



# PhD in BIOINGEGNERIA / BIOENGINEERING - 38th cycle

**PARTENARIATO PNRR Research Field: DEVELOPMENT OF METHOLOGIES FOR DATA ANALYSIS, MODELLING AND INTERPRETATION AIMED AT WELLBEING AND HEALTH**

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1250.0**

In case of a change of the welfare rates during the three-year period, the amount could be modified.

## Context of the research activity

**Motivation and objectives of the research in this field**

In recent years, the availability of new technologies, including wearable sensors, Internet of Things (IoT), telemedicine as well as Machine Learning (ML) and Artificial Intelligence (AI), has made possible recording of many different physiological signals during daily life and activities.

This data is a precious source of information which can be exploited for improving wellbeing in the general population and for early identification of disturbances during human life evolution.

On the other hand, specific methodologies are needed in order to properly address different sections of the general population, from the early stages of life, up to ageing, though the school-time, the work life and the sport activities.

Within this context, there is the urgent need to develop tools for data integration and interpretation, for the extraction and analysis of physiological features and for the creation of predictive models able to exploit heterogeneous and multimodal sources of information. Through this PhD Thesis we plan to find a structured and interdisciplinary approach to the \*\*. The PhD student will develop knowledge and skills in the treatment and quality assessment of large biological databases. In this context the PhD project aims to provide and test data recording and analysis tools aimed to promote wellbeing in the general population and that could be shared with the scientific community through the MUSA platform.



	<p>This project research is in the framework ECS-MUSA ECOSISTEMA DELL'INNOVAZIONE MUSA - MULTILAYERED URBAN SUSTAINABILITY ACTION CUP D43C22001410007 Decreto di Concessione D.D. 1055 del 23/06/2022</p> <p>D.D. 3277 del 30/12/2021 Avviso pubblico per la presentazione di Proposte di intervento per la creazione di 12 Ecosistemi dell'innovazione sul territorio nazionale da finanziare nell'ambito del Piano Nazionale di Ripresa e Resilienza, Missione 4 Componente 2 Investimento 1.5 - Creazione e rafforzamento di ecosistemi dell'innovazione, costruzione di leader territoriali di R&amp;S - finanziato dall'Unione europea -NextGenerationEU.</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>After selecting specific use cases (i.e. pregnancy and early childhood, workplace activities, etc.), the PhD project will be dedicated to the development and optimization of methods for the multimodal analyses and interpretation of datasets collected through dedicated devices from healthy controls and during different selected activities.</p> <p>Among the main ingredients will be used in this thesis, we have data integration techniques, data quality approaches, machine learning methods, statistical modelling approaches, for the development of scalable and reusable software pipelines on biological data. Data processing phases include definition of protocols, data cleaning, feature extraction and interpretation, predictive model development exploiting advanced processing methodologies based on ML and AI. Existing datasets will be integrated with new data specifically collected and testing performed on selected groups.</p> <p>The advanced computing facilities available in the DataCloud Lab will be made available to the research. The newly developed methods will be integrated in a software facility, which will be made available to the scientific community for use in multidisciplinary research</p>



	areas though the MUSA platform.
<b>Educational objectives</b>	Work in a multidisciplinary team; Develop capabilities in understanding clinical problems and provide engineering solutions; Data analytics and AI research tools; capability in developing novel research tools; development of a framework to support the analysis of biomedical signals.
<b>Job opportunities</b>	Research and development in research institutions or in enterprises; support to clinics; product manager; service manager.
<b>Composition of the research group</b>	4 Full Professors 4 Associated Professors 6 Assistant Professors 15 PhD Students
<b>Name of the research directors</b>	PROF. MARIA GABRIELLA SIGNORINI

<b>Contacts</b>	
<p><i>Maria Gabriella Signorini</i>  <i>mariagabriella.signorini@polimi.it</i>  <i>tel.:02 2399 3328</i></p> <p><i>Anna M. Bianchi</i>  <i>annamaria.bianchi@polimi.it</i>  <i>tel.: 02 2399 3342</i></p>	

<b>Additional support - Financial aid per PhD student per year (gross amount)</b>	
<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	625.0 €
<b>By number of months</b>	6

<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
The PhD student will attend specific PhD courses at Politecnico di Milano according to his/her



personal study plan;

He/she will be able to attend summer schools and will have the opportunity to disseminate his/her research results in international conferences;

The PhD student will assist in teaching by giving practical and lab lessons and by tutoring of BSc and MSc students developing their thesis work.

The PhD student will have personal desk in the Politecnico B3Lab or E-health Lab and will be equipped with a personal computer, in addition he/she will have access to the Lab facilities and instrumentation.

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ECS-MUSA

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