



# PhD in INGEGNERIA DELL'INFORMAZIONE / INFORMATION TECHNOLOGY - 39th cycle

Research Area n. 2 - Electronics

**THEMATIC Research Field: DESIGN AND TESTING OF IN-MEMORY COMPUTING CIRCUITS  
(PROGETTAZIONE E MISURA DI CIRCUITI DI CALCOLO IN MEMORIA)**

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

**€ 1400.0**

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

## Context of the research activity

<p><b>Motivation and objectives of the research in this field</b></p>	<p>In-memory computing allows for high parallelism and reduced memory access, thus improving the speed and energy efficiency for data intensive tasks. This project aims at the design of novel analogue circuits capable of accelerating machine learning by matrix vector multiplication in memory arrays. Circuit testing by accurate memory programming will allow for experimental validation and benchmarking with conventional digital circuits.</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>The activity will consist of the design of circuit for in-memory computing to accelerate linear algebra and machine learning. The methodology includes theoretical study, analogue/digital integrated circuit design and experimental testing of the developed chip to assess the accuracy, performance and energy efficiency of the novel circuits.</p>
<p><b>Educational objectives</b></p>	<p>The doctorate activity will include attendance of academic courses, conferences, summer schools and workshops for the training of the student on the topics relevant for the research (clean room fabrication techniques, neuromorphic computing, device physics).</p>
<p><b>Job opportunities</b></p>	<p>The competence developed during the doctorate studies</p>



	will enable access to job positions in device engineering and integrated circuit development.
<b>Composition of the research group</b>	1 Full Professors 0 Associated Professors 0 Assistant Professors 10 PhD Students
<b>Name of the research directors</b>	Prof. Daniele Ielmini

<b>Contacts</b>	
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<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>	700.0 €
<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 have access to a clean room facility after proper training. The PhD student will also have access to the electrical and numerical lab, where he/she will have a desk and a computer available to carry out the research project.