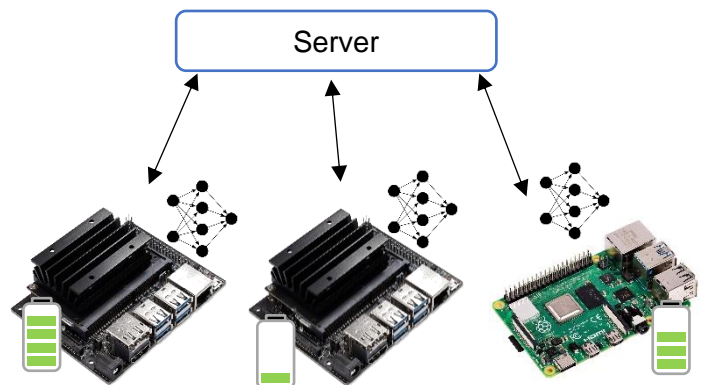


Bachelor/Master Thesis Energy-Efficient Federated Learning

In federated learning, a set of **distributed devices** (e.g., smartphones or sensor nodes) cooperatively learn towards a specific goal. Thereby, each device trains a local **neural network (NN)** with its own locally collected training data. All devices periodically synchronize their knowledge via a server to be able to benefit from each other and jointly achieve a better performance. Embedded devices typically have a **limited available energy**. For instance, smart-phones and many IoT nodes are battery-powered. Consequently, energy-efficient training is essential to reach a high accuracy.

The goal of this thesis is to develop energy-efficient techniques for federated learning. This could be for instance client selection, which needs to determine for each client when it should be active during training. Another option is to investigate the role of dynamic voltage and frequency scaling (DVFS) to optimize the energy consumption of local NN training.

The developed techniques can be evaluated on an existing distributed platform with several embedded devices such as NVIDIA Jetson Nano and Raspberry Pi.



Skills required for the thesis

- Programming skills (Python)
- Background on machine learning
- Experience with ML frameworks such as PyTorch or tensorflow is beneficial but not required

Skills acquired within the thesis

- In depth knowledge of resource-efficient distributed ML
- Technical writing skills
- Work in a research environment

Language

The collaboration with the colleagues can be in English or German.

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