Machine Learning for Embedded Systems

Home assignment 3

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GitLab repository: gitlab.cs.ttu.ee/onsche/ias0360

For this home assignment I have used model from my home assignment 2, where I have focused on model weight optimization. I have followed the steps of the 8th lab from our course in order to convert the tflite version of the model into C code and then run it on the STM32 board.

After successful import of the tflite model I have also tried to optimize the model to improve the predictions. In the end I have used model with architecture shown below in Figure 1.

```
model = tf.keras.models.Sequential()
model.add(tf.keras.layers.Conv2D(3, kernel_size=(3, 3), activation='relu', input_shape=(28, 28, 1)))
model.add(tf.keras.layers.MaxPooling2D((2, 2)))
model.add(tf.keras.layers.Flatten())
model.add(tf.keras.layers.Dense(80, activation='elu'))
model.add(tf.keras.layers.Dense(60, activation='elu'))
model.add(tf.keras.layers.Dropout(0.2))
model.add(tf.keras.layers.Dense(10))
```

Figure 1 - final model architecture

After converting the model into C code using the CubeMX software I tried drawing numbers on the board in order to test the functionality. The board was able to recognize most of my hand-written numbers. I have included pictures with some of them below.

Issues

During my work I have encountered many issues. Most of my issues were related to conversion of the model into C code using the CubeMX software. I was running into various errors and was having hard time compiling the project, but I was eventually able to succeed.

Predictions of my model are not perfect and there is still some room for improvement. For example, the board is not able to recognize number 3, but overall I think I was able to fulfill the assignment successfully.