

A black and white photograph of a person's hand hovering over a computer monitor. The monitor displays a complex molecular model with numerous spheres and connecting lines. The person is wearing a dark jacket with 'lus' visible on the sleeve. The background shows a desk with a keyboard and other computer equipment.

FRI

**CREATING
THE FUTURE**



University of Ljubljana
Faculty of Computer and
Information Science

3rd Cycle
Doctoral Programmes



Earning a Doctorate is One of the Highest Honours

Computer and information science is one of the leading breakthrough areas with regard to shaping the economy, education, culture, administration and other disciplines. The marked rise of computer technology in developed countries dictates the need for highly qualified human resources which are capable of developing new computer and information technologies and implementing them in innovative environments. This study programme is designed to appeal to young people, especially those who plan on pursuing research and scientific work in computer science and informatics. The main focus of the doctoral study is on research, enabling students to receive training in both independent and team work, which encourages interdisciplinarity and also offers students the opportunity to cooperate with internationally recognised domestic and foreign experts. Special emphasis is devoted to combining scientific and professional areas, elective courses and an academic mentor programme so as to encourage students throughout the course of their studies.

The current Doctoral Programme in Computer and Information Science is the successor of two previous doctoral programmes, the first being Computer and Information Science and the other being Information Systems and Decision Making, both of which were launched at the University of Ljubljana in 1985 and 1998, respectively. This year we have revamped the programme in order to make it more effective in terms of responding to students' needs. The selection of courses available has been expanded and there is a greater emphasis on each student's research work.



Doctoral Study Programme in Computer and Information Science

At the Faculty of Computer and Information Science we offer the Doctoral study Programme in Computer and Information Science. There is a wide range of courses available which offers students the opportunity to further their research work in a specific field. The aim of the programme is to provide computer science education to independent researchers, teachers and future leaders.

We also run a Interdisciplinary Study Programme Biosciences in cooperation with several faculties (the Biotechnical Faculty, the Faculty of Electrical Engineering and the Faculty of Mechanical Engineering).



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**MATIC CANKAR,
PhD, researcher at XLAB**

To become an expert in your field you need to be up to speed with the latest research and technology. Enrolling in PhD studies is an important step on the road towards gaining skills and staying on track with ongoing research, which is crucial in order to develop new ideas and contribute to international research projects. This knowledge enables me to tackle and solve the academic and industrial issues that arise if you are working for an IT company with a strong research group like XLAB.

Computer and Information Science

The Computer and Information Science doctoral programme is designed to further the student's knowledge of computer science and information technology, while also providing training in the soft skills required for research and development. The course is recommended for students who intend to pursue a career in academia and for students who intend to carry out demanding and innovative research and development in the industry.

Admission Criteria

Pursuant to the provisions of the Amendments and Supplements Act to the Higher Education Act, which has been in force since 9 September 2006, those candidates who have completed the following may enrol on the third cycle study programme:

(a) A second cycle master's programme; (b) A vocational study programme regulated by EU directives or any other standard master's study programme evaluated with 300 ECTS credits; (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 a specialisation. 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. The candidates' study requirements

(a list of courses) will be determined by the faculty's committee, taking account of the candidate's prior education (completed programmes). (e) A study programme leading to a MSc degree. Candidates shall be awarded up to 60 ECTS credits.

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 University of Ljubljana statutes. The procedure is led by the authorised person at the University of Ljubljana, with the content managed by the senate of the member faculty or the University of Ljubljana Senate.

Scheme of the Study Programme Computer and Information Science

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

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 conducting the 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 the 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.

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 presentations, copyright and patent laws, ethics in science, writing project proposals and the like.

Elective Courses

The candidate chooses four elective courses, two of which are selected from the twelve elective courses available in the following areas:

Software Development • Computer Systems • Information Science • Architecture and Algorithms • Artificial Intelligence • Mathematical Methods in Computer Science

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 a combined workload of at least 10 ECTS credits.

Seminars

Seminars are a compulsory part of the study programme and serve to ensure regular PhD student meetings and discussions about their research. There are five seminars in total: one in each of the first four semesters 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.

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.

Enrolment

Application for Enrolment

Candidates must submit their application for enrolment on the University of Ljubljana's doctoral study programmes online via the eVŠ online portal:

<http://portal.evs.gov.si/prijava/?locale=en>

More information is available on the University of Ljubljana web page in the document titled "*Call for enrolment on the doctoral study programmes of the University of Ljubljana*".

Application Enclosures

Applicants must enclose the following documents with the application form and send them to the faculty:

- A well-structured curriculum vitae (personal data, work experience, professional background, education, academic background, knowledge of languages, awards, prior experience in research and project work); bibliography (details of research undertaken/papers published in national/international journals and at conferences);
- A certified copy of their bachelor and master's (if applicable) degrees or the corresponding certificate of the institution that awarded the degree;
- A list of courses completed and the grades awarded for each, and a list of grades in the current studies. Please submit a form provided by the institution which granted the degree;
- A motivation letter;
- Two recommendation letters provided by two referees (academic or professional) with whom you have been associated in an academic or professional capacity.

The official deadline for applications is **28 August 2015**.

Information for Foreigners

Candidates who apply for enrolment with foreign education documents must submit a request for the recognition of foreign education so that it is possible to determine if they meet the enrolment criteria.

Candidates who are foreign nationals are strongly encouraged to commence procedures related to the acknowledgement of their education and other formalities regarding residence permits in May 2015.

Please visit www.fri.uni-lj.si/en/phd_apply for further information on how to apply to and enrol on the FRI doctoral programme. Enrolment will take place in September 2015.

Recognition of Education

For recognition of education, applicants must send "*Form N: Application for recognition for access to education*" to the University of Ljubljana, Kongresni trg 12, 1000 Ljubljana. The procedure is later continued by the Faculty of Computer and Information Science. N Form is available on the University of Ljubljana web page.

Required enclosures for applications:

- The original of the certificate/diploma, proving the completed or partially completed foreign education;
- A photocopy of the certificate/diploma referred to in the first indent;
- A certified Slovene translation of the certificate/diploma referred to in the first indent;
- A photocopy of evidence of the contents and duration of the 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 and signed by the applicant or his or her legal guardian.

The official deadline for applications is **28 August 2015**.

More information on the procedures for recognising education, as well as all the forms and instructions, are available at:

http://www.uni-lj.si/study/useful_information/recognition_of_foreign_education/





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 and the Faculty of Mechanical Engineering. The study programme consists of organised learning (lectures, practicals, presentations of themes of doctoral dissertations, etc.) amounting to 60 ECTS credits, while the remaining 120 ECTS credits are devoted to individual research work for the doctoral dissertation.

1st Year

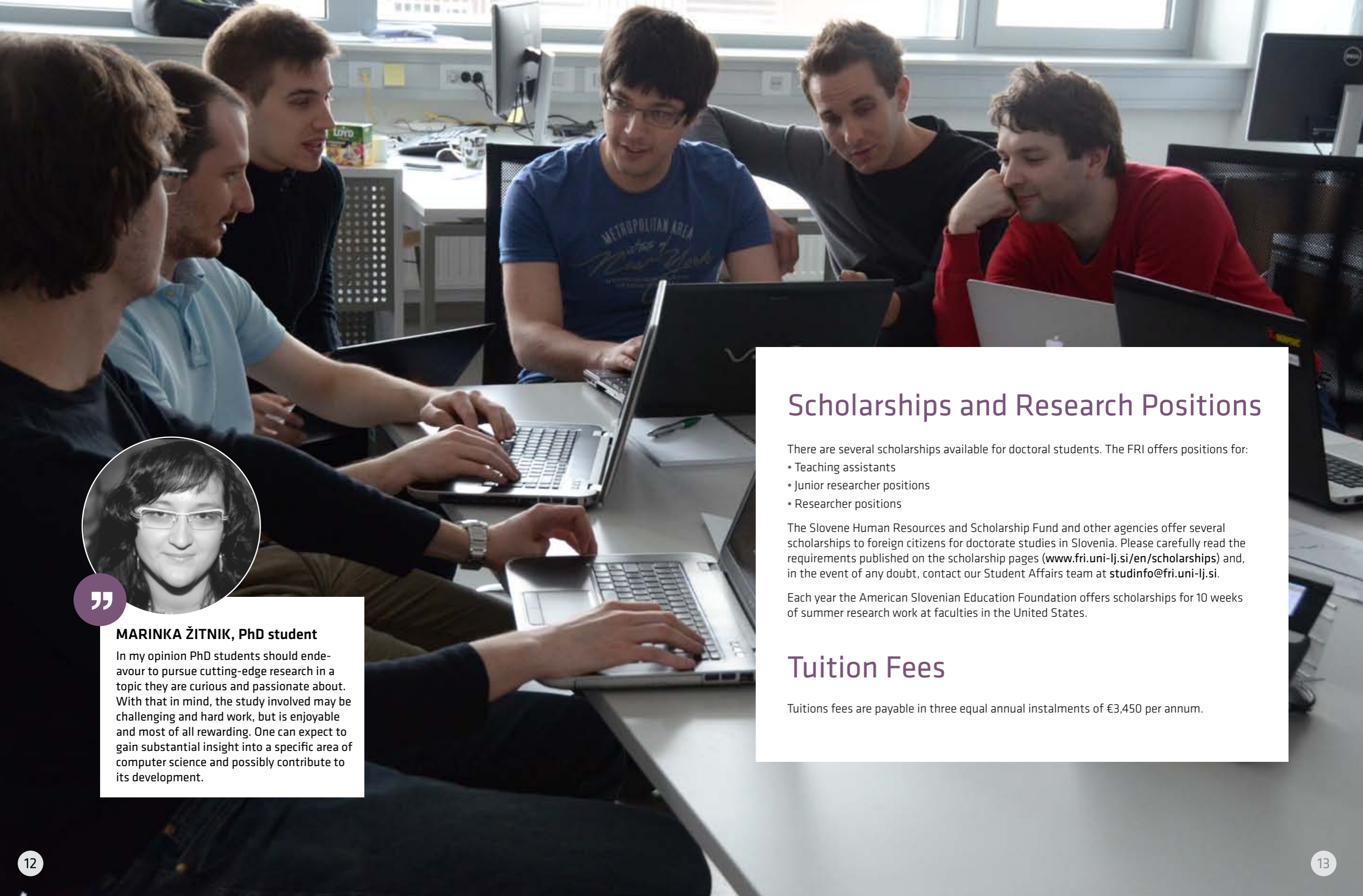


2nd Year



3rd Year





MARINKA ŽITNIK, PhD student

In my opinion PhD students should endeavour to pursue cutting-edge research in a topic they are curious and passionate about. With that in mind, the study involved may be challenging and hard work, but is enjoyable and most of all rewarding. One can expect to gain substantial insight into a specific area of computer science and possibly contribute to its development.

Scholarships and Research Positions

There are several scholarships available for doctoral students. The FRI offers positions for:

- Teaching assistants
- Junior researcher positions
- Researcher positions

The Slovene Human Resources and Scholarship Fund and other agencies offer several scholarships to foreign citizens for doctorate studies in Slovenia. Please carefully read the requirements published on the scholarship pages (www.fri.uni-lj.si/en/scholarships) and, in the event of any doubt, contact our Student Affairs team at studinfo@fri.uni-lj.si.

Each year the American Slovenian Education Foundation offers scholarships for 10 weeks of summer research work at faculties in the United States.

Tuition Fees

Tuitions fees are payable in three equal annual instalments of €3,450 per annum.



Research Work

The research work carried out in our 19 laboratories is diverse. The research is particularly intense in 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. We are addressing various other research questions from different fields of computer and information science which can be seen through the keywords on the next two pages and the list of ongoing research projects. Doctoral students are actively involved in carrying out their research in collaboration with other researchers.



JURE BORDON, PhD student

The doctoral programme is a great way to delve deeper into the complexities of computer science. It also gives you the opportunity to broaden your understanding of computer science and provides you with the tools and the knowledge required to become a leading expert in your specific area of interest. Although the PhD title is traditionally associated with an academic career, all leading tech companies have their own research and development departments which are constantly on the lookout for researchers who want to apply their knowledge to areas outside academia.

Research Projects

The research work is carried out through various projects funded by the European Commission, the Slovenian Research Agency, industrial partners and other funding agencies. Doctoral students participate in these projects, gaining international experience as a result.

Our laboratories are partners on several research projects funded by the European Commission:

FLEXICIENCY – energy services demonstrations of demand response, flexibility and energy efficiency based on metering data

SWITCH – Software workbench for interactive, time-critical and highly self-adaptive cloud applications

CREA – Network of summer academies for improving entrepreneurship in innovative sectors

AGROIT – Increasing farming efficiency through an AgroIT platform based on open standards

SALUS – Security and interoperability in next generation PPDR communication infrastructures

AXLE – Advanced analytics for extremely large European databases

CARE-MI – Cardio repair European multidisciplinary initiative

Current Basic research and application projects funded by the Slovenian Research Agency:

Designed cellular logic • Maintenance of large databases based on visual information using incremental learning • Overcoming the curse of dimensionality with the use of background knowledge • Post-transcriptional regulatory networks in neurodegenerative diseases • Model for Domain-Specific Trend Prediction based on Semantic Enrichment of Unstructured Patterns • Epidemiology and Biodiversity Studies of Plant Pathogens

Additionally to these projects faculty is participating on more than 30 projects funded by different institutions and industry partners including Akrapovič, CBSR, Celtra, CHS, Datalab, FMC, Guru Namig, HTTPPOOL, Informatika, Iskratel, Iskra Impuls, IBM Slovenija, Kopa, Mega M, Optilab, Prosplet, PB Slovenije, RC IRC Celje, Stacklabs, SRC, SŽ, TMG-BMC, UCS, XLAB and others.

The faculty cooperates with partners from industry and universities abroad. Some of our most important European projects are described below.



AXLE

AXLE focuses on the automatic scaling of complex analytics, while addressing the full requirements of real data sets. Software features will be released as commercially usable open source code and submitted for wide use as core parts of the PostgreSQL database or the Orange visualisation project, or pluggable extensions for these tools.



SWITCH

The SWITCH project addresses the urgent industrial need for developing and executing time critical applications in clouds, such as disaster warnings, collaborative communications or live broadcasting. The very high network, computing service, optimised software architecture and protocol requirements often result in infrastructure lock-in. Existing technologies incur enormous development costs and make it difficult to fully utilise the virtualised programmable services. SWITCH introduces an application-infrastructure co-programming and control model, in which QoS/QoE and cloud environment features can all be included in the complete application lifecycle.



FLEXICIENCY

Major DSOs are working together with market players and other stakeholders within the Horizon 2020 – LCE-07-2014 project FLEXICIENCY to develop a technical model in order to achieve a vision of data exchange based on the meter data accessibility provided by DSOs which is close to real time. Standardised interfaces will be developed to integrate the platforms of different players, before becoming plug and plays at the EU level and allowing for the replicability of novel energy services. A virtual ICT environment will catalyse the interactions between relevant stakeholders and encourage cross-country and cross-player access to innovative energy services based on metering data.

Employment Opportunities

Employment opportunities for Computer and Information Science doctoral students are very broad. The programme trains doctors of science who become high-level professionals in the private sector. Typical roles include leadership and R&D. Owing to the high demand for such professionals in Slovenia and around the world, the employability of doctoral students who complete the programme is high. The fact that there is a high demand for such qualified personnel serves as further motivation for future students to enrol in this study programme. This is reinforced by the experiences of students who have completed their PhDs, given the fact that they found job positions without difficulty.



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MIHA ŠTAJDOHAR,
PhD, CTO and co-founder of Genialis – friendly bioinformatics

The fruits of research are typically left hanging on the prototype "branch". The objective of research is to come up with ideas, publish them and then move on to the next big thing. As an engineer at heart, I was irritated to see all that potential just hanging in my lab's GitHub branches. I always wanted to build products and I saw the opportunity to do something great. We founded a spin-off

company, licensed the concepts invented at the FRI and partnered up with Biolab, which continues to advise us. I am delighted that our research ideas have now helped create a product that helps many life scientists learn from their data. We continue to grow and search for talents to join us in our endeavours.



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ŠTEFAN FURLAN,
PhD, Executive Director at Optilab d.o.o.

The doctoral programme has deepened my analytical and critical thinking. The ability to think analytically is vital when it comes to solving everything from small everyday problems to the most complex strategic business solutions. On the doctoral programme I was given the opportunity to

work in very interesting areas of scientific research and, for me, this was also a real test of my perseverance. I also broadened my connections in Slovenia and abroad, meeting several interesting and highly competent people with whom I am currently working and will continue to do so in the future.



University of Ljubljana

The University of Ljubljana is an institution with a very rich tradition. It was established in 1919 on the foundations of a long-established pedagogical tradition. 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 6,000 higher education teachers, researchers, assistants and administrative staff in its 23 faculties and 3 arts academies.

Ljubljana is Ranked the 75th Best City in the World in Which to Live

The university is based in Ljubljana, the capital of Slovenia, a relatively large central European city with just over 300,000 inhabitants. Students account for more than one-seventh of the population, giving the city a youthful and lively character. The numerous cultural events held throughout the year are characterised by a richness of tradition as well as modern creativity. In general, a visitor's first impression of Ljubljana is that it is an exceptionally young and picturesque city.



Useful Information

Residence Permits for the Republic of Slovenia

EU citizens do not need a permit (visa) to enter the Republic of Slovenia. They may enter with a valid identity card or valid passport regardless of the purpose of their stay. For all stays less than three months, EU citizens are not required to register their place of residence; they only need to register at their nearest police station within three days of crossing the Slovenian border. If they would like to extend their stay beyond three months, they are obliged to register their place of residence at their local administrative unit.

Third country nationals coming for study, specialisation, professional improvement or practical training purposes will be issued visas or temporary residence permits. Third country nationals who do not need visas because they are citizens of a country with which Slovenia does not have a visa arrangement may enter with a valid passport and remain in Slovenia for 90 days within a six-month period.

Enrolment Number and Citizen Number (EMŠO)

All exchange students receive their enrolment number and citizen number (Unique Master Citizen Number or EMŠO) upon arrival at the International Exchange Coordinator's Office.

Student Life in Ljubljana

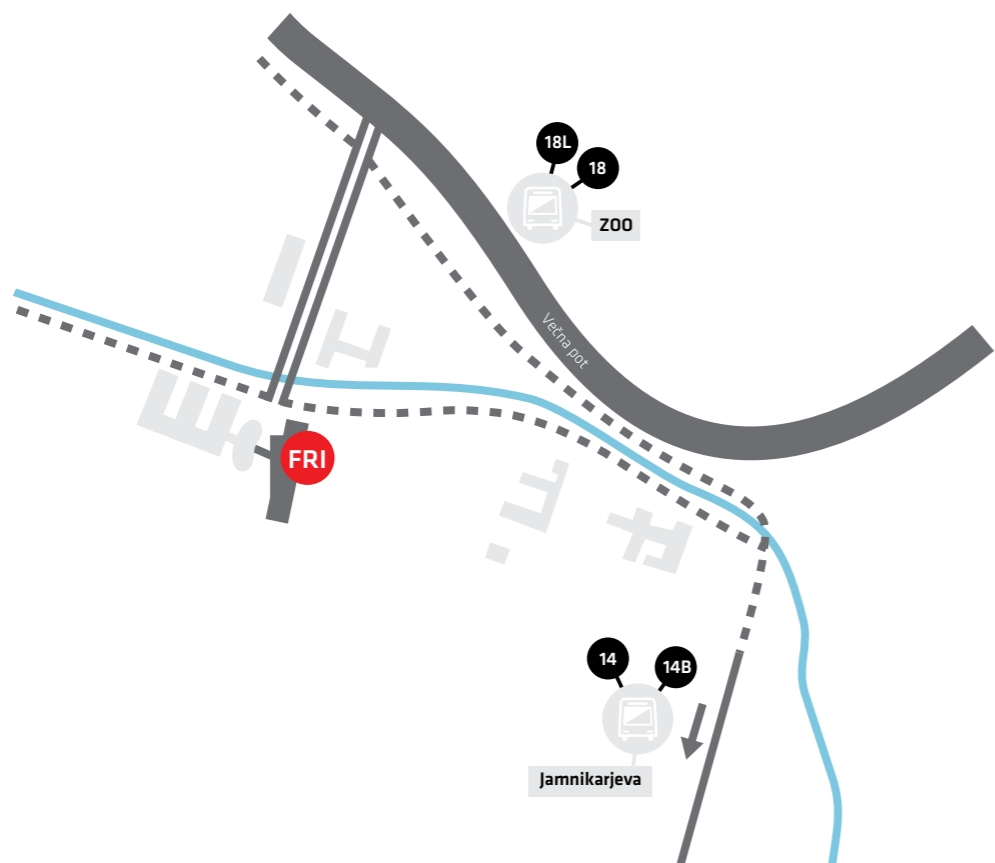
Information on renting rooms or flats can be found at www.svetovalnica.com/sobe. Slovenes without Slovene citizenship who have been awarded a Republic of Slovenia scholarship (the Slovene Human Resources and Scholarship Fund) can apply for a room in one of the student halls of residence (<http://www.stud-dom-lj.si>). The monthly price for private accommodation is €150–250 per room and €80–160 per room in a dormitory. During their stay in Ljubljana, students are entitled to discounted prices for food (the average is €3.50) in the majority of Ljubljana's restaurants. The most common way of getting around the city is by bus. A monthly student ticket costs €20.

The average cost of living in Ljubljana is approximately €300–500 per month.



The Faculty of Computer and Information Science is located in a pleasant environment behind Rožnik hill. The area has been evolving into a hub that will connect students, researchers and other technology and natural science personnel.


It is located in the South-West of Ljubljana. To reach the Faculty from the center take bus lines 18/18L or 14/14B.




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