



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 40th cycle

Research Area n. 2 - Electronics

**THEMATIC Research Field: ADVANCED MULTI-SENSOR SYSTEM FOR CARDIOVASCULAR  
PARAMETERS MONITORING**

<b>Monthly net income of PhDscholarship (max 36 months)</b>
<b>€ 1400.0</b>
In case of a change of the welfare rates during the three-year period, the amount could be modified.

<b>Context of the research activity</b>	
<b>Motivation and objectives of the research in this field</b>	<p>The project aims to develop an ultra-low power hardware for biomarkers monitoring, that well fit in eyewear frame and includes sensor fusion and AI to robustly extract biomarkers parameters.</p> <p>The main objectives are:</p> <ul style="list-style-type: none"> <li>- Design a main-board for power supplies and microcontroller (MCU) that well fit in the eyewear frame</li> <li>- Exploit the MCU ultra-low power operation modes</li> <li>- sensor fusion, photoplethysmography (PPG) and Inertial Measuring Units (IMUs) for motion artifacts mitigation</li> <li>- Sensor fusion between PPG and on-demand ECG to estimate the Blood Pressure (BP)</li> <li>- Explore algorithms and calibration modes for SpO2 estimation</li> <li>- Simple activity recognition embedded in the IMU processing unit</li> </ul>
<b>Methods and techniques that will be developed and used to carry out the research</b>	<p>PCB will be designed to host MCU and sensors. Firmware will be optimized to be compatible with ultra-low power operation. Algorithms based on standard processing and Neural Network will be implemented in the MCU and in the processing units available in the sensors.</p>
<b>Educational objectives</b>	<p>The PhD student will acquire in depth skills for designing</p>



	and simulate ultra-low power and compact electronic circuits and for developing embedded firmware for data processing.
<b>Job opportunities</b>	The research project will open many opportunities in the field of electronic circuit design, and embedded system development, giving the possibility to proceed further in a researcher position or to work in a company.
<b>Composition of the research group</b>	1 Full Professors 2 Associated Professors 1 Assistant Professors 7 PhD Students
<b>Name of the research directors</b>	Prof. Federica Alberta Villa

#### Contacts

federica.villa@polimi.it

#### Additional support - Financial aid per PhD student per year (gross amount)

<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--

#### Scholarship Increase for a period abroad

<b>Amount monthly</b>	700.0 €
<b>By number of months</b>	6

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

EDUCATIONAL ACTIVITIES (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student.

TEACHING ASSISTANTSHIP: availability of funding in recognition of supporting teaching activities by the PhD student.

There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

COMPUTER AVAILABILITY:

1st year: Yes



2nd year: Yes

3rd year: Yes