

Thesis project – RISE Testbed for Wood and Fibre Properties: Deep Learning Models for Segmenting Microscopy Images of Wood

RISE testbed for Wood and Fibre Properties combines several techniques and instruments to analyze the physical and chemical properties of wood samples. The testbed has been running for almost 20 years and has collected large amounts of data.

More info about the testbed: <https://www.ri.se/en/what-we-do/test-demo/testbed-for-wood-and-fibre-properties>

The thesis project:

During 2023, we have been working on new deep learning models that can segment cell like structures in microscopy images of spruce wood. This model has proved that AI has great potential for analyzing our microscopy images; however, we believe it is possible to create even better models with higher accuracy.

We propose a thesis project where the student(s) will try to develop **deep learning models for segmenting microscopy images of wood**. The thesis projects could include some of the following:

1. Identify, train, and evaluate new AI-based model(s) with higher accuracy than our previously developed models;
2. Develop other AI-based model(s) or tools that can improve the quality of historical and new microscopy images by:
 - a. Detecting pith and bark;
 - b. Identifying dirt and other features that disturb our existing analysis;
 - c. Improve the quality/resolution of the images;
 - d. Detect images that deviate too much to remove outlier samples from the data set.
 - e. Other.

The data:

The data available for the project consists of more than 300,000 microscopy images corresponding to 6800 samples from Swedish trees. For the thesis project, not all data may be needed.

The student(s):

Who: One or two students interested in AI/ML/DL, programming (preferably Python), and data analysis. No previous knowledge of wood science is needed. The language for the project may be in either English or Swedish.

Where: To get to know the testbed and project, it might be necessary to visit the testbed in Stockholm occasionally. It might be possible to provide a working space at RISE in Kista.

When: 2023/2024

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