COMPUTER AND CONTROL ENGINEERING

MUR DM 117/STMicroelectronics - Tecniche di Testing and Diagnosis per assicurare l'affidabilità di dispositivi automotive

Funded By	MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] STMICROELECTRONICS S.R.L. [P.iva/CF:00951900968] Politecnico di TORINO [P.iva/CF:00518460019]
Supervisor	BERNARDI PAOLO - paolo.bernardi@polito.it
Contact	BERNARDI PAOLO - paolo.bernardi@polito.it
Context of the research activity	The proposed research focuses on the reliability of embedded nano-electronic systems, for automotive and safety-critical systems in general. Currently, 2 trends of profound innovation are observed in this field: a) today's manufacturing capabilities allow for sensational processing functions to be integrated on board a single chip. This inevitably leads to managing a manufacturing complexity never achieved before; as a result, state-of-the-art testing methods are currently insufficient to ensure maximum reliability of these systems. New methods that allow to support the testing chain, guaranteeing an expanded coverage capacity in acceptable times, are one of the priorities of the semiconductor industry b) Net of the enormous efforts made to place extremely reliable microelectronic devices on the market, the Automotive world is also moving towards the collection of large amounts of data from vehicle fleets. This data, collected during the useful life of the chips on board each vehicle, is analyzed to extract prognostic information and to report back to the manufacturer information related to the types of failures that could be encountered. The latter form a strong feedback loop towards designers and technologists. Data collection capabilities are a relevant topic as they are preparatory to the analysis of large databases, possibly with the support of artificial intelligences. Progetto finanziato nell'ambito del PNRR - DM 117/2023 - CUP E14D23002020004
	During the PhD, the selected candidate will work on the two topics described before: a) It will address its studies to the development and evaluation of reliability

Objectives	and testing techniques that can address the complexity of current nano-metric systems. We expect to get the following results: - Reduction of evaluation computational times for reliability metrics - Improvement of the coverage of these reliability metrics through alternative methodologies or that complement traditional testing methods - Optimization of the equipment related to the real application of the techniques developed b) Will devote efforts in the direction of defining strategies for data collection during the useful life of a device on board a vehicle and their processing, also with Artificial Intelligence tools. The tangible results from this activity will be - The creation of an innovative data collection system, which makes it possible to obtain information from both the HW and SW components. - Estimate of project costs and implementation of a data collection system (including the area required on board the chip, the amount of memory to be allocated to the collection, the communication strategy towards the cloud) The topics addressed are aimed at favoring social and economic, as well as scientific, repercussions. In fact, they follow the mega-trend of autonomous driving and are considered useful, if not indispensable, for achieving the highest levels of reliability of the modern car, by implementing road accident prevention directions. At a human level, the doctorate will allow the training of a new professional figure, capable of conceiving and designing techniques for reliability at all levels of development of a device, including the useful life on board the vehicle.

Skills and competencies for the development of the activity	Attitude for team work. Simulation of circuits at high level of abstraction including RTL and GATE level simulations. Firmware development. Preferable, testing and reliability competences, including test pattern generation and fault simulations. C, C++, Python, bash languages