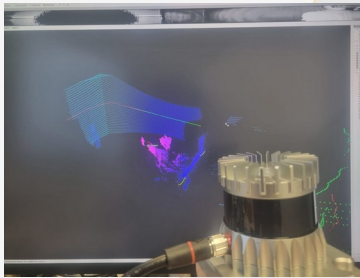


Are you enthusiastic about embedded systems and interested in the world of artificial intelligence? We have an opportunity for you! The Embedded Software Systems group is launching a Master Project Group for the upcoming semester, focused on optimizations of neural networks for embedded systems. Here, as a team, you will work on teaching a state-of-the-art robot with four integrated AI-accelerated microcontrollers and various sensors to behave like a very smart dog, while figuring out the opportunities and limitations of machine learning algorithms operating in resource-constrained devices.



LESSI, our robot dog

Practical Goals and Tasks



LiDAR Ouster OS1 in operation

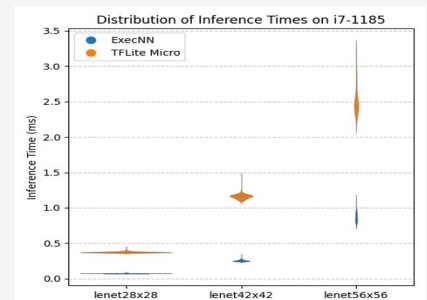
This is a collaborative venture where you will work to integrate multiple sensors (ranging from cameras, microphones, IMU, to even a 3D LiDAR) to execute tasks with the robot. Meanwhile, you will also be encouraged to extract the maximum performance of the available embedded boards, through benchmarking and optimizations, looking into novel methods that seek to accelerate inference times of neural networks without resorting to GPU acceleration.

Scientific Background

You will be able to test novel techniques for neural network acceleration, including our ExecNN approach, a framework based on code generation aiming to achieve unprecedented performance through the use of executable data structures. The group will be able to test this and other techniques for minimizing resource consumption as a scientific goal.

For more details regarding this approach:

<https://ess.cs.uos.de/static/papers/Ferraz-2023-CODAI.pdf>



Comparison between our ExecNN approach and Google's TensorFlow Lite

Your Benefits

Throughout this project, participants will gain experience in hardware-software integration, neural network design, performance optimization, and collaborative project management.

Formalities

Duration	2 Semesters (SS 24 and WS 24/25)
Requirements	Basic programming skills in C/C++; Python
Language	English
Goal	Programming a robot using efficient ML techniques
Grading	Introductory talk; Active participation; Final presentation
Supervisors	Matheus Ferraz, Olaf Spinczyk
Contact	matheus.ferraz@uos.de