

Spectral mapping of savanna  
tree species at canopy level, with  
focus on tall trees, using an  
integrated CAO Hyperspectral &  
LiDAR sensor approach

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# Introduction

- ◆ Benefits of species detection:
  - 1) Enables sustainable monitoring of economically viable tree species
  - 2) Identification and management of problematic bush encroaching and alien invasive tree species
- ◆ **BUT** numerous challenges exist...

# Challenges of Species Detection

- ◆ The following factors directly and indirectly influences mapping success:
  - i) **Meteorological factors** (rainfall, seasonality, climate, sun viewing angle)
  - ii) **Physical factors** (geology and landscape geomorphology)
  - iii) **Biological factors** (plant phenological states – green vs senescent trees of the same species)
  - iv) **Technical factors** (inherent limitations of the sensor – spectral & spatial resolution)

# Aim

- ◆ To spectrally map 5 tall (>5m) savanna tree species, at canopy level, using a novel decision tree approach
- ◆ Tall tree species: *Acacia nigrescens*, *Combretum imberbe*, *Euclea natalensis*, *Lonchocarpus capassa* & *Sclerocarya birrea*

# Methods schema

Extracted from hyperspectral imagery

Spectral endmembers

Min Tree Height

Extracted from LIDAR vegetation height product

4 Vegetation indices (CRI, PRI, NDVI, Red Edge NDVI)

Histograms were created to ascertain predicted parameter range and overlap

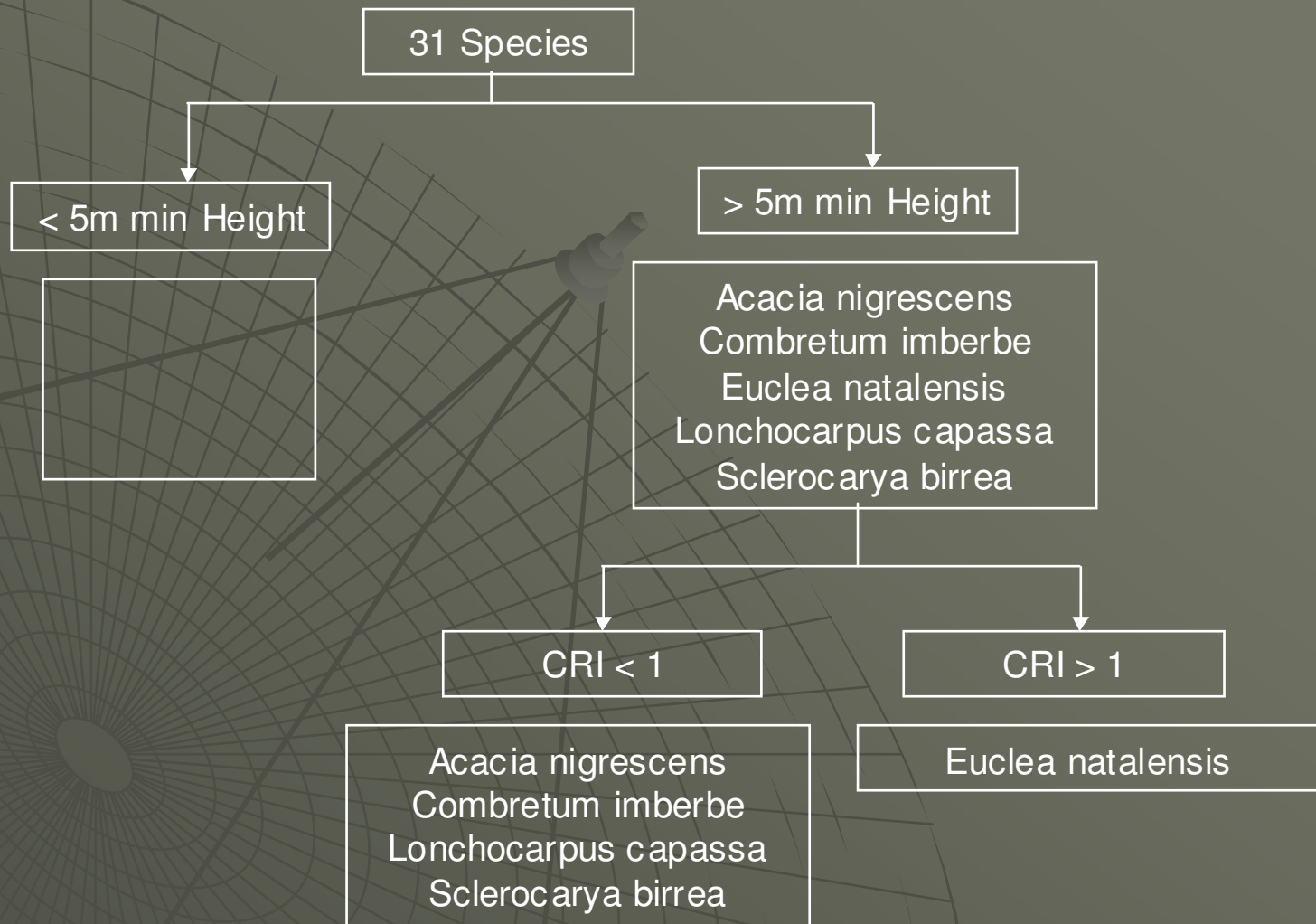
Thresholding formula [ $1SD - \text{mean} + 1SD$ ] for fixed species specific range for each parameter (Lower threshold and Upper threshold)

Decisions for the Decision Tree Nodes were created from the threshold values

Spectral Angle Mapper (SAM) classification was applied to the species at the Decision Tree End nodes

Final Mapped Product

# Decision Tree



# Results

- ◆ A subset sample area of the Bushbuckridge area was considered
- ◆ *Euclea natalensis* occurred more dominantly in and near riparian zones
- ◆ *Acacia nigrescens* & *Sclerocarya birrea* dominated the crest and mid crest slopes
- ◆ The remaining species occurred sparsely and sporadically in-between

=> Refer to the poster for classified image product

# The next step?

- ◆ To be implemented over the entire species database of 31 species
- ◆ Perform added field work to collect validation data for post classification analysis
- ◆ Future seems bright for fine resolution species mapping