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# Programming Project: Convolutional Neural Network

## Project Definition

Work in groups of 2 or 3 students. Exceptions have to be arranged with the instructor.

Play with the [CIFAR10](https://github.com/fchollet/keras/blob/master/examples/cifar10_cnn.py)<sup>1</sup> example of [Keras](https://keras.io/)<sup>2</sup>:

1. Run the original example.
2. By altering the network structure, parameters, initialization, training procedure, etc., try to achieve better results than the original example.
3. Report on your findings.

Study at least twice as many aspects as there are people in your group. For example, a two-person group might examine the influence of (1) the number of conv-relu layer pairs, (2) dropout layers, (3) pooling parameters, and (4) minibatch size.

## Hints

- It may prove difficult to achieve better results than the original example. Do not worry; it is not your quantitative results that will be graded but your insights into the influence of the parameters you investigate.
- Use an NVIDIA GPU if you can.
- Use an optimized BLAS library.<sup>3</sup>
- If you cannot speed up computations to a level you can reasonably work with, reduce the number of epochs. Also, you may reduce the demands of the task, e.g. by working with only, say, 3 instead of 10 classes, working with smaller training and/or test sets, etc.

Carefully document in which ways you alter the standard CIFAR10 task.

## Submission

Prepare a report of a few pages with the following content:

- Give the names of all members of the group. If the members' contributions differ substantially, explain their respective contributions.
- Discuss any algorithmic choices you made. Explain any deviations from the methods discussed in class.
- Give illustrations, numbers and results as described above.
- Discuss your results and any interesting insights and observations.

One member of the group should submit the report in PDF format as well as the complete source code as indicated on the course Web page.

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<sup>1</sup> [https://github.com/fchollet/keras/blob/master/examples/cifar10\\_cnn.py](https://github.com/fchollet/keras/blob/master/examples/cifar10_cnn.py)

<sup>2</sup> <https://keras.io/>

<sup>3</sup> On my laptop (without NVIDIA GPU), replacing my standard BLAS library by OpenBLAS resulted in an overall speedup of almost 10.

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