Image recognition techniques on digital images of colon and stomach biopsies

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By using Machine Learning (ML) techniques it is possible to recognize patterns in digital images and to classify these images based on their contents with high accuracy. Pattern recognition is one of the main parameters used by pathologists in the analysis of biopsy material. We therefore focused our study on pattern recognition and not on object (cell) detection/classification.

The aim of our study is to build and train one algorithm which will pre-analyse digital images of different

types of intestinal mucosa.

Digital images from gastric (51) and colon (92) mucosal biopsies were labeled normal or abnormal. Images of gastric biopsies were labeled as abnormal when following histological features were present: increased number of inflammatory cells, interstitial oedema and differentiation abnormalities of the epithelial lining. Images of colon

biopsies were labeled as abnormal when distortion of the glands, villous structures, differentiation abnormalities of the epithelial lining, increased number of inflammatory cells were found. All images showing no abnormalities were labeled as normal.

With these data sets we trained different machine learning algorithms to classify the digital images. The

best performing algorithm, a support vector machine classifier, achieved an accuracy of 94% on colon

images and 75% on gastric images.

This pilot study illustrates the possibility to train an algorithm on a limited data set so that it classifies with acceptable accuracy. If the algorithm proves to be as successful on full scanned biopsies it will be helpful as a pre-analysis tool in daily histopathological workload.

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