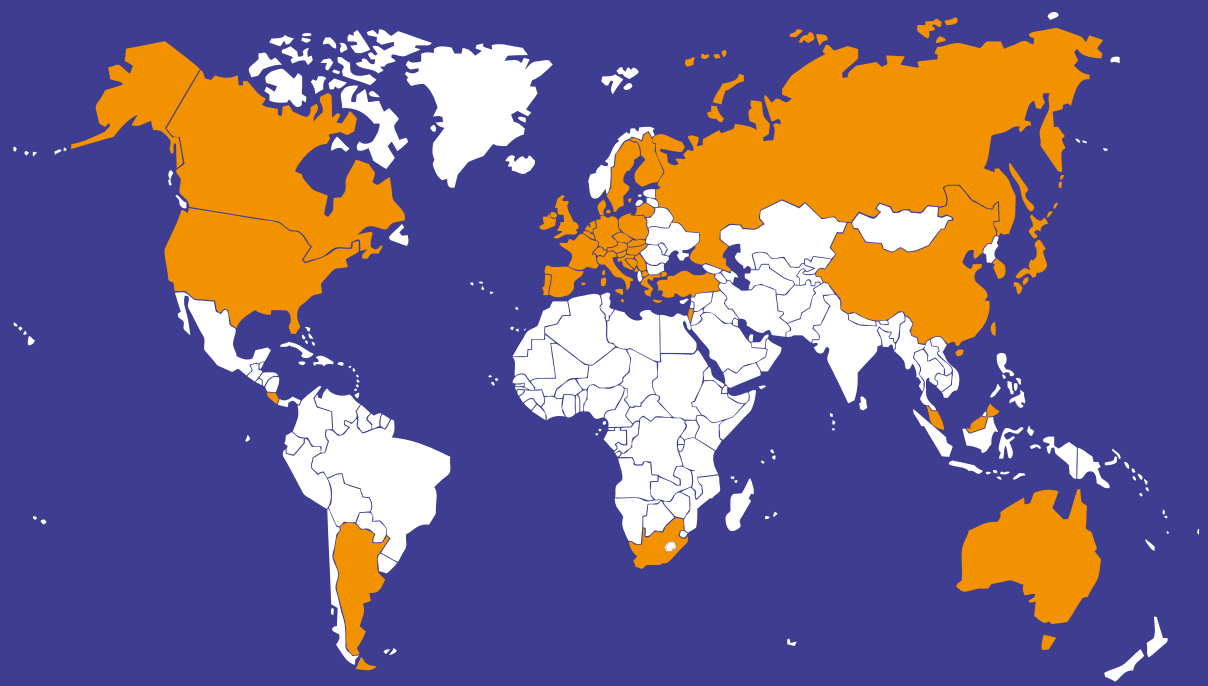
Baylor College of Medicine (USA) – joint research in bioinformatics

DFKI, Saarbrücken (Germany) – joint research in computer vision

Alpe-Adria University Klagenfurt (Austria) – joint research in computer compilers and algorithmics

University of Belgrade (Serbia) – joint research in sport statistics and computational linguistics

King Abdullah University of Science and Technology (Saudi Arabia) – computer graphics and visualization technology for depicting the life forms from atoms to organisms



Student Life in Ljubljana

During their stay in Ljubljana all students are entitled to food and transport subsidies.

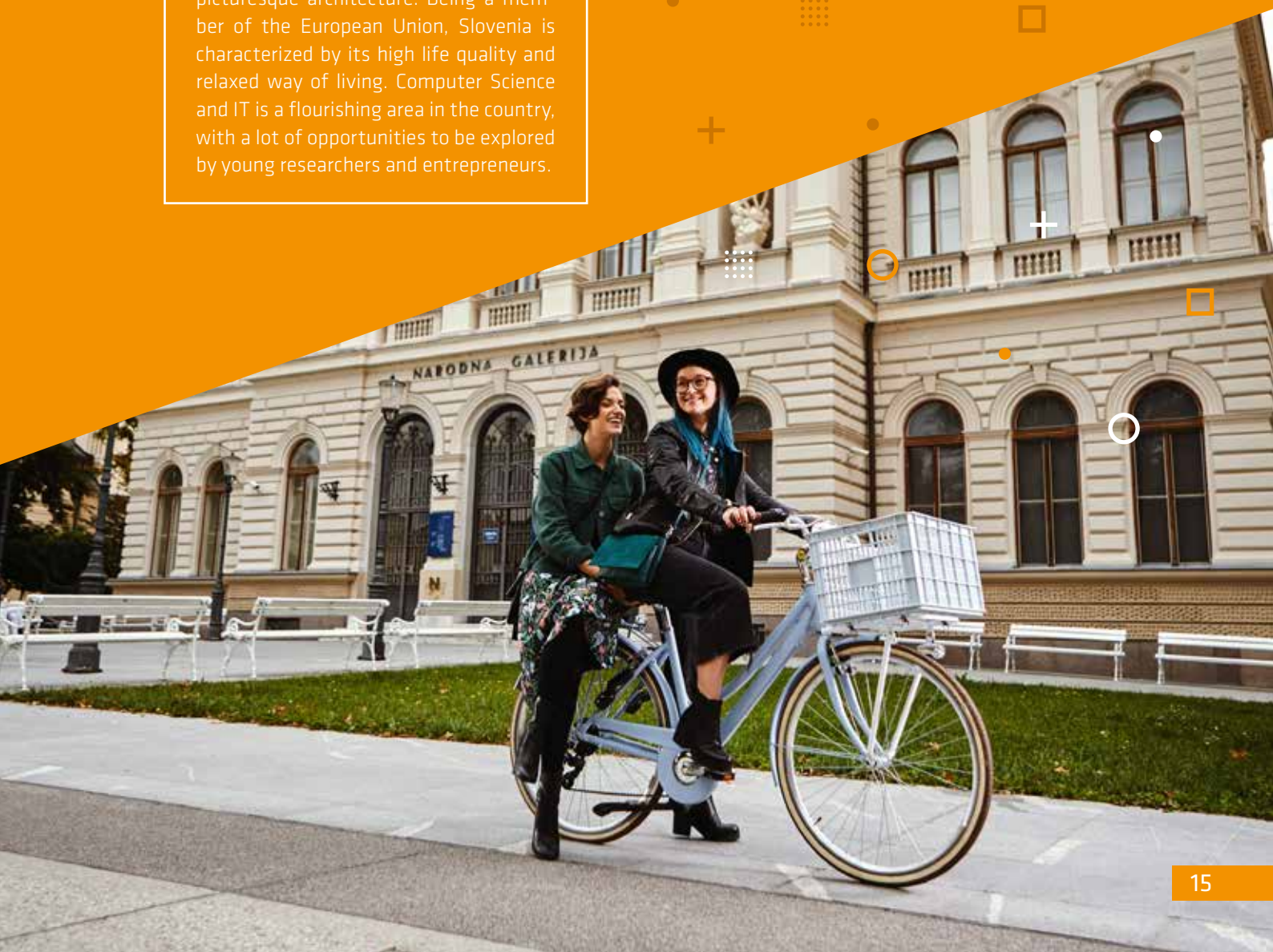
Slovenia is a small country in central Europe, known for its natural beauties and picturesque architecture. Being a member of the European Union, Slovenia is characterized by its high life quality and relaxed way of living. Computer Science and IT is a flourishing area in the country, with a lot of opportunities to be explored by young researchers and entrepreneurs.

Living expenses (rent, food, public transport, books) in the Republic of Slovenia roughly amount to 500€ per month.

The price for a meal in a restaurant is 2–5€ and 20€ for a monthly bus ticket.

International students should find a private room as there are no dormitories available for international students. The average price for a room is 150–250€.

Students from EU countries and countries with which Slovenia has an agreement can enter without a visa and stay up to 90 days. They can apply for the residence permit in Slovenia. Non-EU students need a visa to enter the Republic of Slovenia.



University of Ljubljana

The University of Ljubljana is an institution with a very rich tradition. It was established in 1919.

It is a very large university, with around 50 000 undergraduate and postgraduate students, and over 300 undergraduate and postgraduate study programmes. It employs approximately 6000 higher education teachers, researchers, assistants and administrative staff in its 23 faculties and 3 arts academies.

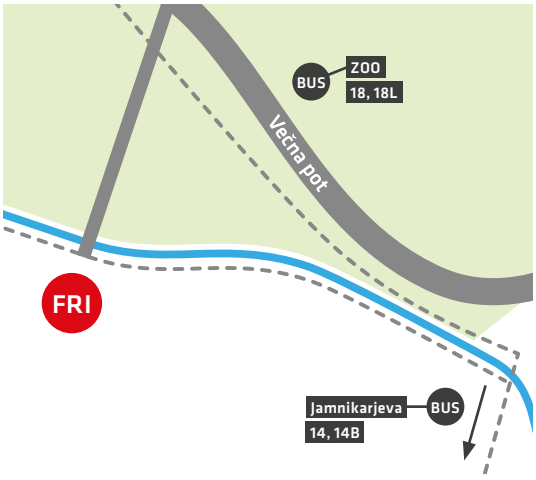
Faculty of Computer and Information Science

The Faculty of Computer and Information Science has a long history in artificial intelligence, data mining and computer vision research.

It was established in 1996, however computer study programme at the University of Ljubljana dates back to 1973.

Location

The Faculty is located in the South-West part of the city, in a pleasant green environment next to the Rožnik hill. The area has been evolving into a hub, connecting technology and natural science students and researchers. The Faculty can be accessed by city bus routes nr. 14, 14B, 18 and 18L. Leading to the Faculty are also a nice bike and walking trail.



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