"Functional Safety in Managed NAND Embedded Systems" Ph.D. Project
in collaboration with Micron - Ref. Prof. Anna Rita Fasolino

Goal

The main goal of this ph.D. project consists in introducing and validating innovative software engineering solutions in the software lifecycle of Managed NAND embedded systems, with reference to the industrial context of the Micron company. These innovative solutions need to support the software development process in the achievement of the functional safety requirements for this type of embedded systems, in accordance with the directives established by the International Standard ISO/FDIS 26262 on Functional Safety.

To reach this goal, the pH.D. candidate will have to:

- Analyse the state of the art in the field of embedded software development processes, lifecycles, methods, techniques, and tools, with reference to the specific Micron Managed NAND firmware development processes;
- Analyse the directives of the International Standards related with the Functional Safety requirements, and the state of the art in the research area regarding the application of such Standards in real industrial processes;
- Propose innovative software engineering solutions for aiding the execution of the software lifecycle activities prescribed by the reference Standard, in order to improve the effectiveness and efficiency of the embedded software development process implemented in Micron.

Possible Research areas to be investigated:

- Introduction of semi-formal requirement languages (such as Cucumber, or Gherkin) for aiding the activities of Functional Safety requirements Specification and Validation;
- Graph-based data models and graph-based data analytics tools for supporting functional safety dataset analysis (from Hazard analysis and Risk assessment -HARA, to Software Functional Safety Requirements definition, Pattern detection, Anomaly detection, etc.)
- Introduction of reusable solutions (such as Design styles, Design patterns) for the Software Architectural design and definition of tools aiding the architectural design based on such reusable assets;
- Model-based techniques for the Software Unit design, implementation, and Validation;
- Model-based approaches for the automated generation of test-cases at the Unit level;
- Equivalent class, boundary values, search-based and genetic testing techniques for improving Coverage testing;
- Introduction of Random and Fuzzy testing techniques for robustness testing (at Unit, Integration, and System Levels) or performance testing (at system and acceptance level);
- Machine learning techniques for software defect prediction
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