DEEP LEARNING FOR VISUAL COMPUTING

Report 1st Assignment:

**Group 4:**

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**What is image classification:**

M. K.:

Image classification is a process of assigning images to different classes (labelling) based on information extracted from these images. For this task one of the Machine Learning algorithms could be used, where classification is based on the information extracted from a set of images used in a training process.

“””In image classification an ML algorithm learns to predict the class of unseen samples based on extracted information and assigns a class value called label. In classification the number of class label values is finite and discrete.”””

**What is the purpose of the training, validation and test sets and why do we need all of them?**

M.K.:

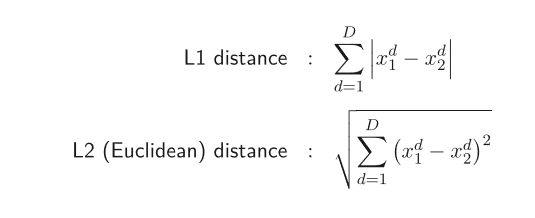
The training set is used to train a classifier, that means to teach a classifier how to perform classification. Validation set is used to estimate the performance of a classifier during the training process and test set to estimate final performance of the classifier (after training).

Effectiveness of the classifier is based on the ability of predicting a label for unseen data. According to that, observations present in the training set, should not be present in validation or test sets. 🡨 A bit incomprehensive. Not following these rules could lead to overfitting.

“””The training set is used for classifier training. Hyperparameters are tested and selected using a validation set. Test set is used for the final estimate of performance. Accuracy of a classifier is based on the ability of predicting labels for UNSEEN data. Thus, observations present in the training set, must not be included in the validation or test set. The performance estimate is not valid, if the test set is used during training or validation.. Not following these rules leads to overfitting. “””

**How do knn classifiers work?**

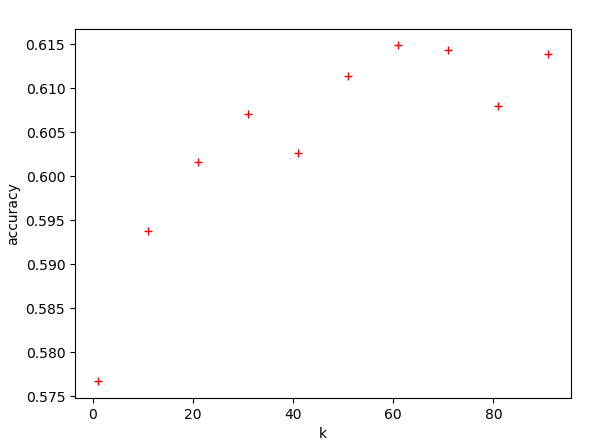
The knn classifier computes the distance between a sample and its k closest neighbours. To identify the k closest neighbours of one sample x, the distance (either L1 or L2) to all other samples has to be calculated. As a distance measure either L1 or L2 (Euclidian) can be used. The distance is computed over all dimensions.



Then the classifier looks at the label of the k nearest neighbours and assigns the most frequent label to sample x. [If one wants to know how certain the classifier is,] (it is not really clear I guess we do not need that?) the frequency of each class label can be calculated among the k closest samples. Additionally, the largest value could be emphasized using the softmax function.

**Results**

In the following plot the validation accuracies for different k-values can be seen:



Best accuracy using validation set is: **0.6148946594806467** for k = **61**.

Accuracy using test set is: **0.6175** using best k of validation set.

**Conclusions**

M.K.:

As we see . 🡨 I don’t understand what you mean .We assume with a highprobability, that we could generalize th these results for the whole population of observations.

The value of the accuracy indicates that we could not strongly rely on the results of this classifier. It analyses the values of colour channels for each pixel without analysing relations between those pixels. We could assume with high probability that for classification background colour has a higher impact than features allowing recogn recognition of an animal on the picture 🡨 don`t understand what you mean here

The performance could be probably improved, but the gap between actual and expected results is too big to use that solution for reliable image classification.

“””The knn classifier performs poorly, because it is based on average image similarity. As feature vectors we use all pixels of an image. Thus the classifier has no understanding of the image. Dimension is large and input space is sparsely occupied, which is why distance measures become unintuitive. The solution here is the extraction of discriminative features such as background intensity or gradients “””