Master's thesis internship
Anomaly detection for predictive maintenance in the edge

INTRODUCTION

VERHAERT is an SME with a clear focus on innovation and development of new products for international customers in various sectors. We offer a broad range of product development services, from business consultancy to series production.

Predictive maintenance is growing in popularity as anomaly detection becomes more cost-effective to implement. Anomaly detection can be done in the cloud, on an edge server, or on an edge device (IoT device). Nowadays, companies are becoming more aware of operational costs associated with a centralized cloud solution and are looking for an economically viable alternative.

One potential solution is to run a neural network directly on the sensor. This may require a more expensive sensor, but it can enable the hardware after the sensor, such as edge devices, edge servers, and the cloud to be more cost effective. Chip manufacturers like STM have released a new type of IMU sensor with this capability, called Intelligent Sensor Processing Units (ISPUs). They can run an AI inference on a MEMS IMU and offer solutions to train and port the neural network to the hardware. Migrating this intelligence to the sensor is a trend in which we as Verhaert see great potential.

NANOEDGE AI STUDIO

ISM330IS

SCOPE OF THE INTERNSHIP

Where do you come into play? During this hands-on internship, you will work with different software solutions, development boards and ecosystems designed for these ISPU and embedded AI applications.
The use case around which this thesis is build is anomaly detection of the motors of a motorized stairlift.

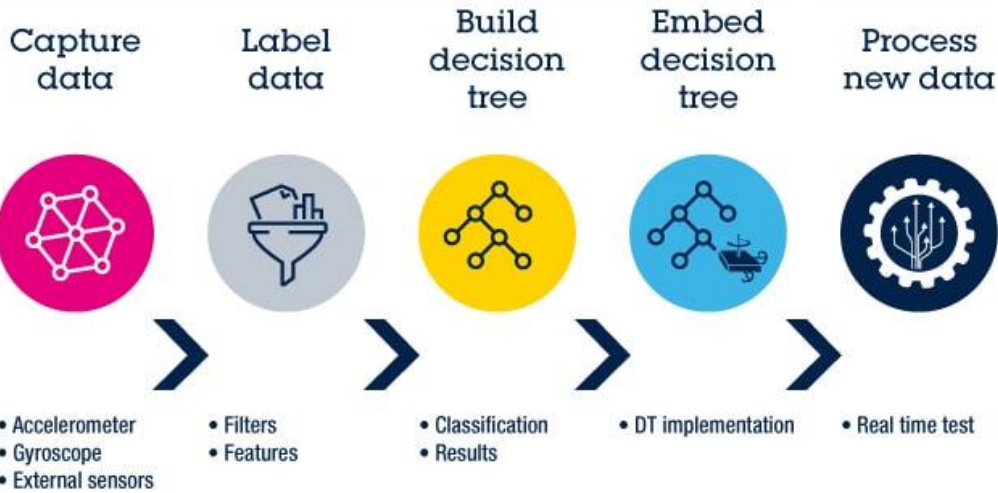You will be able to work (but not limited to) the following technologies:

- STM32's Cube.AI and NanoEdgeAI Studio
- eIQ from NXP
- E-AI from Renesas
- Tensorflow lite
- Other

As internship outcome we expect the following:

- State-of-the-art on embedded AI technologies (hard- and software)
- A trade-off between available solutions (hard- and software)
- Design guidelines and methodology for embedded AI development and integration.
- Demonstration of anomaly detection on a stairlift.

Machine Learning Core configuration → **Operating Mode**

Capture data	Label data	Build decision tree	Embed decision tree	Process new data
• Accelerometer • Gyroscope • External sensors	• Filters • Features	• Classification • Results	• DT implementation	• Real time test

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YOUR PROFILE

- You have a keen interest in AI and embedded applications.
- You are experienced in C or C++.
- You have experience in with microcontrollers and IMU sensors.
- You know the basics of AI development.
- Experience with any embedded AI solutions is a plus.

OUR OFFER

Next to an in-depth experience with several embedded AI solutions, we offer you a view within an inspiring and innovative company, a very pleasant atmosphere and professional coaching.

COACHES

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