

PhD Programme in MATHEMATICS AND COMPUTER SCIENCE Curriculum 1: MATHEMATICS Curriculum 2: COMPUTER SCIENCE Curriculum 3: STATISTICS, OPTIMISATION AND BIG DATA	
DISCIPLINARY SCIENTIFIC AREAS	01 - MATHEMATICS AND INFORMATICS; 13 - ECONOMICS AND STATISTICS
COORDINATOR	PROF. ANTONIO IANNIZZOTTO
HEAD DEPARTMENT	DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE
DURATA	3 YEARS
LEARNING OUTCOMES AND RESEARCH TOPICS	<p>The Doctoral Program in Mathematics and Computer Science covers a wide range of interconnected disciplines on cultural, methodological, and applicative levels. Through the practice of scientific research in cutting-edge areas of mathematics and computer science, the Doctorate aims to train researchers and professionals with a cultural level adequate to contribute to the current demands for innovation and development in industry and information society, both in terms of scientific creativity and design skills, with particular attention to fundamental, applied, and industrial research.</p> <p>The Doctorate is structured into three curricula: Mathematics, Computer Science, and Statistics, Optimization and Big Data. Each track offers a variety of personalized doctoral paths focused on innovative research themes related to the disciplinary areas of mathematics, computer science, and statistics.</p> <p>In particular, in the mathematical area, some of the leading themes are: numerical methods for inverse problems, integral equations; approximation theory; harmonic and biharmonic maps in differential geometry; complex and Kählerian geometry; qualitative study of partial differential equations, with applications to biological and physical models; methods of mathematical physics for relativity; inverse scattering for evolutionary equations; optimization for data analysis and combinatorial problems; manifold learning, manifold optimization; study of the problem of moments on algebraic structures and applications; analysis of point processes on configuration spaces with applications to statistical mechanics.</p> <p>In the computer science area, research topics include: computer graphics, geometry processing, human-computer interaction, digital fabrication, cybersecurity, cryptography, blockchain technologies, formal methods, artificial intelligence, machine learning, natural language processing, data mining, semantic web, sentiment analysis, IoT technologies, assistive technologies, biomedical image analysis, precision agriculture, image retrieval, computer vision, multimedia forensics, high-dimensional data analysis.</p> <p>In the statistical area: statistical modeling in classical and Bayesian frameworks with special attention to medical/epidemiological and environmental applications; selection techniques for optimal models; parametric inference methods based on the “scoring rules” theory; causal inference with special focus on individual causal inference problems; model based clustering; statistical network models; evidence measures in Bayesian framework.</p>

	<p>The organization of the Doctoral Program integrates educational and research activities. Educational activities include a wide range of courses and seminars taught by faculty members and researchers from the PhD Board and the Department of Mathematics and Computer Science at the University of Cagliari, as well as by a network of visiting professors from other Italian and foreign universities. Research activities include, in addition to individual or group study focused on each doctoral student's specific research project, cycles of seminars aimed at periodically sharing results, participation in conferences and schools in Italy and abroad (with appropriate financial coverage), publication of articles in scientific journals and proceedings of international conferences, periods of training abroad (lasting at least six months), collaborations with private companies and public institutes engaged in research and innovation. The research groups of the Department of Mathematics and Computer Science provide the necessary computing tools for the doctoral research.</p> <p>Starting from the academic year 2022-2023, an agreement with the University of Minho (Portugal) is in place, involving the Computer Science track. The two doctoral programs collaborate to share research themes, objectives, operational methods, activities of their doctoral programs, as well as the operational and scientific structures necessary to ensure their sustainability.</p> <p>Finally, the doctoral program includes the achievement of an English language certification of at least level B2, possibly through courses offered by the University Language Center.</p> <p>The employment opportunities of the Doctorate (which relies for this purpose on a specific Advisors' Board composed of teachers and representatives of interested third parties) are various: the course is primarily aimed at training independent and qualified researchers, capable of carrying out scientific activities in universities and research institutes, but also specialists with high technical and methodological skills, able to work in innovative companies with managerial or consultancy tasks, as well as freelancers. In this context, positions advertised in collaboration with organizations external to the University on specific research and innovation projects are of particular interest. Another opportunity is teaching STEM disciplines at primary and secondary schools.</p>
<p>ELIGIBILITY AND OTHER REQUIREMENTS FOR CANDIDATES (ART. 2 - NOTICE OF COMPETITION)</p>	<p>EVERY ITALIAN 2ND CYCLE DEGREE (<i>LAUREA MAGISTRALE/SPECIALISTICA/VECCHIO ORDINAMENTO</i>) AND EQUIVALENT AND SUITABLE FOREIGN ACADEMIC DEGREES</p>
<p>ADMISSION TESTS FOR CANDIDATES APPLYING FOR THE ORDINARY POSITIONS</p>	<p>The selection process involves the evaluation of qualifications, the curriculum vitae of the candidate, and an interview. In addition to the documents required by Article 3 of the Call for Applications, the submission of a research project in English, prepared according to the model attached to the Call, is mandatory.</p> <p>In assessing qualifications and the curriculum vitae, the Evaluation Committee will consider the candidate's skills in the scientific areas relevant to the Doctorate. The interview will aim to assess the candidate's ability to navigate the main areas of study related to the Doctorate, and will include a careful examination of the presented research project in terms of originality, feasibility, and coherence with the educational objectives of the Doctorate. The Committee reserves the right to indicate specific qualifications of the candidate to occupy one or more of the possible positions linked to research projects.</p> <p>Candidates unable, for justified reasons, to attend the interview at the established location may be granted the opportunity to conduct it via video</p>

	conference, on the same date and time scheduled for in-person interviews, according to the modalities indicated in the Call for Applications.
ADMISSION TESTS FOR FOREIGN CANDIDATES APPLYING FOR THE RESERVED POSITION	<p>The selection process involves the evaluation of qualifications, the curriculum vitae of the candidate, and an interview. In addition to the documents required by Article 3 of the Call for Applications, the submission of a research project in English, prepared according to the model attached to the Call, is mandatory.</p> <p>In assessing qualifications and the curriculum vitae, the Evaluation Committee will consider the candidate's skills in the scientific areas relevant to the Doctorate, the consistency of the foreign academic degree with the educational objectives of the Doctorate, and the relevance of publications and letters of recommendation. The interview will aim to assess the candidate's ability to navigate the main areas of study related to the Doctorate, and will include a careful examination of the presented research project in terms of originality, feasibility, and coherence with the educational objectives of the Doctorate. The Committee reserves the right to indicate specific qualifications of the candidate to occupy one or more of the possible positions linked to research projects.</p> <p>Reference letters (up to 3) must be written in English, using the form available on the webpage https://web.unica.it/unica/en/studenti_s01_ss05.page (How to apply for PhD selection: Guidelines and forms- Annex D), by a university professor or an expert in the research fields of the PhD programme, on letterhead of their institution, dated and signed. Evaluators will send their letters directly to the email address phdcall_referenceletter@unica.it (object: surname and name of the candidate being evaluated and name of the PhD programme for which he/she is applying).</p> <p>For candidates applying for reserved positions, the interview will be conducted via video conference, on the same date and time scheduled for in-person interviews, according to the modalities indicated in the Call for Applications.</p>
POSITIONS	10, 2 of which without scholarship, and 1, with scholarship, reserved for a foreign candidate with a 2nd level degree awarded abroad
SCHOLARSHIPS	<p>8:</p> <ul style="list-style-type: none"> - 1 funded by the University of Cagliari (funds from Regional Law no. 7 of 7.8.2007, allocated to the University pursuant to Regional Council Resolution no. 45/84 of 27.11.2024) – CUP F23C24001130002 - 1 funded with funds from the Ministry of Enterprises and Made in Italy - RICALTRO_CTC_2023_REFORGIATO_RECUPERO - 6 funded with funds from PR FSE+ 2021-2027 (PNR 2021-2027 research and innovation area: Health; Security for social systems; Digital, industry, aerospace; Climate, energy, sustainable mobility - Specialisation Area S3: Agro-industry; Biomedicine; ICT; Smart networks and energy production; Tourism, culture and environment): <ul style="list-style-type: none"> ● 3 on Line A, reserved for university female and male graduates under 35 years at the time of application ● 3 on Line B, reserved exclusively for university female graduates under 35 years at the time of application
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