

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 content 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-analyze digital images of different types of intestinal mucosa. Digital images from gastric 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 edema 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.

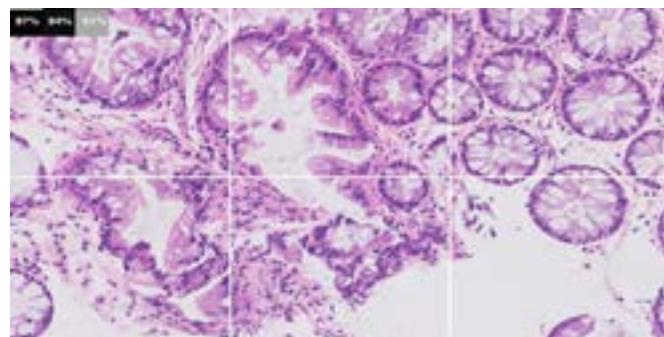


Figure 1: Digital image of colon mucosa, representing classification predictions made by algorithm

Table 3: Results SVM with ResNet features

	recall	precision	support
colon abnormal	99%	95%	96
colon normal	81%	95%	22

Figure 2: Results SVM with ResNet features

Biography

Pascale De Paepe has completed her MD at the KU Leuven, and became certified anatomical pathologist at the UZ Gent where she has completed her PhD degree. She published 27 papers in peer reviewed journals. She is a staff member in the Department Of Pathological Anatomy at AZ Sint Jans Brugge. In 2015, this Pathology department was equipped with an installation allowing full digital histopathology diagnosis. The AZ Sint Jan's project Digital pathology-The end of the microscope won the Agoria e-Health award in 2017 for best innovation project (patient care), patient response or medical practice support.

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