

Faculty of Computer Science

PhD programme in COMPUTER SCIENCE

Duration: 4 years

Academic year: 2019/2020

Start date: 01/11/2019

Official programme language: English

Website: <https://www.unibz.it/en/faculties/computer-science/phd-computer-science/>

Programme contents:

The aim of the PhD programme is to allow students to acquire the abilities and skills to carry out independent research in the area of computer science. This also involves the ability to communicate ideas clearly and efficiently orally and in writing and the ability to work in groups.

In order to conclude the programme successfully, the PhD student has to elaborate a research topic independently and this research must contribute significantly to current knowledge in the area of computer science. Due to the time limits of the programme, PhD students will focus on their research work. To achieve this, they are supported by a structured PhD programme.

In the following, this structure is described in detail together with the procedures for the nomination of the supervisor, the definition of the research and study plan, and the examinations:

- The programme is divided into five phases, which end at months 6, 12, 24, 36, and 48 respectively.
- For each PhD student, the PhD Course Committee nominates a supervisor, who is preferably chosen among its members. It can also nominate a co-supervisor who can provide additional support.
- Together with their supervisor, each student sets up a *Research and Study Plan*, which defines the research goal and the steps to achieve it. The latter include subjects where the student needs to deepen their expertise. The Research and Study Plan is updated continuously, taking into account both the progress that has been made and new developments that arise in the area of research during the course of the PhD work.
- There are five milestones at the end of the five phases at which students report on their work and at which the PhD Committee assesses their progress. The updated Research and Study Plan is one of the deliverables for each milestone.

In the following, we provide a more detailed description of the five phases:

Phase 1 covers the first six months. During this period, the student identifies with the support of his or her supervisor the area of research, a specific topic within the area, and one or more possible approaches to the topic. The student acquires the necessary foundations for carrying out the research, for instance, by way of attending courses or through supervised literature studies. The supervisor will introduce the student to the relevant research activities at the faculty.

Phase 2 comprises the second half of the first year. The student spends time both on the acquisition of skills and on first research steps.

Phase 3 comprises the second year, and is to be spent on an in-depth exploration of the research topic.

Phase 4 comprises the third year, and is to be spent on continued exploration of the research topic.

Phase 5 comprises the fourth year, and the aim is to complete the research and to present it in a thesis.

Research areas

Research at the Faculty of Computer Science spans three main research areas, which are being developed by research groups on a long-term basis. Within these three research areas, the group members investigate the following specific topics:

Information and database systems engineering:

1. SPATIAL AND TEMPORAL DATABASES
2. PROCESSING DATA STREAMS AND TIME SERIES DATA
3. APPROXIMATION TECHNIQUES IN DATABASES
4. QUERY OPTIMIZATION IN DATABASES
5. DATA MINING AND MACHINE LEARNING FOR PERSONALIZATION
6. DECISION SUPPORT AND RECOMMENDATION SYSTEMS
7. HUMAN-CENTERED COMPUTING
8. COOPERATIVE INTERFACES FOR INFORMATION ACCESS AND FILTERING
9. INTERACTION DESIGN
10. EDGE COMPUTING ARCHITECTURES AND PLATFORMS
11. IMAGE PROCESSING AND COMPUTER VISION
12. MATHEMATICAL AND SCIENTIFIC COMPUTING

Knowledge representation and databases:

1. LOGIC-BASED LANGUAGES FOR KNOWLEDGE REPRESENTATION
2. INTELLIGENT DATA ACCESS AND INTEGRATION
3. SEMANTIC TECHNOLOGIES
4. CONCEPTUAL AND COGNITIVE MODELLING
5. DATA-AWARE PROCESS MODELLING, VERIFICATION, AND SYNTHESIS
6. BUSINESS PROCESS MONITORING, MINING, AND CONFORMANCE
7. TEMPORAL ASPECTS OF DATA AND KNOWLEDGE
8. EXTENDING DATABASE TECHNOLOGIES
9. VISUAL AND VERBAL PARADIGMS FOR INFORMATION EXPLORATION
10. REASONING WITH UNCERTAIN AND IMPRECISE KNOWLEDGE

Software and systems engineering:

1. EMPIRICAL SOFTWARE ENGINEERING
2. MINING SOFTWARE REPOSITORIES
3. SOFTWARE RELIABILITY AND TESTING
4. AUTOMATIC IMPROVEMENT AND EMPIRICAL INVESTIGATION OF SOFTWARE QUALITY ATTRIBUTES
5. RECOMMENDATION SYSTEMS IN SOFTWARE ENGINEERING
6. SOFTWARE SYSTEM BEHAVIOR
7. SOFTWARE EVOLUTION AND MAINTENANCE
8. SOFTWARE ENGINEERING EDUCATION
9. AGILE AND LEAN PROCESSES
10. LEAN STARTUP AND SOFTWARE STARTUPS
11. DEPENDABLE IoT, EDGE AND CLOUD COMPUTING
12. SOFTWARE ARCHITECTURE

Among these topics, the following research projects are being proposed:

Possible research projects and respective supervisors	
Title	Supervisor
Efficient querying of data under temporal constraints	Alessandro Artale
Change and evolution in ontologies	Alessandro Artale
Description logics for conceptual modeling	Alessandro Artale
Techniques and tools for ontology-based data management	Diego Calvanese
High quality open data publishing	Diego Calvanese
Data and knowledge aware dynamic systems	Diego Calvanese
Numerical linear algebra algorithms for high-performance computers	Bruno Carpentieri
Parallel programming paradigms for distributed memory and GPU computing	Bruno Carpentieri
Graph and data analytics	Bruno Carpentieri
Making across ages	Antonella De Angeli
Making an Inclusive Education	Antonella De Angeli
Gendered perspectives of Computer Science	Antonella De Angeli
Knowledge driven information access	Enrico Franconi
Intelligent conceptual modelling of information systems	Enrico Franconi
Data Integration and data preparation	Enrico Franconi
Efficient time series analytics for monitoring applications	Johann Gamper
Big data and machine learning for predictive maintenance	Johann Gamper
Event detection and social network analysis	Johann Gamper
Enterprise architecture and business modeling	Giancarlo Guizzardi
Ontology-driven conceptual modeling	Giancarlo Guizzardi
Ontology of computational microeconomics	Giancarlo Guizzardi
Integrating process and data management: modeling, verification, execution	Marco Montali
Declarative business processes	Marco Montali
Process mining	Marco Montali
Generation of Fine-Grained Knowledge Graphs from Natural Language	Werner Nutt
Data Profiling for Knowledge Graphs	Werner Nutt
Learning to Schedule Business Processes	Werner Nutt

Software architecture and performance engineering	Claus Pahl
Cloud and IoT systems and technologies	Claus Pahl
Software engineering education and educational technology	Claus Pahl
Group conversations mining and supporting	Francesco Ricci
Integrated models of on-line and off-line customer behaviour	Francesco Ricci
Software maintenance and evolution	Romain Pierre Robbes
Machine learning and transfer learning on software repositories	Romain Pierre Robbes
Tools to increase software developer productivity	Romain Pierre Robbes
Explanations and transparency in recommender systems	Markus Zanker
Persuasive information systems	Markus Zanker
Online decision support systems	Markus Zanker
Logic and cognition	Oliver Kutz
Computational creativity / Conceptual blending	Oliver Kutz
Cognitive robotics and common sense	Oliver Kutz
Matrix and tensor factorization in social media	Panagiotis Symeonidis
Link prediction in heterogeneous information networks	Panagiotis Symeonidis
Session-based recommendations	Panagiotis Symeonidis
Software startups and lean startup methodology	Xiaofeng Wang
Agile and lean software development methods and practices	Xiaofeng Wang
Innovation in software business	Xiaofeng Wang

Admission requirements

Italian degrees

Degree from the old Italian system: all

Master (*laurea specialistica/magistrale*): all

Foreign degrees

Applicants who have obtained their degrees abroad must have a university education of at least five years duration and fulfill the prerequisites listed below.

Other requirements:

In order to apply for the PhD programme in **COMPUTER SCIENCE** applicants must have sufficient knowledge of English.

The prerequisites for admission to doctoral programmes include having acquired an appropriate educational degree, and/or have worked in the PhD course fields, in particular being able to demonstrate a deep knowledge of the fundamental techniques and methods used in computer science.

Qualifications in Computer Science, Computer Engineering, Information or Electronic Engineering are preferable.

Admission to the program is based on the assessment of applicants through:

- CV and academic qualifications;
- their research exposé;
- interview.

Their competency in English (at least level B2) will also be assessed during the interview.

To apply to the PhD programme, applicants must include the following:

- Master degree certificate or equivalent with the final mark (if applicable) and the transcripts of exams taken with their marks (*transcript of records*). In case of Italian university titles, the certification **MUST** be substituted by a self-declaration or by the Diploma Supplement;
- Curriculum vitae (CV) (in English and possibly following the EU format that can be downloaded here <https://europass.cedefop.europa.eu/en/documents/curriculum-vitae>). If available, please indicate your ranking within your graduating cohort;
- Research exposé ** (= *in English as a PDF file, no **longer than two pages** in total, digital format*);
- English-language certificates at **level B2** (Common European Framework of Reference) or alternatively a certificate or a declaration signed by the applicant of being awarded an undergraduate or postgraduate degree in English.

** *The **Research exposé** (RE) is a document that should convince the selection committee that you are -supplementing the more formal certificates and achievements - a promising candidate, who has clear ideas about why to pursue your research as well as about your envisioned career after successfully passing the PhD. One aspect of this is the description of a research activity (this should be no more than one page in length), which can be either a current or recent research activity (e.g. your master thesis), or a research activity that you envision carrying out during your Ph.D. You should also explicitly indicate in the RE which of the research topics proposed by faculty members you are interested in, and whether you are also interested in the research topics proposed by our external partners (FBK and/or SIAG). Last but not least you may mention why you think unibz and our faculty is the right place for all of the aforementioned.*

Other documents to be included in the application if available:

- list of publications with related links, if applicable (up to a maximum of 3 publications from the past 5 years);
- up to a maximum of 3 reference letters provided by the applicant's work or research supervisors, describing the work carried out and the quality of the same (*the letters **MUST** be signed in original and scanned!*).

Evaluation criteria for examinations/qualifications:

The selection is based on:

- the evaluation of each applicant's profile as specified in the curriculum, the study titles and the research exposé;
- the coherence between the curriculum and the research areas in the call;
- the evaluation of the reference letters and the publications, and
- an interview.

The following points will be awarded:

- up to a maximum of 50 points for the curriculum, qualifications and publications:
- *Educational and working curriculum (up to 35 points)*

- *Experience abroad, participation at summer schools and conferences, contribution to research projects, scholarships (up to 10 points)*
- *Publications (up to 5 points)*

- up to a maximum of 5 points for the reference letters;
- up to a maximum of 10 points for the research exposé and for the coherence between the curriculum and the research areas in the call.

The Evaluation Committee will select the best applicants on the basis of a comparative assessment. For those applicants that satisfy the pre-requisites (reported in the general call document), the Evaluation Committee will first evaluate the applicant's application documents, which include the curriculum vitae, their qualifications, including publications and reference letters (if any), the research exposé and the coherence between the curriculum and the proposed research areas.

Candidates that have obtained at least 45 points in the evaluation of their application documents will be admitted to the next stage of the selection process. This will consist of an interview in which also the knowledge of English of the applicant will be assessed. The interview can make use of telecommunication media such as video-conferencing, telephone and the like. Up to a maximum of 35 points will be awarded for the interview.

Examination dates

Description	Date	Place
Personal Interview	From 18 to 19 July 2019	Seminar room POS 1.01

The precise date and time of the interview will be communicated per email **by July 16, 2019**. Candidates who wish to be interviewed via Skype, should indicate this in their curriculum vitae, and must include in their contact information, also their skype id.

The *final score* is the sum of the score for the evaluation of the application documents, and of the score for the interview. The maximum score is 100.

Applicants that have obtained a final score of at least 70/100 are considered *eligible*. Eligible applicants will be ranked according to their final score. The top eligible applicants will be admitted according to the number of available places with and without grant, according to their order in the ranking list. The remaining eligible applicants will be put on a waiting list. Applicants in the waiting list will be admitted to the program in case an already admitted applicant is not available or withdraws their application.

If two or more applicants have the same score, a lot will be drawn to decide on the allocation of places. The ranking list will be published on the website of unibz.

Grants funded by external parties

For grants funded by external parties, the candidate, if interested in, **must indicate this in the research exposé**, by mentioning the specific topics and motivating why they are interested in the topic associated to the grant.

The candidate interested in topics funded by external parties must clearly indicate such topics in the research exposé (*see the above description of the research exposé*). For these grants, a separate ranking lists will be established containing candidates who are also eligible according to the general ranking and who in addition have a scientific profile that is particularly suited to the specific topics associated to these grants.

PhD positions and grants:

Total PhD positions: **19 places**

PhD positions with grants from the University: 10 places

PhD positions without grant: 4 places

PhD positions with other grants of partner in agreement (FBK): **3 places**

<i>Topic related to the grants</i>	<i>Positions</i>	<i>Funding body</i>
Process Mining From Text	1	FBK - Fondazione Bruno Kessler (TN) Referent: Dr. Chiara Ghidini
Computational Models of Individual and Social Behaviors	1	FBK - Fondazione Bruno Kessler (TN) Referent: Dr. Bruno Lepri
Computational Models of Contagion Processes	1	FBK - Fondazione Bruno Kessler (TN) Referent: Dr. Marco Ajelli

PhD positions with other grants of external parties (SIAG): **2 places**

<i>Topic related to the grants</i>	<i>Positions</i>	<i>Funding body</i>
<ul style="list-style-type: none"> • Data science and Data Management • Security • Software and Process Modernisation • Intelligent Decision Support 	2	SIAG – Informatica Alto Adige S.p.A. Referent: Dott. Stefan Gasslitter