Cell Detector and Classifier

In this project, two neuronal networks were used to solve an image detection problem. Networks were build with help of the python bibliotheca Keras and NumPy.

Background: Under lab conditions, biological cells and cell clusters can be easily stimulated via mechanical stretch. During that, occurring processes are highly relevant (e. g. for the highly dynamic cardiomyocytes or the cells of the lung) and can provide information about inter- and intracellular signaling pathways.

In Springer et al., cells of the epidermis (keratinocytes) were stimulated via cyclic stretch. See *Springer et al.* (2019) PLOS ONE 14(3): e0210570. https://doi.org/10.1371/journal.pone.0210570

Aim of this project: After staining of stretch-relevant protein structures, detection of the tiny changes in the protein confirmation are very challenging. Here, single keratinocytes on microscopy images are detected, and changes of the actin cytoskeleton classified via self-learning algorithms. In a further step finding correlation within the multi-channel images, e. g. with vimentin, is of high interest too.
Data: used images are from the repository of *Springer et al.*, see https://idr.openmicroscopy.org/webclient/?show=project-505

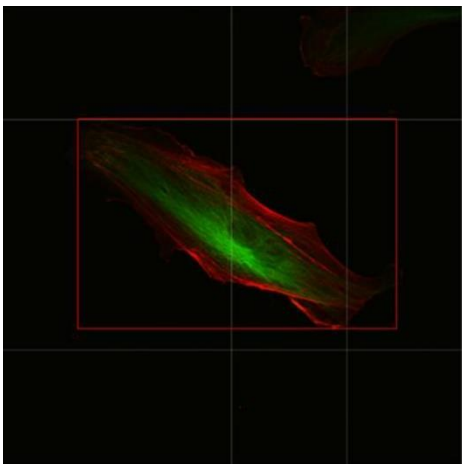

Fig. 1: Fluorescence image of a keratinocyte (actin in red, vimentin in green) with a bounding box. Image from *Springer et al.* (2019) PLOS ONE 14(3): e0210570.

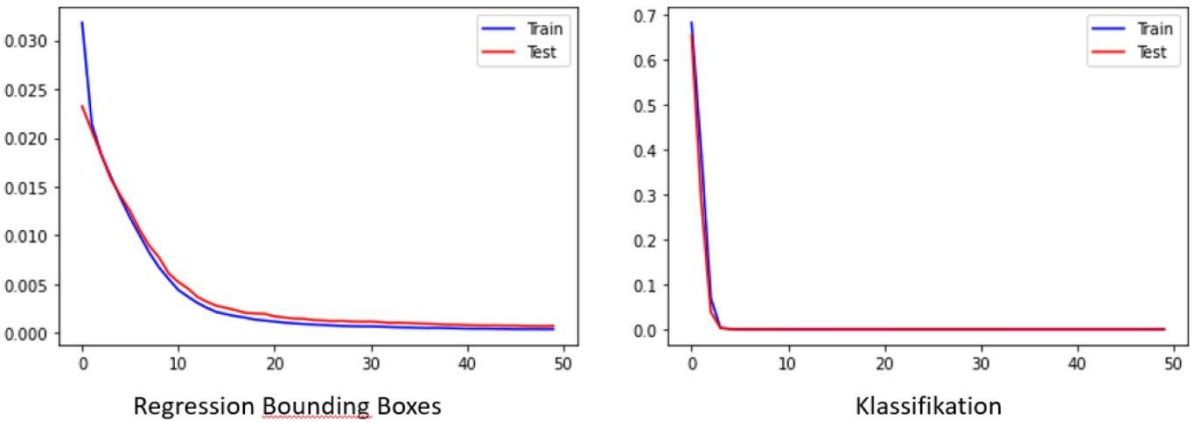

Fig. 2: Loss-functions of the training/testing during regression of the bounding boxes (*left*) and classification of cells (*right*).