

Automated multifocus pollen detection using deep learning (2024)

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Autores: Ramón Gallardo, Carlos J. García-Orellana, Horacio M. González-Velasco, Antonio García-Manso, Rafael Tormo-Molina, Miguel Macías-Macías, Eugenio Abengózar

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Abstract:

Pollen-induced allergies affect a significant part of the population in developed countries. Current palynological analysis in Europe is a slow and laborious process which provides pollen information in a weekly-cycle basis. In this paper, we describe a system that allows to locate and classify, in a single step, the pollen grains present in standard glass microscope slides. Besides, processing the samples in the z-axis allows us to increase the probability of detecting grains compared to solutions based on one image per sample. Our system has been trained to recognise 11 pollen types, achieving 97.6 % success rate locating grains, of which 96.3 % are also correctly identified (0.956 macro "F1 score), and with a 2.4 % grains lost. Our results indicate that deep learning provides a robust framework to address automated identification of various pollen types, facilitating their daily measurement.

Keywords: Bright-field microscopy, Pollen recognition, Deep learning, Multifocus microscopy, Airborne pollen