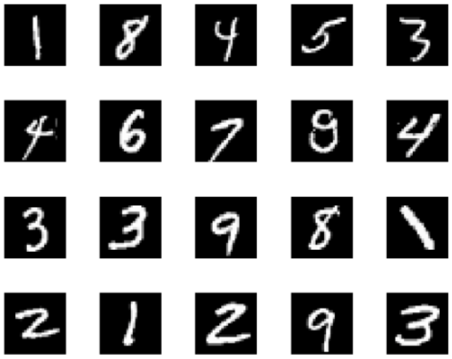
MIW (eng) - mini-project 6 (06.05.20)

Convolutional Neural Networks with Keras: classification of handwritten digits



0. **(optional) Setup**
    a. You can use 6_CNN_template.py to fill out necessary sections. It is up to you.
    b. Google Colab notebooks have Keras installed.
    c. If you are coding locally on your computer, install Keras with *pip install keras*
    d. But remember, the code should be submitted as a Google Colab notebook.

1. **Get and prepare data**
    a. Load MNIST dataset of handwritten digits from keras with train/test split
    b. Reshape to fit CNN's dimensions to fit CNN's input shape
    c. Convert labels to a binary class matrix

2. **Build, train and test:**
    a. Build a model according to this structure:

        i. *Sequential*
        ii. *Convolutional 2D*: 32 filters, kernel size 3 by 3, RELU, input shape as (height, width, number of channels for greyscale)
        iii. *Convolutional 2D*: 64 filters, kernel size 3 by 3, RELU activation

    iv. *MaxPooling2D*: pool size 2 by 2
    v. *Dropout*: rate 25%
    vi. *Flatten*
    vii. *Dense*: 128 units, RELU activation
    viii. *Dropuout*: rate 50%
    ix. *Dense*: 10 units, softmax activation

b. Fit the training data in the model. 3 epochs.
c. Evaluate the model on the test dataset.
d. Make predictions on the test dataset (20 elements is enough).
e. Print out the score.
f. Show model's summary.

Submission:

1. Send a link to your notebook on https://colab.research.google.com/ to my email ihalych@pja.edu.pl.
2. DON'T erase your outputs in the notebook, I should see them.

Deadline rules:

1. By midnight 6.05.20 - max amount of points is 10
2. By midnight 13.05.20 - max amount of points is 10
3. By midnight 20.05.20 - max amount of points is 5
4. Later - 0 points

Resources:

0. Installing Keras
   https://keras.io/#installation
1. Sequential model
   https://keras.io/getting-started/sequential-model-guide/
2. Load MNIST dataset and split
   https://keras.io/datasets/#mnist-database-of-handwritten-digits
3. Labels to binary class matrix
   https://keras.io/utils/#to_categorical
4. Convolutional 2D layer
   https://keras.io/layers/convolutional/#conv2d
5. MaxPooling2D
   https://keras.io/layers/pooling/#maxpooling2d
6. Dropout
   https://keras.io/layers/core/#dropout
7. Flatten
   https://keras.io/layers/core/#flatten
8. Dense layer

https://keras.io/layers/core/#dense

9. Loses

   https://keras.io/losses/

10. Optimizers

    https://keras.io/optimizers/

11. Metrics

    https://keras.io/metrics/#available-metrics

12. Fitting data

    https://keras.io/models/model/#fit

13. Compiling a model

    https://keras.io/models/model/#compile

14. Model's summary and more

    https://keras.io/models/about-keras-models/