

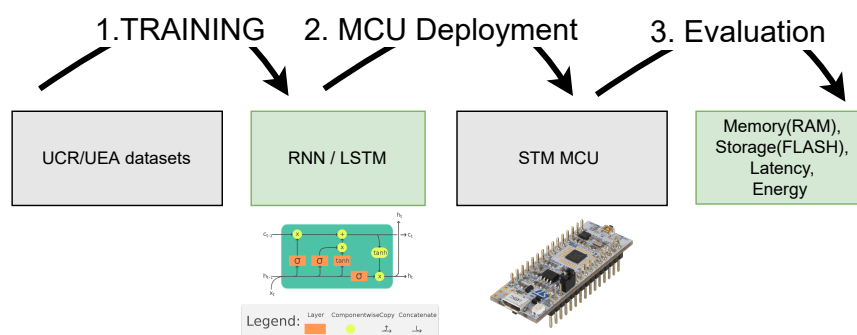
# Bachelor Thesis: RNN-based Time Series Classification on MCUs

The **Christian Doppler Laboratory Embedded Machine Learning** at the *Institute of Computer Technology* does research on Deep Neural Networks (DNN) in resource constrained embedded devices. It studies how energy consumption and resource usage can be minimized while keeping high accuracy. The solution space is characterized by architecture parameters, DNN optimization and transformations, implementation platform configurations, and mapping options. This design space is huge, poorly understood, and it is rapidly evolving.

This work is about comparing the performance of Recurrent Neural Network (RNN) architectures with traditional Convolutional Neural Networks (CNN) used for Time Series Classification on STM Microcontroller (MCU) platforms.

This thesis project consists of the following steps:

- Train a Long-Shortterm Memory (LSTM) architecture on UCR/UEA TSC benchmark datasets.
- Study its accuracy performance compared to state-of-the-art (e.g., InceptionTime [1]).
- Implement and run inference of the trained networks on an STM-MCU platform.
- Measure and evaluate on-device latency, memory and storage occupation based on the inference reports of STM-X-CubeAI.



For details, please consult:

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## References

- [1] Hassan Ismail Fawaz et al. "InceptionTime: Finding AlexNet for time series classification". In: *Data Min. Knowl. Discov.* 34.6 (2020), pp. 1936–1962. DOI: 10.1007/s10618-020-00710-y. URL: <https://doi.org/10.1007/s10618-020-00710-y>.