

LABORATORY OF WOOD TECHNOLOGY (UGENT-WOODLAB)

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# SMARTWOOD ID: SMART CLASSIFICATION OF CONGOLESE TIMBERS – ON THE WHY AND HOW OF DIGITIZING WOOD COLLECTIONS

## Why digitizing wood collections?

### The problem of illegal logging

A substantial part of the timber traded each year has been logged illegally and thereby involves a high risk of causing irreversible damage to forests since it often involves overexploitation of highly sought after, sometimes protected, species. Timber regulations are already active (CITES, FLEGT, EUTR), but implementation and enforcement are a challenge.

### What do we need to combat it?

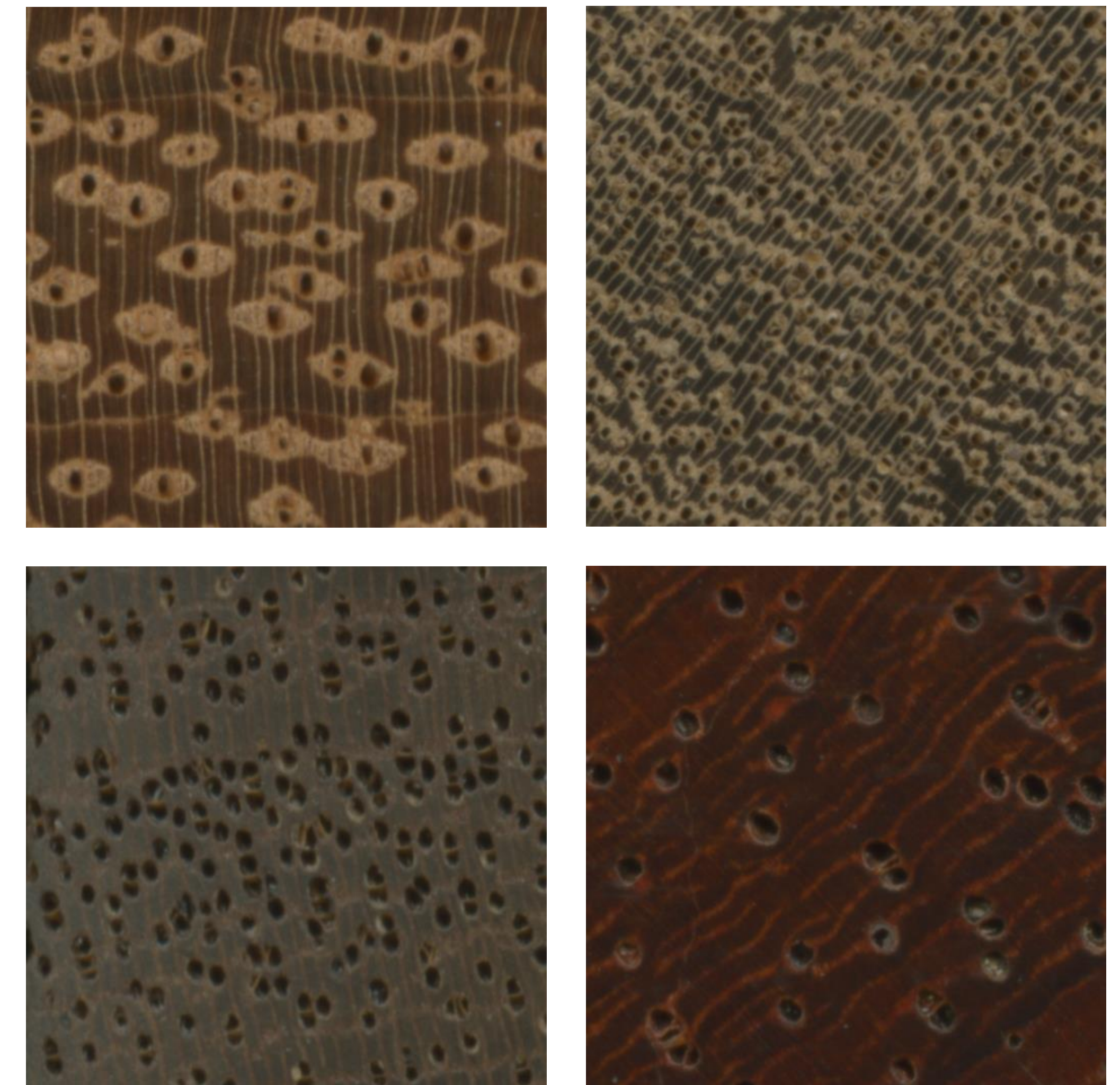
Wood identification is crucial in the enforcement process when it comes to verify whether the shipment corresponds with the products mentioned on the accompanying documents. For this reason, there is a growing demand for timber identification tools that can be applied by law enforcement officers.

### Large databases are the bottleneck

To build an accurate identification tool, a database with typical species features and sufficient detail is needed, including visual and/or textual information on multiple specimens to consider biological variation. Online databases, such as InsideWood provide macroscopic anatomical descriptions of wood, but they may not cover all intra-specific variability of anatomical features that can occur in wood. It is the limited availability of such databases, that cover the variability of wood anatomical features, which is the main obstacle currently faced when building timber identification tools.

### SmartWood ID

SmartWood ID aims to create such a reference database to stimulate research on wood identification and to aid in the development of timber identification tools.



Four typical images (0,5x0,5 cm) of the cross-section of *Afzelia* spp., *Pericopsis*, spp., *Khaya* spp. and *Pterocarpus* spp. Taken with a flatbed scanner at high resolution (2400 dpi)

## How to digitize wood collections?

### Digitizing Wood Collections

SmartWood ID uses specimens of the Tervuren Wood Collection to create a database with high-resolution scans of the endgrain surface of 1190 Congolese species, along with expert wood anatomical descriptions. The database describes the inter- and intraspecies variability of macroscopic diagnostic anatomical features. The resulting database therefore gives a good general overview on the wood anatomical features for different timbers, which makes it a valuable source of information to produce illustrated keys for wood identification in the field.

### Development of methods for digitizing large Wood Collections

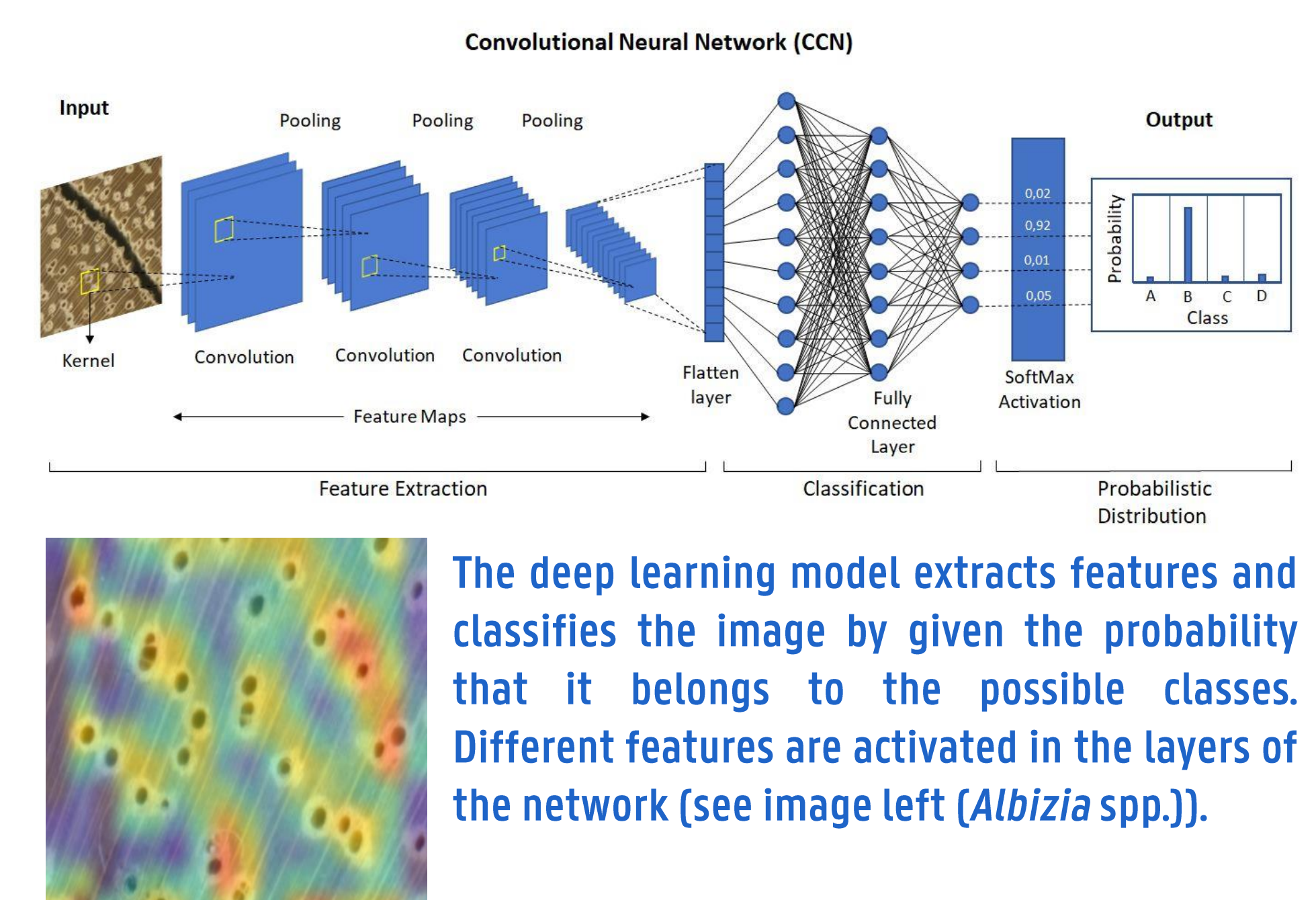
Digitizing a wood collection can be challenging depending on the type of digital material needed. Wood anatomical assessment is a commonly used and cost-effective method for wood identification, involving observation of tissues and cells for diagnostic features. Visualizing these features aids research in wood identification. Methods such as cutting thin sections with a knife or microtome are time-consuming. Sanding with finer grains of sandpaper is another option but can be labor-intensive for large databases. A promising new approach uses a robotic arm to sand large batches of specimens with improved quality and efficiency compared to traditional methods.

### Applying machine learning techniques

The SmartWood ID database, along with modern deep learning approaches, can enhance wood identification by utilizing the scans and anatomical descriptions as annotated training data. This data can be used to develop a machine learning-assisted illustrated key for wood identification. This innovative approach combines traditional wood anatomical assessment with cutting-edge technology, allowing for more accurate and efficient wood identification processes. The machine learning-assisted illustrated key can provide valuable support to researchers, foresters, and other professionals working with wood collections, enabling faster and more reliable identification of wood specimens.



typical images (0,5x0,5 cm) of the cross-section of *Albizia* spp.



### About me

PhD-student specialized in macroscopic wood identification of Congolese timbers and advanced computervision to develop deep learning models for wood identification. I started as a scientific worker at the service of wood biology of the Royal museum for Central-Africa (RMCA) in 2021 on the Belspo funded BRAIN-be 2.0 project, SmartWood ID. The aim of this project is to create a reference database of macroscopic images of Congolese timbers for identification purposes. In 2022, I started my PhD on the SmartWood ID project. Currently, I am working as a PhD-student in a collaboration between the RMCA and UGent-Woodlab to study computervision-based wood identification on Congolese timbers.



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