PhD SDC
CU GAMMA
TECHNOLOGY AND TERRITORY

Now open for application

C42.CU-Gamma.10

AI-driven Life Cycle Assessment of industrial-level technological scale-up of BioSolutions

- **Reference person**
  Monia Niero
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- **Host University/Institute**
  Sant'Anna School of Advanced Studies
- **Internship**
  N
- **Research Keywords**
  Prospective Life Cycle Assessment
  Artificial intelligence
  BioSolutions for the food sector
- **Reference ERCs**
  H7_5 Sustainability sciences, environment and resources
  SH7_6 Environmental and climate change, societal impact and policy
- **Reference SDGs**
  GOAL 9: Industry, Innovation and Infrastructure
  GOAL 12: Responsible Consumption and Production
  GOAL 17: Partnerships to Achieve the Goal

Description

The application of Artificial Intelligence techniques and prospective Life Cycle Assessment (LCA) represent two frontiers in LCA methodological development which, although still at the research stage, are attracting growing interest in the scientific community. Integrating these approaches offers the potential to evaluate the future environmental impacts of emerging technologies, currently at the laboratory scale.

To support our aims, we are searching for a PhD student as a new member for our recent project, FrameBio (Multiscale Frameworks for BioSolutions), funded by the European Union through the Horizon Europe, Marie Skłodowska-Curie Actions (MSCA) grant. FrameBio's goal is to revolutionize biotechnologies by fostering the advancement of sustainable bioproducts production technologies for food applications (such as Single Cell Proteins). More specifically, the objective is to quantify the resource dependencies and environmental impact of relevant emerging technologies of the sector across various scales: Microorganism Design and Engineering - Fermentation Design of Experiments coupled with High Throughput Screening - Commercial Production Scheme Simulations - Supply Chain Design - Planetary Resource Utilization and its Impact on Earth's Geophysical Synergies, to predict the broad sustainability impacts of BioSolutions.

This full-time PhD position is part of a Doctoral Network (DN) that will train 13 PhDs in genomics, metabolomics, fermentation and process optimization, data science, and sustainability assessments in a unique venture. Applying LCA within this project is essential, given the central importance of environmental sustainability in the development of innovative BioSolutions.

This position is an exciting opportunity to work on a seminal topic and to study cutting-edge technologies towards our vision of a sustainable bioeconomy, focusing on the development of advanced environmental assessment models. Your specific tasks will be:

• Analyzing and interpreting materials and energy flows data collected from the experimental and computational laboratories of the partners and from the scientific literature.
• Creating explorative scenarios expressing realistic technical evolution trends in the production of BioSolutions while moving from laboratories to industry.
• Developing AI models that learn from the evolution of similar technologies in the past to simulate the progressive optimization pathways of current emerging technologies in terms of resource efficiency and scalability.
• Conducting a scenario-based prospective LCA analysis aimed at assessing potential environmental impact and benefits of BioSolutions in the food sector once they will be commercialized on a planetary-scale.
• Contributing to the methodological development of environmental impact assessment methodologies by improving the integrability between prospective LCA and AI.

Suggested skills:

years immediately prior to the date of hiring.

Basic knowledge of environmental science and engineering. Familiarity with LCA methodology and software (e.g. SimaPro, openLCA, Brightway) will be an advantage.

Basic knowledge of informatics, data management, and programming. Familiarity with AI programming will be an advantage

Good written and spoken English as well as presentation skills.

interpersonal and organizational skills

Requirements

In order to fulfill the eligibility criteria of the Marie Curie MSCA Doctoral Networks at the date of recruitment, applicants must not have resided or carried out their main activity (work, studies, etc.) in Italy for more than 12 months in the 3 years immediately prior to their recruitment. Compulsory national service and/or short stays such as holidays are not taken into account. Italian candidates can apply if they have resided in another country for more than 2 years of the last 3 years. Furthermore, applicants must not already hold a doctoral degree.

Scholarship Details

The DCPh.D.studentwillreceiveayearlygrosssalary:

- Living allowanceof€45.858,36(includingincometaxandretirementpensioncontributions);
- Mobility allowanceof€8.520,00;
- Family allowance(IftheDCPh.Dstudenthasoracquiresfamilyobligationsduringthe research programme)€5.940,00.

Research team and environment

The PhD student will be part of the COGITO (Consumption-Oriented Green Innovation Tools platform for Life Cycle Assessment) lab, an interdisciplinary research team within the Sustainability and Climate Interdisciplinary Center at Sant'Anna School of Advanced Studies in Pisa led by Prof. Monia Niero specialized in the methodological development of LCA and its application across various research fields, including emerging technologies, to evaluate the environmental impacts of products and processes.
The PhD student will be co-supervised by Dr. Federico Rossi

The University Institute of Higher Studies of Pavia (IUSS) is a research and training center that offers courses of excellence to complement the usual university courses.

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