

EXTENDING THE RENODE-BASED EXPERIMENT PLATFORM

1 ASSIGNATION

Number of students: 1

Type of project: Masterthesis

2 SHORT DESCRIPTION

Within M-Group there are multiple research tracks. One research track investigates how embedded software can be made more resilient against hardware bitflips through software-implemented fault tolerance. This track has resulted in multiple fault detection techniques, a compiler extension and a fault injection tool that can test the fault detection techniques.

Another research track investigates how machines can be retrofitted to detect anomalies through machine learning on the edge. This track has resulted in a new and improved anomaly detection technique that can be generalized over many machine conditions.

In first studies, these two tracks have been brought together, through two machine learning case studies executing on an nRF52840 DK board and through their simulated variant provided by the Renode framework. This thesis will build upon this work by further extending the Renode-based experiment framework.

Information: Jens Vankeirsbilck (Jens.Vankeirsbilck@kuleuven.be)

Supervisors: Jeroen Boydens, Jens Vankeirsbilck, Brent De Blaere

Research group: M-Group (<https://iiw.kuleuven.be/brugge/m-group>)

3 EXPLORATION

The best source about Renode, is it's webpage: <https://renode.io/>

Access to the necessary GitLab repositories, other software, the hardware and unpublished papers will be given once the project has started and the NDA has been signed.

More on the bitflip resilience track can be read in:

- PhD thesis: <https://lirias.kuleuven.be/retrieve/556289>
- Papers of [Brent De Blaere](#), [Mohaddaseh Nikseresht](#) and [Jens Vankeirsbilck](#)

More on the anomaly detection track can be read in the papers of [Chandrakanth Kancharla](#)

More on the hardware, nRF52840 DK, can be found at

<https://www.nordicsemi.com/Products/Development-hardware/nrf52840-dk>

4 FOCUS

Bitflip Resilience, On-the-Edge Machine Learning, Anomaly Detection, Research Track Combination, Simulation

5 GOAL

At the end of the thesis, the following should be achieved:

- Optimize the fault injection by using multiple simulated boards and dividing the experiment among them.
- Using a different platform, in order to generalize the connection/interaction interface
- And if time allows: investigate if an I/O driven demonstrator of the M-Group, i.e. our small scale factory, can be fully simulated and experimented with through Renode

6 ORGANIZATION

The project will be organized at the M-Group research group.