



PhD in BIOINGEGNERIA / BIOENGINEERING - 38th cycle

PARTENARIATO PNRR Research Field: QUANTIFICATION OF HUMAN-ENVIRONMENT INTERACTIONS THROUGH BIOLOGICAL SIGNAL

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

The proposed research activity is part of the PNRR project MUSA (spoke 1) and will develop methods for measurements obtained by biosignals to quantify affective responses in subjects interacting with urban and open-environments.

Methods and techniques that will be developed and used to carry out the research

Affective computing uses biometric signals and machine-learning algorithms to automatically classify emotions and several sources can be used. Common practice is to utilize variables associated with the central nervous system (CNS) and autonomic nervous system (ANS) dynamics. Most accustomed signals are Electroencephalogram (EEG), Respiration (RESP), Electrocardiogram (ECG), Photoplethysmogram signal (PPG), Electromyogram (EMG), Galvanic Skin Response (GSR), and Skin temperature (SKT). ANS has the objective to mediate the stimulation of body processes, usually through the sympathetic division, or their inhibition, usually through the parasympathetic system. Emotional states are characterized by different sympathetic and parasympathetic activation. While most of those techniques are evaluated in laboratory settings, the proposed research will study subjective interactions at different levels of immersion in urban, open-environment. Automated algorithms for affective state quantification will be evaluated and the best settings for outdoor recordings



	<p>be evaluated and the best settings for outdoor recordings selected.</p> <p>The study will also apply novel AI-based ML methods to integrate subjective information with physiological insights coming from the biosignals in order to estimate specific emotional states and psychological conditions as a result of the environment stimulation.</p>
Educational objectives	<p>PhD student will:</p> <ul style="list-style-type: none"> - learn advanced methods for biosignal analysis - learn new technologies for data gathering and analysis - learn how to develop research in a multidisciplinary environment.
Job opportunities	<ul style="list-style-type: none"> - Direct interaction with companies through the PNNR program. - Data analyst positions. - Data Scientist positions. - Engineering for urban infrastructures
Composition of the research group	<p>1 Full Professors 1 Associated Professors 1 Assistant Professors 2 PhD Students</p>
Name of the research directors	PROF. LUCA MAINARDI - PROF. RICCARDO BARBIERI

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

Scholarship Increase for a period abroad	
Amount monthly	625.0 €
By number of months	6



Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

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 and will be equipped with a personal computer.