Solution for Project #2
Deep Learning, HHU 2016 / 2017

Thomas Germer   **Michael Janschek**   **Patrick Brzoska**

1   Code and Architecture

The code is provided as GitHub repository and is available under

```
https://github.com/99991/DeepLearningProjects/tree/master/projects
```

To test various neural network configurations, run

```
https://github.com/99991/DeepLearningProjects/blob/master/projects/test/
test_runner.py
```

2 Tasks

1. CNN on CIFAR-10

   (a) To accommodate the higher complexity of the CIFAR-10 dataset we chose to train a relatively deep CNN compared to our first project. Also, with the number of batches at 10000 and each batch having 64 samples, the training time was increased.
   The leaky Rectified Linear Unit (ReLU) activation function was used to counter the "dying ReLU" problem. Instead of the function being zero when $x < 0$, it is set to a small negative value of $0.01 * x$.

   (b) With the deeper CNN and larger training time a success rate of about 85% was reached, and while this is still far from optimal, it was the best we could do with our limited computational resources.

   (c) compute...

   (d) Some papers, like [...] suggest using average pooling, max pooling has worked better within our network, [WERT].

   (e) Frage:[gehoert per image standardization hier her? Z118]
   Using random cropping as a way to increase the data size has not lead to any significant improvement [WERT]. Random brightness and saturation has not yielded any success, although this has helped within other implementations, i.e. the Wide Residual Netwokrs used by Zagoruyko and Komodakis [Quelle].

   (f) better with Dropout: No. [WERT]

   (g) Tensorboard.

2. Recurrent Neural Network

   (a) a

   (b) A Long short-term memory (LSTM) cell is recurrent network unit, which can remember values for either long or shirt durations of time. It achieves this by omitting the activation function wich would otherwise reduce the value over time,

   (c) c.

   (d) d.

   (e) e.

   (f) f.