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Classification and Image Segmentation of Pollen Grains

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Abstract

This thesis presents an automated approach for the classification of Swedish pollen grains. The research aims to enhance the accuracy of pollen classification while automating the process of identifying pollen. The proposed methodology involves pre-processing, segmentation using clustering, and a convolutional neural network, classifying eight different pollen types. In the pre-processing phase methods are compared to find the best method of reducing dirt and other noise found in the microscopic images of the pollen preparations. The segmentation of individual pollen grains is done using the k-means clustering algorithm, which performance extraction and identification of pollen grains compared to the watershed method in terms of computational efficiency. For pollen classification, six convolutional neural networks were trained their performance were compared using loss and accuracy. The models were trained using RGB and grey versions of 3 sets of images of the same segmented pollen grains. Results showed using a mixture of images was the most accurate and achieved even higher accuracy when using the maximum softmax probability over multiple image depths to predict pollen type. To achieve full automation for pollen classification wider sets of data with more variation is needed for the convolutional neural networks along with further research into segmentation of pollen.

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