DC Number	DC11
Title of the PhD Project	Enhancing CO2 emissions reduction strategies through advanced machine learning techniques: A case study with enersis' environmental data
Keywords	CO2 emissions reduction, digital twins, machine learning, environmental data analysis, scenario analysis
Recruitment organisation	enersis suisse AG
Supervisors names and contacts	Christian Thomann – christian.thomann@enersis.ch Thomas Koller – thomas.koller@enersis.ch
Scientific context and objectives	The project aims to address the challenge of deriving effective measures for reducing CO2 emissions from complex and interdependent environmental data. enersis facilitates this endeavor through the usage of digital twins that replicate real-world environments. These models aggregate vast quantities of environmental data, serving as foundational elements for a diverse array of applications aimed at fostering transparency, facilitating planning processes, and enabling sophisticated simulations. The intricacies of environmental data, characterized by its volume, interdependencies, and complexity, pose significant hurdles to traditional analytical methods. However, advanced analytical techniques, particularly machine learning (ML) algorithms, offer a promising avenue for extracting valuable insights and facilitating informed decision-making in the realm of CO2 emissions reduction. General Research Objectives: • Leverage the rich database of hundreds of cities provided by enersis and explore new approaches for feature engineering and selection to identify the most relevant variables and attributes influencing CO2 emissions. This involves exact domain knowledge and advanced statistical techniques to extract meaningful information from the complex data. • Identify, design & implement ML models capable of capturing the intricate relationships and dependencies within the data to predict CO2 emissions accurately. Evaluate the performance of these and assess their robustness across diverse geographical regions and sectors. • Utilize the developed ML models to conduct scenario analysis and prediction of CO2 emissions under different policy interventions, technological advancements, and other changes. This will enable stakeholders to assess the potential impact of various strategies and interventions on CO2 emissions reduction. • Integrate the ML models into decision support systems tailored to the specific needs of energy suppliers, policy maker, urban planners, and other stakeholders involved in CO2 emissions reduction initiatives. These systems will provide actionable insights and recommendations to guide strategic planning and resource allocation efforts. By addressing these research objectives, this project aims to advance the state-of-the-art in CO2 emissions reduction strategies by harnessing the power of advanced analytical methods, particularly ML, to extract actionable insights from complex and interdependent data provided by enersis. Through collaboration with stakeholders and policymakers, the findings of this research will contribute to more informed decision-making and ultimately support global efforts to mitigate climate change.
Required skills	• A degree in environmental sciences, data science or a related quantitative field • Advanced knowledge in python programming for machine learning applications • Intrinsic motivation to acquire new skills and engage in personal development

This project has received funding from the European Union's
Horizon Europe Framework Programme (HORIZON) under the GA n. 101120278 - DENSE

	• Effective communication skills for working in interdisciplinary and international research teams • Very good knowledge of English
References	enersis suisse ag

This project has received funding from the European Union's
Horizon Europe Framework Programme (HORIZON) under the GA n. 101120278 - DENSE