Doctoral School of Computer Science

The aim of the School is to support postgraduate studies at the University of Szeged, leading to the degree of PhD in computer science (informatics). The School operates within the Institute of Informatics. The research work in the school belongs to the following research areas: Theoretical Computer Science, Operations Research and Combinatorial Optimization, Software Engineering, Artificial Intelligence, Image Processing, and Electrical and Computer Engineering.

In Theoretical Computer Science the research topics range from the theory of automata and formal languages, which is now considered a classical field, to the most up-to-date topics such as advances in computational complexity, term rewriting, tree automata and tree transformations, mathematical semantics of programming languages, process algebras, theory of fixed points, temporal logic, semirings.

The research topics offered in Operations Research and Combinatorial Optimization include topics from the fields of theory of economic decisions, multicriteria decision making, group decisions, fuzzy theory, learning algorithms, global optimization, reliable numerical procedures, interval inclusion functions, process network synthesis, bin packing algorithms, online optimization, scheduling, logistic.

In the area of Software Engineering the research topics are advanced programming paradigms, theory of compilers, compilation of embedded systems, legacy system analysis, program slicing, software maintenance and reengineering, software dependencies, object-oriented design and development, web programming, databases and data mining, network protocols, formal specification and testing of protocols, distributed programming, software testing.

In the field of Artificial Intelligence the research topics offered are frame and rule based knowledge representation, machine learning algorithms (decision trees, genetic algorithms, neural networks), complexity of the machine learning algorithms, natural language processing, speech recognition, peer-to-peer network.

In Image Processing the research topics cover both the theory and the applications of image reconstructions from projections, discrete tomography, medical image analysis, image segmentation, image registration and fusion, computer vision, skeletonization, discrete geometry and topology.

The research topics offered in Electrical and Computer Engineering include topics from the fields of FPGA implementation of emulated digital CNN-UM, FPGA based image and signal processing, noise and fluctuations in various systems, applications in secure communications, multidisciplinary research, robotics, trajectory tracking, pneumatic artificial muscles, fuzzy control, sensors, sensor networks, embedded systems, sensor signal processing, software-defined instrumentation, multidisciplinary applications.

There are two ways of obtaining the PhD degree: by following a four-year study program, or by individual preparation. The program of which the duration is 4 years prescribes the accomplishment of 240 credits, active participation in the Institute's seminars, and the conduction of research under the supervision of a thesis adviser appointed by the Council of the Program. The completion of 5 courses is included, the courses embrace a number of fields in computer science without the intention of being exhaustive. A course may be offered as a reading course if enrollment is low. In such cases consultation is provided. The language of education in the four-year program is mainly Hungarian, but for foreign students, each course may be offered in English.

The teaching and research stuff of the Program consists mainly of scientists working at the Institute of Informatics and the Research Group on Artificial Intelligence of the Hungarian Academy of Sciences. Some members of the Department of Medical Informatics, Faculty of Medicine, the Department of Computer Sciences, Juhász Gyula Teacher Training College Faculty also participate in the School.
The requirements for obtaining the PhD degree are the following. At the end of the second year, each candidate has to pass a comprehensive doctoral exam which has two main parts. During the first (theoretical) part, the student takes exams in one major subject/topic and in one minor subject/topic. In the second (dissertation) part of the comprehensive exam the student holds a lecture, giving account of his/her knowledge about relevant scientific literature and his/her research results, and describing his/her research plan for the second part of the doctoral training, and the schedule for writing the dissertation and publishing the results. Regarding language skills, a state examination or equivalent at a level not lower than intermediate is required in a foreign language accepted by the School, preferably English. A lower level examination is required in a second foreign language. Special rules apply to foreign students. As a third major requirement, each applicant has to fulfil the publication requirements of the Program. As a last major requirement, each candidate has to prepare and defend a doctoral thesis containing new scientific results in computer science, or high-level applications of computer science in other areas. A dominant part of the results included in the thesis has to be published before submission.

For consideration for doctoral studies in the four-year study program, one must file a formal application during the spring semester. The forms are available at the Dean's Office (Aradi Vértanuk tere 1, H-6720 Szeged, Hungary). Along with the forms, one has to submit the copies of diplomas (MS degree is required), transcripts, certificates of language proficiency. Each applicant has to arrange two letters of recommendation, submitted in sealed envelopes, or sent directly to the Dean's Office. All these will be assessed by the Council of the School. The Council may also require an interview of the applicant in order to obtain further information.

Students enrolled in the program are usually required to conduct course exercises up to 4 hours per week at the Institute of Informatics, at the graduate and/or the undergraduate level. The Program usually receives up to 5-6 new fellowships per year from the State of Hungary to be given to students who are citizens of Hungary. The rate of tuition for foreign students is 4000 EUR per semester.

**Additional information**

The director of the School is Prof. Zoltán Fülöp (Institute of Informatics). The School is governed by its Council whose current members are: Zoltán Fülöp (professor), Tibor Csendes (professor), János Csirik (professor emeritus), József Dombi (professor), Zoltán Gingl (professor), Tibor Gyimóthy (professor) and Zoltán Kató (professor).

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Further information with potential research topics for applicants, 2016 [3]


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