Automatic species detection and classification in palynological slides using deep learning: A test case from the Jurassic in the Norwegian North Sea'

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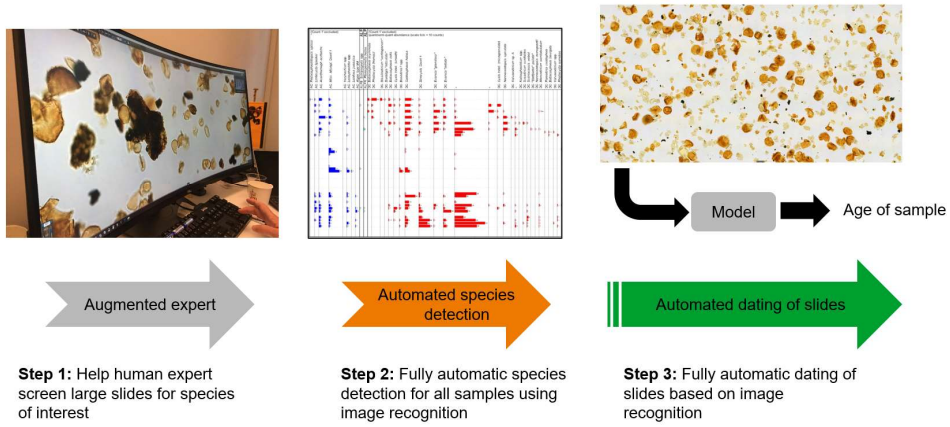
Abstract

The utilisation of Artificial Intelligence (AI) in species identification has the potential for helping palynologists in terms of saving time and aiding interpretation as well as providing a means for knowledge capture within the discipline.



A feasibility project testing AI dinocyst identification has been undertaken on 4 fossil dinoflagellate cyst species from the Jurassic of the Norwegian North Sea.

Utilising the NPD's scanned library of palynological slides, training datasets were built for *Rigaudella aemula*, *Surculospaheridium vestitum*, *Sirmiodinium grossii* and *Tenua compta*. The training dataset built for each species aimed to replicate how these species may appear in normal 'every day' palynological slides. This included fragments and partially obscured specimens as well as specimens exhibiting both good and poor preservation replicating typical preservation in the North Sea.

The accuracy of the automatic identification was evaluated using blind tests. A high proportion of dinocysts were successfully identified, with an average species F-score of 0.88. We will present the training data, the results and learnings from our feasibility project, as well as challenges we expect in scaling such biostratigraphic AI projects to include more species.

In order to 'automate' palynostratigraphy, we may ultimately require training sets for thousands of species and input would be needed from a wide variety of experts. Given the scale of such a project, we suggest that discipline-wide collaboration across academia and industry would be the optimal process for expanding such an approach.