Machine Learning for Agricultural Applications

Assignment 6

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Task 1 – EuroSAT dataset RGB [40 points]

In this exercise you will work with the EuroSAT dataset.[1] The EuroSAT dataset is based on Sentinel-2 satellite images covering 13 spectral bands and consisting of 10 classes with 27 000 labeled and geo-referenced samples. Two datasets are available. **RGB** contains only the frequency bands corresponding to red, green, and blue channels encoded as JPEG images. **All** contains all 13 frequency bands available in the original satellite images. The class labels are: *AnnualCrop, Forest, HerbaceousVegetation, Highway, Industrial, Pasture, PermanentCrop, Residential, River* and *SeaLake*.

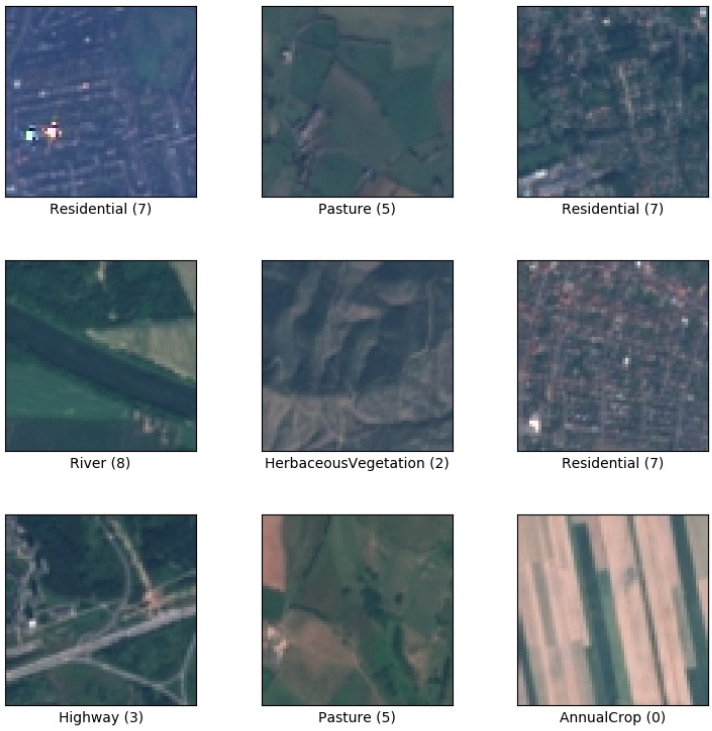

Figure 1: Some samples of the EuroSAT dataset.

It is recommended to implement this exercise in Colab or a similar cloud computing service, so you have access to a powerful GPU for training the model.

[1] *EuroSAT: A Novel Dataset and Deep Learning Benchmark for Land Use and Land Cover Classification*, Patrick Helber, Benjamin Bischke, Andreas Dengel and Damian Borth (2017), arXiv:1709.00029

The EuroSAT dataset is already included in tensorflow-datasets: `https://www.tensorflow.org/datasets/overview`. To use datasets from tensorflow-datasets, you need to install them (`pip install tensorflow-datasets`).

a) Find out how to load the **RGB**-dataset (`www.tensorflow.org/datasets/overview`).

b) Split the overall data set into training and test data sets, using a random sample of 20% for testing and the remaining instances for training, see instructions at https://www.tensorflow.org/datasets/splits.

c) Plot some examples from the training data together with their labels.

d) Use the Keras Sequential API to construct a CNN consisting of several convolution layers, pooling layers and dense layers.

e) Train the model and plot the training and test accuracy of the model during different stages of training.

Task 2 – EuroSAT dataset ALL [10 points]

Now adapt your script for the application on the EuroSAT **ALL** dataset, containing 13 bands in the original value range. The EuroSAT **ALL** dataset is also included in tensorflow-datasets (RGB is the default dataset). Can you get higher accuracy than for the RGB dataset?