Marco De Luca

Functional safety in managed NAND embedded systems

Tutor: prof. Anna Rita Fasolino
co-Tutor: Pasquale Cimmino

Cycle: XXXVII Year: 2021

My background

- MSc degree**: Computer Engineering**
- Research group/laboratory: ***REvERSE* - REsEarch gRoup of Software Engineering**
- PhD start date: **1st November 2021**
- Scholarship type: **founded by Micron Semiconductor Italia S.R.L**

Research field of interest

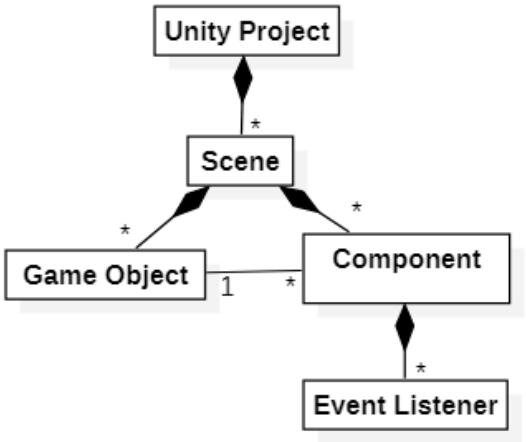
- **Software Testing**: model-based testing techniques for augmented reality (AR) application and fragility of test cases in E2E scenarios
- **Software Repository Mining**: analyze the data available inside software repositories like version control system and bug/issues tracking system to extract useful information for downstream tasks like *community detection*
- **Software Development and Documenting process in safety critical domain in compliance with the ISO 26262**

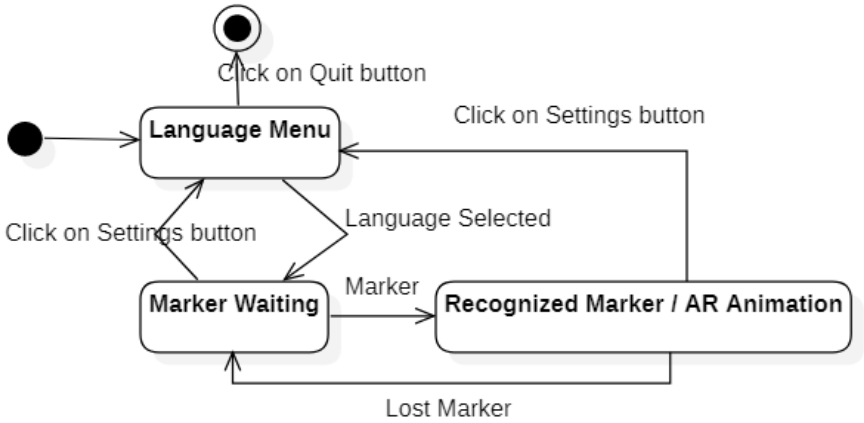
Summary of study activities

- Ad hoc PhD courses:
  - **Big Data Architecture and Analytics**
  - **Imprenditorialità Accademica**
- Courses borrowed from MSc curricula:
  - **Software Testing**
  - **Natural Language Processing**
  - **Machine Learning e Big Data per la Salute**
- Conferences:
  - **16th International Conference on Research Challenges in Information Science** (RCSI) held in Barcelona, during May 17-20, 2022.

Research activity: Overview (1/3)

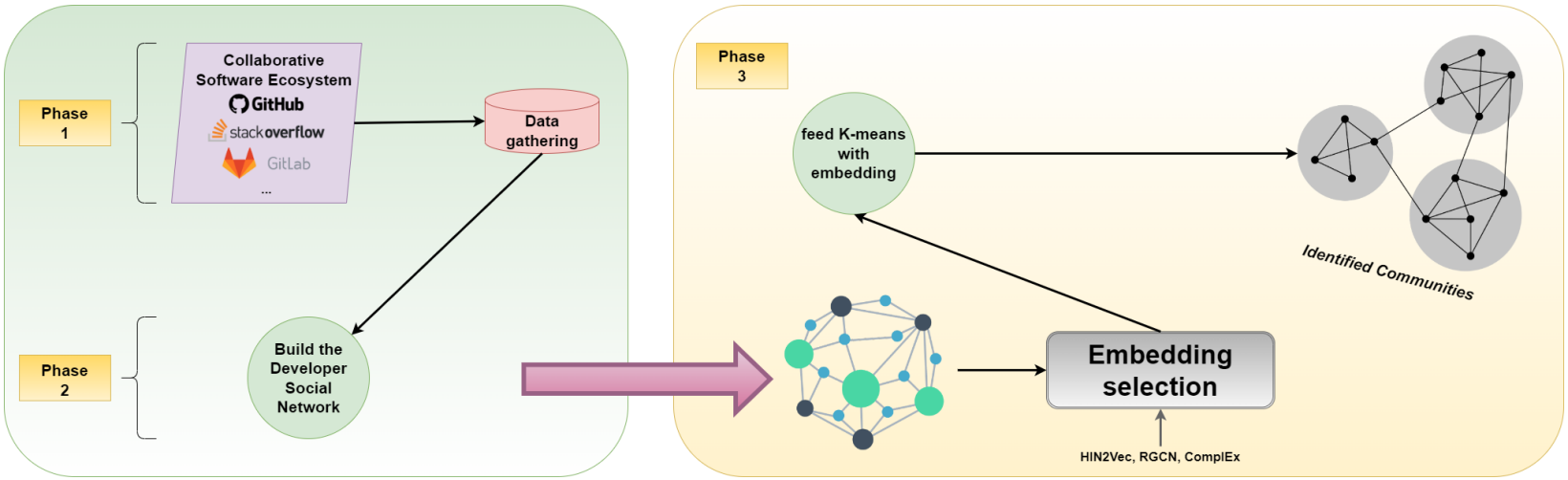
- **Problem:**
  - Testing of Augmented Reality (AR) applications
- **Objective:**
  - Investigate the possibility of using Model Based Testing techniques to generate executable test scripts from Finite State Machines modeling the behavior of the GUI of AR applications
- **Methodology:**
  - Reverse engineering of the source code of the application to obtain the Finite State Machine, that can be exploited to design test suites aiming at covering states, transition and prime paths





Research activity: Overview (2/3)

- **Problem:**
  - Support the software development process by exploiting the data inside the software repositories
- **Objective:**
  - Use of Developer Social Network (DSN) to support downstream task like: i) Community Detection, ii) Expert Finding
  - Use of Graph Embedding techniques to overcome the huge graph-size computational issue
- **Methodology:**
  - Definition of novel a heterogeneous graph-based model able to capture and handle in an effective way all the complex and strongly-correlated information inside a software repository



Research activity: Overview (3/3)

- **Problem:**
  - To support Software development and documentation processes in safety critical domains, in compliance with safety standard
- **Objective:**
  - Investigate novel approaches for suitability with the *requirements* and *recommendations* defined in *"Product Development at the software level"* Chapter 6 of the automotive standard ISO 26262 *"Road vehicles – Functional safety"*
- **Methodology**:
  - Study of the literature on standards applicability issues in the industrial environment (software architecture documentation, traceability management, documentation consistency...)
  - Definition of possible solutions to these problems aiming at proposing a SAD documentation template and an integration software platform to support consistency and traceability management
  - Validation of the proposed solutions in an industrial context, in collaboration with the Micron development teams

Products

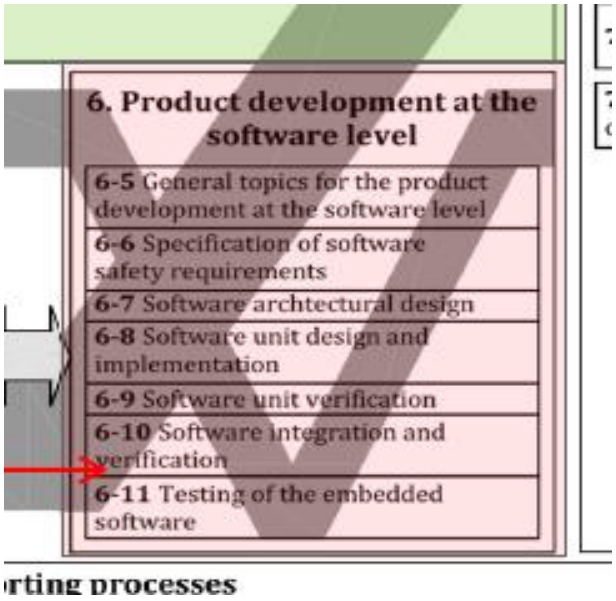
[P1]	P. Tramontana, **M. De Luca**, A.R. Fasolino; *"An Approach for Model Based Testing of Augmented Reality Applications"*, QUAMES@RCIS, CEUR Workshop Proceedings, *published*, 2022
[P2]	**M. De Luca**, A.R. Fasolino, A. Ferraro, V. Moscato, G. Sperlì, P. Tramontana; "*A community detection approach based on Network Representation Learning for repository mining*", Expert Systems with Applications, *submitted*, 2022
[P3]	D. Amalfitano, **M. De Luca**, A.R. Fasolino; "*Documenting Software Architecture Design in Compliance with the ISO 26262: an Industrial Case Study in the Automotive Domain*", International Conference On Software Architecture (ICSA), in progress, 2023

Tutorship

- 12 hours of teaching activities regarding practical lectures/seminars during the course "I*ngegneria del Software*", Bachelor Degree in Computer Engineering

Next Year

- Application of knowledge developed in the field of software testing, to develop new approaches to be tested in clauses 6.8, 6.9, 6.10 of ISO 26262
- Application of software repository mining techniques to improve consistency and traceability management by recovering traceability links among existing software artifact
- Validation of the proposed solution for achieving compliance with ISO 26262, by designing an experimental study in industrial field



Thank you for the attention!