



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

Research Area n. 2 - Electronics

THEMATIC Research Field: **ADVANCED DEVICE CONCEPTS FOR IN-MEMORY COMPUTING**

**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>Emerging memory devices enable novel in-memory computing which can improve the energy efficiency by overcoming the memory wall of digital systems. Novel devices must be developed and optimized to provide a scalable technology platform for modern computing tasks, such as convolutional kernels and transformers. This project will study novel device concepts offering unique properties such as high update linearity for multiply and add operations in multi-head attention units, or short-term memory for neuromorphic systems capable of learning and adaptation.</p>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>The research program will be conducted via a broad range of methodologies, including device fabrication, device characterization, device modeling, and mixed-signal design of in-memory computing circuits.</p>
<p><b>Educational objectives</b></p>	<p>The educational objectives include the acquisition and consolidation of knowledge and practical skills on device fabrication, device characterization and circuit simulation.</p>
<p><b>Job opportunities</b></p>	<p>The PhD program provides a solid background for covering several professional engineering jobs in the industry, including microelectronics process experts and embedded system designers for mixed-signal edge AI accelerators.</p>



<b>Composition of the research group</b>	1 Full Professors 1 Associated Professors 4 Assistant Professors 6 PhD Students
<b>Name of the research directors</b>	Prof. Daniele Ielmini

<b>Contacts</b>
daniele.ielmini@polimi.it

<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>
<p><u>EDUCATIONAL ACTIVITIES</u> (purchase of study books and material, including computers, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student.</p> <p><u>TEACHING ASSISTANTSHIP</u>: 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.</p> <p><u>COMPUTER AVAILABILITY</u>: 1st year: Yes 2nd year: Yes 3rd year: Yes</p> <p><b>Premiality</b></p> <p>Premialities will be recognized to the PhD candidate. Up to 1674,8 euro (gross amount) after the completion of the 1st year; up to 1674,8 euro (gross amount) after the completion of the 2nd year; Up to 1674,8 euro (gross amount) after the completion of the 3rd year.</p>



The premialities will be assigned provided that she/he demonstrates a significant contribution to the growth of scientific excellence, the industrial valorization of research, the networking and communication activities of the Department.