MATHEMATICAL SCIENCES

DM 630/SMAT - Statistical Analysis and Modeling for Data Analysis and Prediction of Water Utility Usage

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] SOCIETA' METROPOLITANA ACQUE TORINO S.P.A. [P.iva/CF:07937540016]
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Context of the research activity	The PhD program is designed to equip students with advanced skills in statistical analysis and modeling of environmental data, with a special focus on the water utility sector within the Metropolitan City of Turin. This interdisciplinary program combines rigorous statistical methodologies with practical applications to address real-world challenges in environmental statistics, particularly focusing on water usage. Progetto finanziato dal PNRR a valere sul DM 630/2024 - CUP E14D24002470004
Objectives	Water is a vital resource, and its efficient management is crucial for ensuring sustainable urban living. The PhD program aims to address the challenges of water resource management in the Metropolitan City of Turin through advanced statistical analysis and modeling techniques. This program is designed to equip researchers with the skills and knowledge required to analyze and predict environmental data. The primary objectives of the program are to: - Develop Advanced Statistical Skills: Provide students with a deep understanding of statistical inference and modeling techniques necessary for analyzing complex data. - Enhance Software Proficiency: Train students in the use of statistical software such as R, Python, and Julia, which are essential tools for data analysis, visualization, and predictive modeling. - Promote Applied Research: Encourage the application of statistical methods to real-world problems in environmental science - Inform Policy and Practice: Generate data-driven insights that can inform public policy, contributing to the sustainable development of urban areas. Despite having a specific topic, the PhD program is designed to provide a

	comprehensive education in both the theoretical and practical aspects of geostatistical analysis and modeling. The curriculum includes core courses, software workshops, research seminars, conference attendance, and practical projects, ensuring that students gain a well-rounded understanding of the geostatistical and environmental modelling and aplications. Geostatistics is a critical component of the PhD program and students will learn advanced geostatistical techniques, such as Point Patterns, Kriging, Potts models, that are essential for analyzing spatially correlated data. The student will learn how to formalize a hierarchical model and how to estimate it using algorithms such as Markov Chain Monte Carlo methods, Hamiltonian Monte Carlo, or by utilizing software such as INLA or STAN.

Skills and competencies for the development of the activity	It is required to have attended a course on statistical inference and statistical models. Prior knowledge of a statistical software, such as R, Python, Julia, etc., is also necessary