Deep Learning - Cats & Dogs - Project description

Thursday 8-10-2020

In this assignment you will be taking a look at images of cats and dogs. Your task is to classify these images into either cats or dogs.

When to submit

You will have to submit your code, visualization, and your trained model file (your .h5 file) before Sunday 15th of November at 23:59.

What to submit

The hand-in must consist of your code, well commented to explain your reasoning, as well as clearly marking which group member was responsible for which

part. At the top of your code, please write the full names of the group members. It must also include your visualization. To participate in the competition, you must share your model using NextCloud. Simply log in with your SDU account and share your model with *boegebjerg@imada.sdu.dk*.

REMEMBER - use *model.save*() and NOT *model.save_weights*()

How to submit

Send your code and your visualization to *boegebjerg@imada.sdu.dk*. To participate in the competition, share your model file with *boegebjerg@imada.sdu.dk* using https://nextcloud.sdu.dk/. Remember to show clearly in your code how you got your final saved model.

Competition

To spice things up and motivate you to explore the possibilities of neural networks, we will also host a competition. The team producing the best network (i.e., the network producing the best accuracy) will win a Raspberry Pi. The best network will be evaluated based on our own dataset. Please follow the rules and only utilize networks which have been built and trained according to the rules (for instance, do not use pre-trained networks, only use the training data provided, etc.). Hint: An accuracy well above 90% is possible when the architecture is well designed and trained. For the competition, the target size will be 150, 150, and the image will be rescaled to be between 0-1.

Notes

You can work in groups of up to 5 people. Only one hand-in is needed per group, meaning only ONE submission per group.

As training your networks can take a long time, remember to start early on this assignment! Please read through the entire project description and feel free to send any questions you might have about the tasks to
Mathias: boegebjerg@imada.sdu.dk
or
Juan: jfmv@esoft.com.

You are **not** allowed to use the predefined networks in *keras.applications*. You are however allowed to use any code developed for the exercise classes.

To pass this project you must do the following: - You have created a neural network - You trained it with data generators using at least one on-the-fly augmentation method - You can provide an estimation of the generalization error - You have commented your code and justify the decisions you made - You have done some kind of visualization - You hand in the code and visualization via email in time.

If you think you cannot pass this project, please hand in what you have anyway.

There will be Q&A on Friday the 30th of October from 8-10 am and Friday the 6th of November from 8-10. If you have any questions about the project, or you are stuck on some part, you can send an email to
Mathias: *boegebjerg@imada.sdu.dk*
or
Juan: jfmv@esoft.com

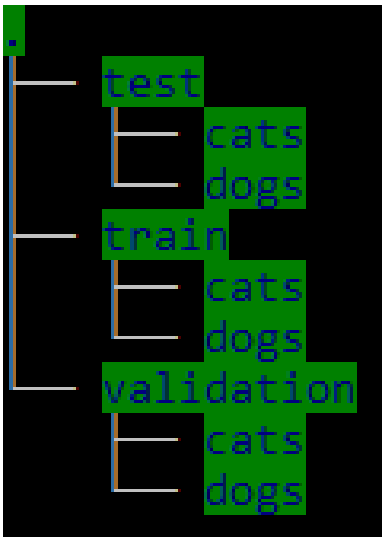

Figure 1: The structure of the dataset.

Tasks

Task 1 - Dataset

The dataset consists of 3000 images of cats and dogs, 1500 images of each. You will need to organize these images into a training set, a validation set, and a testing set. To do this, create three folders, *train*, *validation*, and *test*. Inside these folders you will have to create a folder for each class, so a folder named *cats* and a folder named *dogs*. See Figure 1.

You can decide for yourself how you want to split up the dataset into training, validation, and testing.

Task 2 - Creating the datagenerators

As we have a decently large amount of data, you must use datagenerators to load the images. You can find the documentation here HERE. Using the *ImageDataGenerator* class, you must apply some data augmentation. What kind of data augmentation you want to apply is up to you. For this task you will have to look through the different kinds of data augmentation that are available in Keras. You will have to consider whether this augmentation will be good for your case or not.

Task 3 - Constructing the network

Now that all the generators are made, it is time to make your network and train it. The architecture that you use is up to you. Think about what kinds of architectures are typically used for images. You are more than welcome to look up papers if you want, and try to replicate some of their findings.

This is your time to shine, so play around with a few different models, and try to find the model that gives you the best accuracy. Remember that there is a competition about who has the highest accuracy. You are not allowed to use any training data that isn't included in this project.

Remember that you are not allowed to access any objects from the *keras.applications* package.

Task 4 - Visualizing your results

For this final task, you must visualize your model in some way. It can be a graph of the training / validation performance, it could be visualizations of your filters, activation maps, etc. Save your visualization as a file and remember to include it in your hand-in.