

MWP – Young Researcher Abstract 2025

Project title: Automated Quantification of Resin Canals in Norway Spruce Using Deep Learning and SilviScan Microscopy	
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<p>Abstract (approx. 200 words):</p> <p>By analyzing annual rings in trees, we can both understand the past and prepare for the future. In this project, we developed and applied a deep learning method to quantify resin canals in annual rings of Norway spruce (<i>Picea abies</i>). The method uses high-resolution microscopy images from the SilviScan system at the RISE Wood and Fibre Testbed. The dataset for the project consists of images from 7,081 increment core samples containing 120,801 annual rings collected in previous Swedish field trials representing one of the largest studies of its kind.</p> <p>To develop the custom model for resin canals, a pretrained StarDist2D model was retrained using 745 manually annotated microscopy images containing 1771 resin canals. The model accuracy was validated on 145 randomly selected annual rings, achieving an R^2 of 0.77.</p> <p>This method enables large-scale, ring-level analysis of resin canals, which is important when studying tree defense, wound response, and environmental stress. The resulting dataset can support future research in forest genetics, climate adaptation, and tree breeding. The work was carried out as a part of the Bio4Energy programme with samples and data from previous research projects together with Skogforsk, SLU, UPSC, and Uppsala University.</p>	
Key words: Resin canals, Norway spruce, SilviScan, Microscopy, Annual rings, Deep learning	