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Big Data, decision tree induction, and image analysis for the discovery of decision rules for colon examination

The aim of our research was to develop a method that allows us automatically to discover the decision rules for diagnosing images in normal and abnormal images. We used a dataset of images that came from an endoscopic video system used for colon examination. The data set contains 283 normal tissue images and 61 polyp images. One must decide if the image shows a polyp or not. This is a two class problem. The unequal number of the data in the two classes makes our problem to an unbalanced data set problem. The polyps in the images were identified and selected by a “well-trained” medical expert. The 283 normal images consist of dark regions and reflection. We describe the images by our novel random set texture descriptor. The resulting data set was used to train a decision tree with our tool “Decision Master”. For the full unequally distributed data set we achieved an error rate of 9.88% based on cross-validation. We achieved an error rate of 1.67% when we created a data set with equally distributed data in each class. The results show that decision tree induction based on “Decision Master” and image analysis based on our novel texture descriptor is an excellent method to mine images for the decision rules even when the data set is unbalanced. Our texture descriptor gives a flexible way to describe the appearance of the medical objects. The accuracy of the derived rules can be improved when the data set is made equally distributed.

Biography

Petra Perner is the director of the Institute of Computer Vision and Applied Computer Sciences IBal. She received her Diploma degree in electrical engineering and her PhD degree in computer science for the work on “Data Reduction Methods for Industrial Robots with Direct Teach-in-Programming”. Her habilitation thesis was about “A Methodology for the Development of Knowledge-Based Image-Interpretation Systems”. She has been the principal investigator of various national and international research projects. Her research interest is image/signal analysis and interpretation, machine learning, data mining, big data, machine learning, image mining and case-based reasoning.

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