



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

Research Area n. 1 - Computer Science and Engineering

PNRR 117 Research Field: METHODS AND TOOLS FOR DESIGNING MULTIPROCESSORS
ARCHITECTURES FOR AUTOMOTIVE IN THE SOFTWARE DEFINED VEHICLE ERA

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**

Currently, Multi-processors Systems-on-Chip (MPSoCs) are considered the standard for both general-purpose and embedded architectures. In the automotive industry, heterogeneous MPSoCs are gaining popularity due to their cost-effectiveness and scalability. They are being used to replace hundreds of separate ECUs and optimize communication among subsystems in modern vehicles. The MPSoCs paradigm offers a stable hardware platform that is software programmable, customizable, upgradable, and extensible. However, it is crucial to define and optimize the architecture by assessing the tradeoffs between performance, area, and power consumption while considering constraints unique to the automotive domain because of its significant market volumes and complexity. The objective of this PhD research is to devise an innovative design methodology for system-level modeling and design space exploration (DSE) that can achieve these tradeoffs by identifying suitable architectural configurations for processors, on-chip interconnection network and memory hierarchy. Furthermore, security concerns are a significant issue in the automotive sector since cars have become more connected and prone to cyber attacks. Therefore, the proposed design methodology should also address security problems by providing solutions for secure



	communication and data protection within the MPSoC.
Methods and techniques that will be developed and used to carry out the research	<p>System-level modeling techniques to evaluate various metrics associated with a system configuration, among which performance, area and power consumption. These models will range from simulation-based ones to machine-learning models.</p> <p>An efficient design space exploration methodology to evaluate design tradeoffs and tune automotive MPSoC platforms w.r.t. the above metrics.</p> <p>Techniques for ensuring confidentiality, integrity and the overall security of the automotive MPSoC.</p>
Educational objectives	<p>Acquire and/or consolidate knowledge and/or practical skills around:</p> <ul style="list-style-type: none"> - Modeling and simulation at the system-on-chip level - Hardware architectural definition and exploration - Design of experiments and Machine-Learning models - Analysis and design for confidentiality, integrity and dependability
Job opportunities	The research proposal addresses an output profile that responds to the needs of the automotive industry for technical experts in the design and the development of next generation automotive onboard digital systems.
Composition of the research group	<p>1 Full Professors 1 Associated Professors 0 Assistant Professors 1 PhD Students</p>
Name of the research directors	Vittorio Zaccaria

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	700.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	STMICROELECTRONICS S.R.L.
By number of months at the company	6
Institution or company where the candidate will spend the period abroad (name and brief description)	EURECOM
By number of months abroad	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 allowed by the regulations.</p> <p>COMPUTER AVAILABILITY: individual use.</p> <p>DESK AVAILABILITY: individual use.</p>