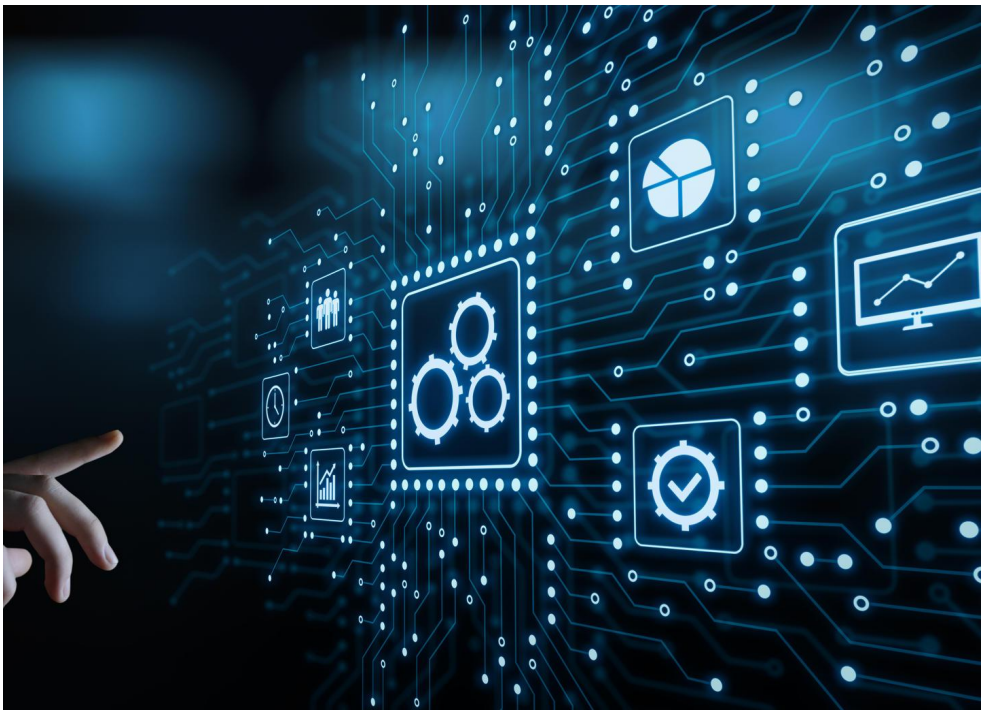

When edge and deep learning unite

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Overview

The idea of the workshop is to introduce the modern AI concepts and techniques related to the deployment of deep learning models (DLM's) on the edge (mist) device - microcontroller STM32 using X-CUBE-AI expansion pack. To present the proposed approach, historical smart home climate data are considered as the input to the deep learning model. An example model is developed using the LSTM architecture.

**Optional. To inference the model, temperature and humidity sensors connected to STM32 microcontroller can be used to obtain data.*

Goals

1. To demonstrate the routine of preparation, configuration and deployment of the STM32 & DLM's conjunction.
2. Show step-by-step development of the DLM for sensory data processing.
3. Get students and DL enthusiasts interested in the fields of edge/mist computing and further perspectives of such research.
4. Teach workshop members to apply and develop applications for solving the real practical problems.

Description of the target workshop audience

Students with the basic or medium knowledge in deep learning and STM32 microcontroller, deep learning enthusiasts, machine learning engineers and computer scientists.

Requirements

Hardware:

1. STM32 (F4 Discovery + USB-UART-TTL converter or H745I-Discovery) microcontroller with the support of X-CUBE-AI expansion pack and USART ST-LINK bridge. If the converter is missing, then VCP will be used.
2. If the model inference on real data is provided, DS-18B20 or DHT-22 sensors have to be available.

Software:

1. STM32CubeIDE.
2. Python3, Jupyter Notebook/PyCharm.
3. Pandas, Numpy, TensorFlow 2.*/Keras, scikit-learn, Matplotlib.

Skills:

1. Deep learning foundations (MLP, LSTM, GRU, CNN).
2. Time series and sensory data foundations.
3. Basic knowledge of STM32 microcontroller (UART, GPIO, information transfer, HAL Library).

Proposed agenda

1. Short introduction to edge computing: problem domain and hardware-software solutions.
2. Deep learning for STM32: sequence data modeling using a simple LSTM model.
3. Data preparation and normalization pipeline.
4. Model development using Keras lib. LSTM intuition.
5. Introduction to X-CUBE-AI.
6. Model conversion, import and deployment on STM32.
7. Inference phase.
8. Conclusions.

Approx. duration:

2.5-**3** hours.