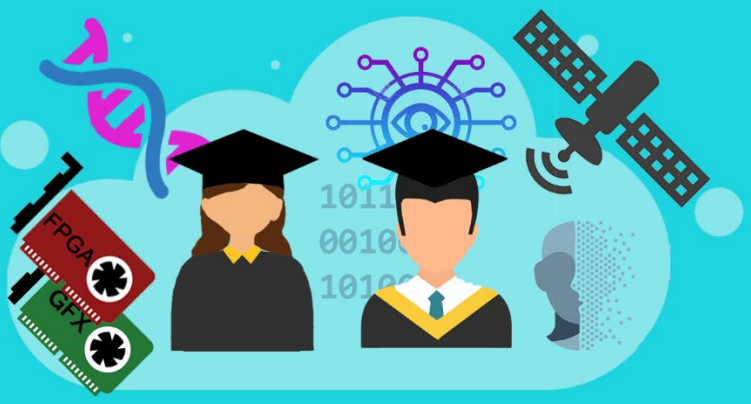
Diploma Thesis

Microproccessors and Digital Systems Laboratory



Distributed model training on Vehicle applications

AI use for vehicle things like tyre, brake motors etc need efficient control and anomaly detection. Wide range of operation and individual usage patterns make on device / edge training important. These small sensors/ actuators data, provide opportunity for better control and maintenance need prediction. However, it might be tricky to update the model properly, as it would need to send all the sensor data to cloud and subsequently to update the model strategy.
An alternative option is the online training. However, the current processing power is significant small and therefore it is not feasible to act meaningfully on a single microcontroller. The latter products have been optimized for their mission profile and AI penetration is still negligible. These resource constraints necessitate to look at alternatives as there are multiple weak microcontrollers which are spread across a car.

Aim of this thesis is to understand and evaluate the collaborative AI model training on such small devices without compromising the mission profile. Strategies to consider are either at start/end or opportunistic cycle stealing. Either way there is no clear framework to test this.
In this thesis the task is to

- Use established communication links i.e. LIN/ CAN / LAN etc to make a network of devices.
- Distributed AI model training for the edge with optimal distribution based on available compute and bandwidth.
- Given heterogeneous compute nodes and asymmetric communication capabilities develop scheduling / partitioning of NN training.
- SW training framework for deployment on distributed compute nodes.

If you are interested, please email:
NTUA supervisors: Prof. Dimitrios Soudris (dsoudris@microlab.ntua.gr)
Dr Assist. Professor Sotirios Xydis (sxydis@microlab.ntua.gr)
Infineon supervisor: Bhatt Vijay Deep (VijayDeep.Bhatt@Infineon.com)
Department, group and team**:** Automotive, Smart Power, Product Development