



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

Research Area n. 1 - Computer Science and Engineering

**THEMATIC Research Field: COMPILER-BASED TECHNIQUES FOR REAL-TIME
SCHEDULING IN CRITICAL SYSTEMS**

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

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

Reliable systems are gaining importance in several industrial application fields, including aerospace, automotive and e-health.

The PhD project aims at researching novel techniques for the correct scheduling of real-time tasks in mission-critical and safety-critical systems running on modern processor architectures. The research will also consider the use of software-implemented hardware fault tolerance techniques, from both the reliability perspective and the challenging scheduling problem. Compile-time transformations and analyses via the LLVM framework will be investigated to exploit compiler-provided information for the improvement of reliability and schedulability metrics.

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

The PhD project includes the development of both theoretical research and the development of demonstrators. The research encompasses the analysis of multiple levels of the hardware-software stack of modern architectures, from the timing model of the processor to compilers and real-time operating systems. Multiple software tools will be used and developed to support the research activities and the realization of demonstrators.



Educational objectives	The student will acquire strong skills in analyzing the timing characteristics of mixed Hardware/Software systems, with emphasis on how to improve the reliability of such systems in presence of faults or misbehavior, with the goal to guarantee acceptable response time and performance.
Job opportunities	The competencies in designing reliable Hw/Sw systems can be exploited in large size industries developing critical systems (e.g., automotive, avionics, defense) as well as in leading edge startups/SMEs, including the possibility of cooperation with academic institutions.
Composition of the research group	0 Full Professors 6 Associated Professors 7 Assistant Professors 7 PhD Students
Name of the research directors	prof. William Fornaciari

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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	700.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>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.</p> <p>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</p>



allowed by the regulations.

COMPUTER AVAILABILITY: individual use.

DESK AVAILABILITY: individual use.

List of Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:

1. Leonardo - IT
2. ESA (European Space Agency)
3. CINI HPC-KTT Lab - IT
4. PNRR HPC Working group of Flagship 1