Mapping Invasive Alien Plants using Imaging Spectroscopy and Machine Learning

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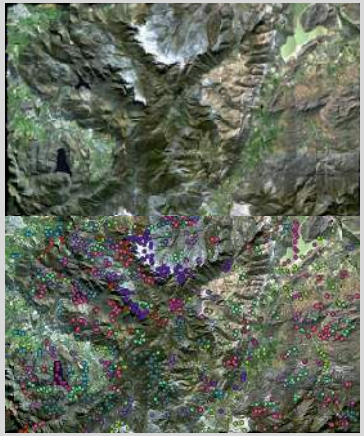
NRF National Research Foundation | SAEON South African Environmental Observation Network

The Nature Conservancy

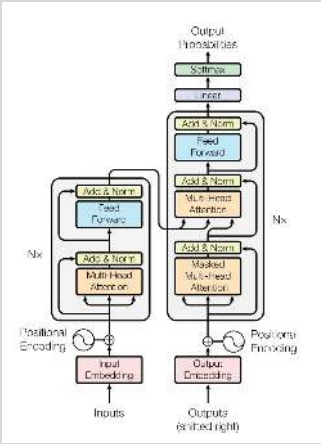
SEEC - Statistics in Ecology, Environment and Conservation

Machine learning modelling components

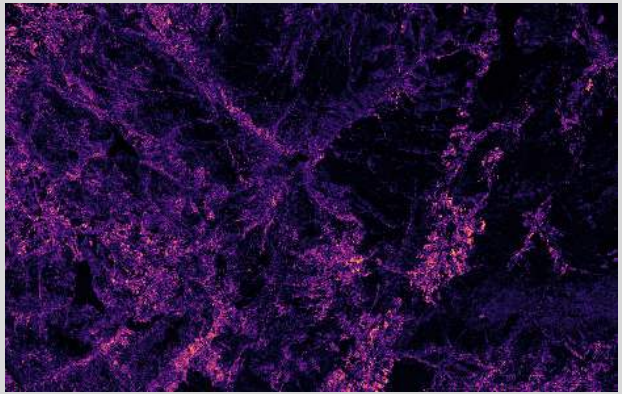
Labels + Features



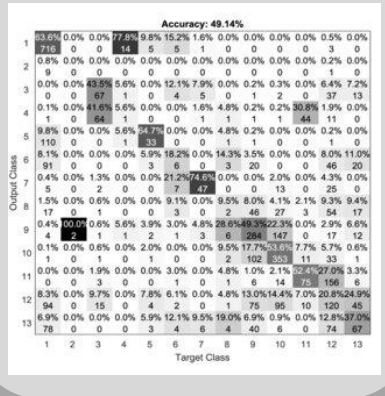
Model



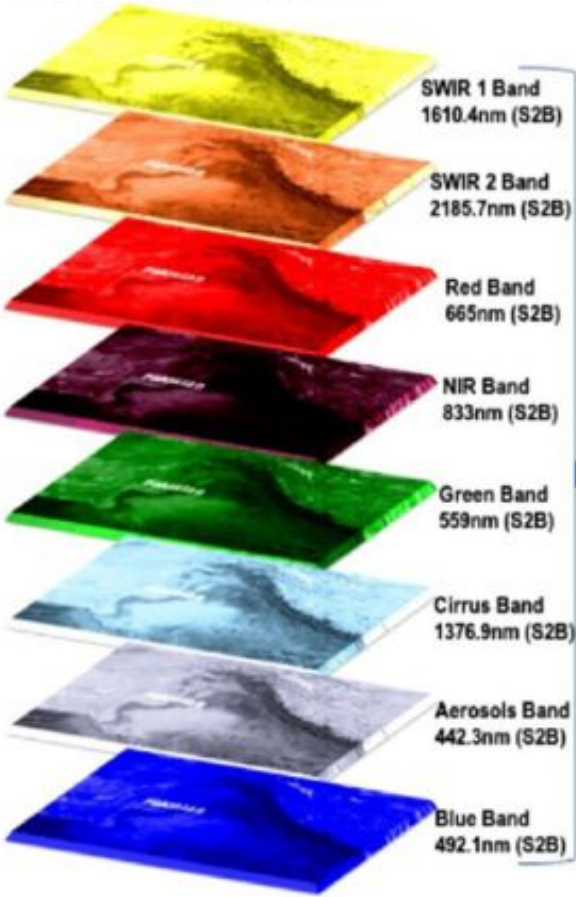
Prediction

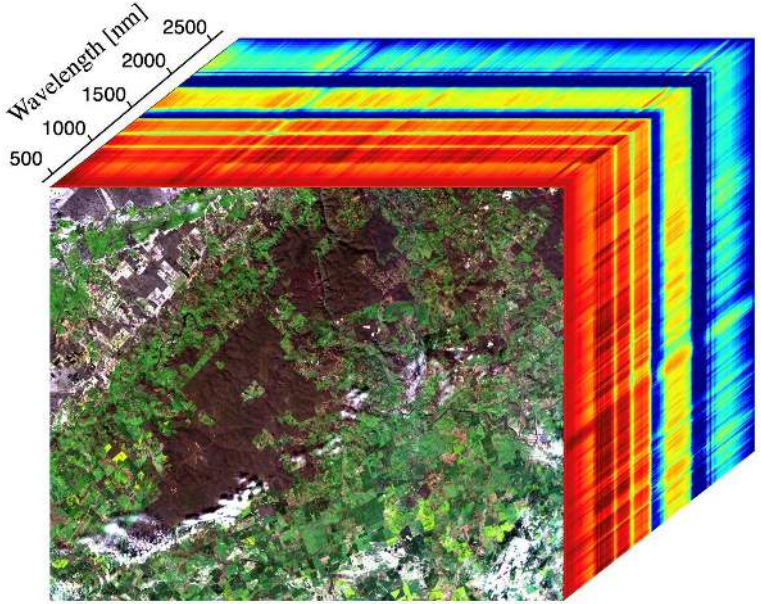


Evaluation



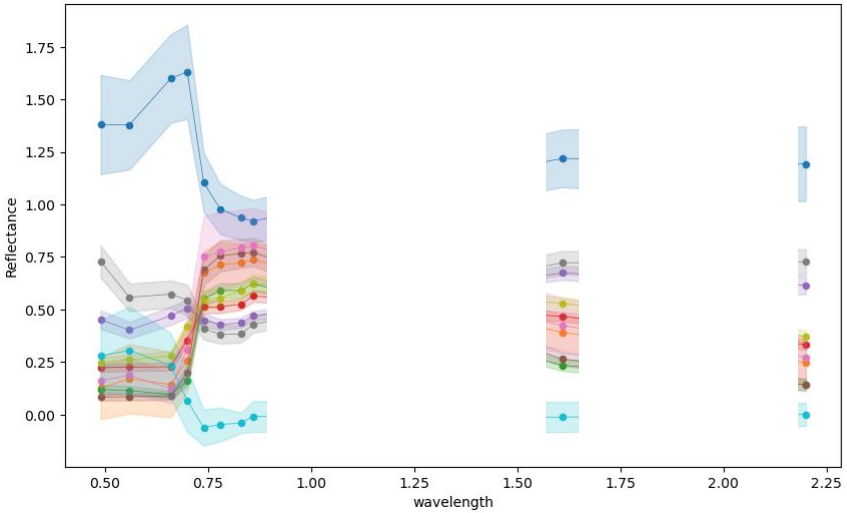
Data: Features

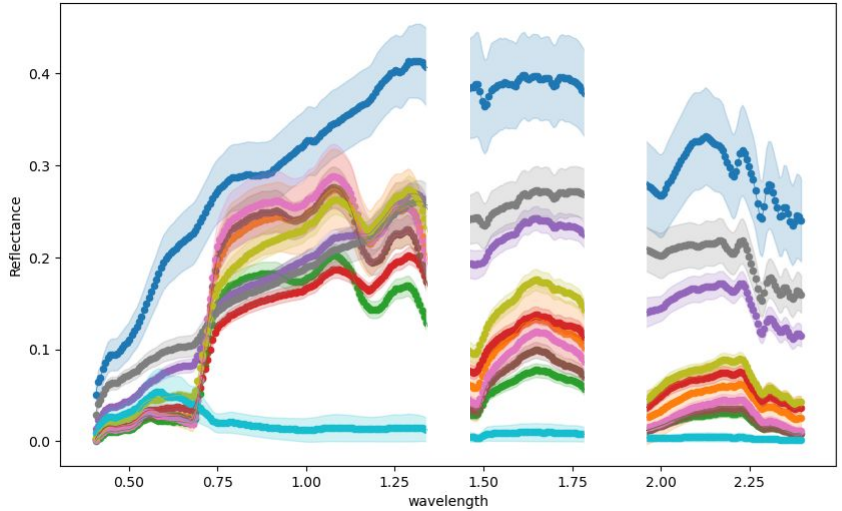




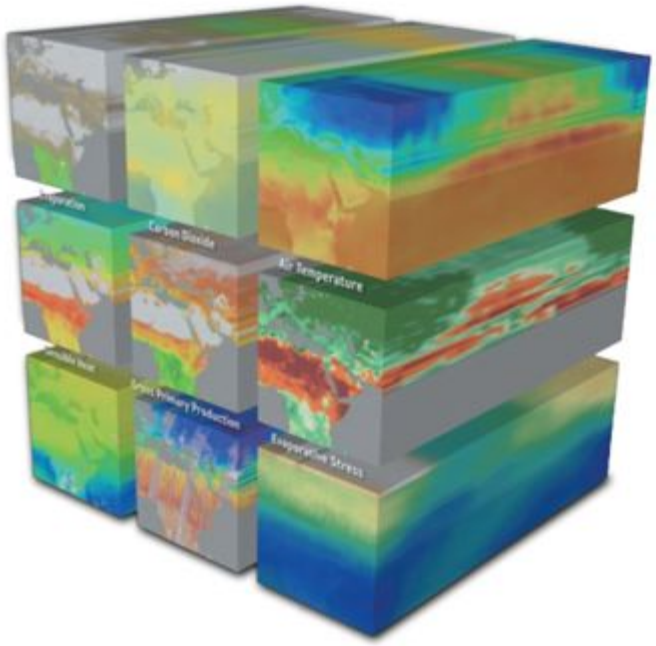
NASA/JPL

Data: Features

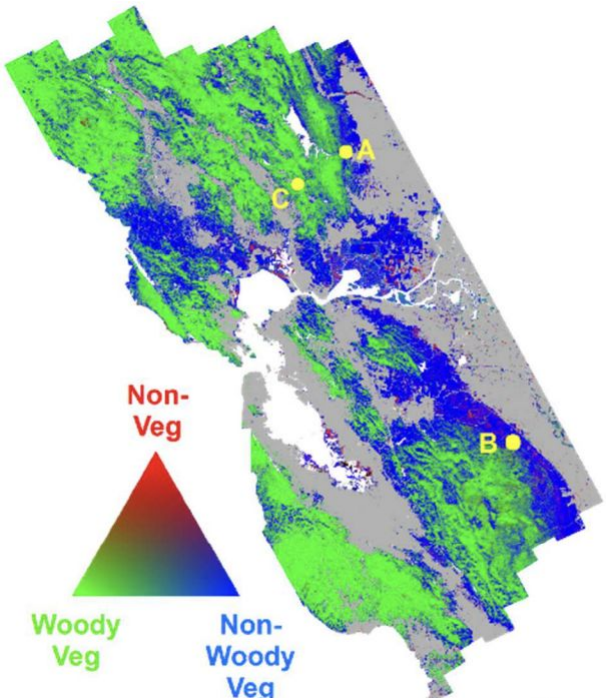


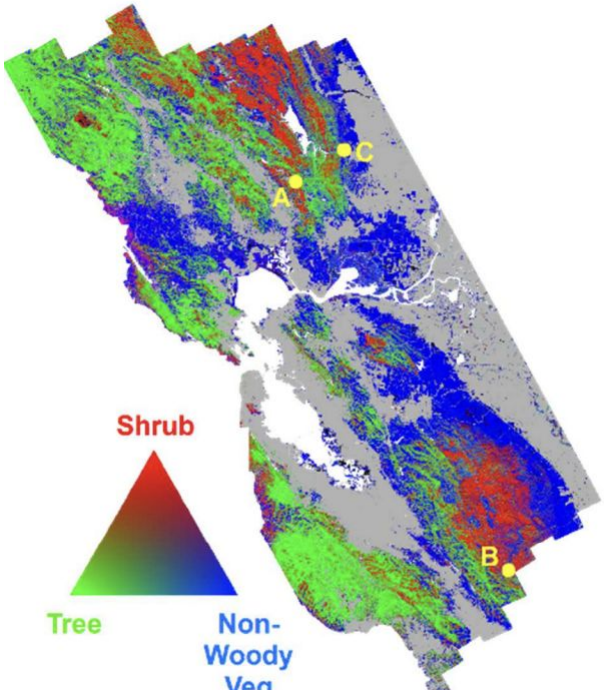


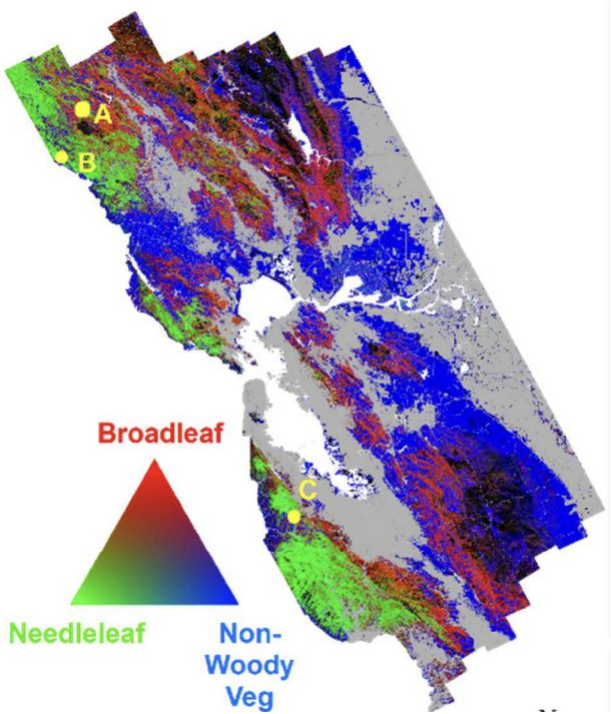
Data: Features



Data: Labels

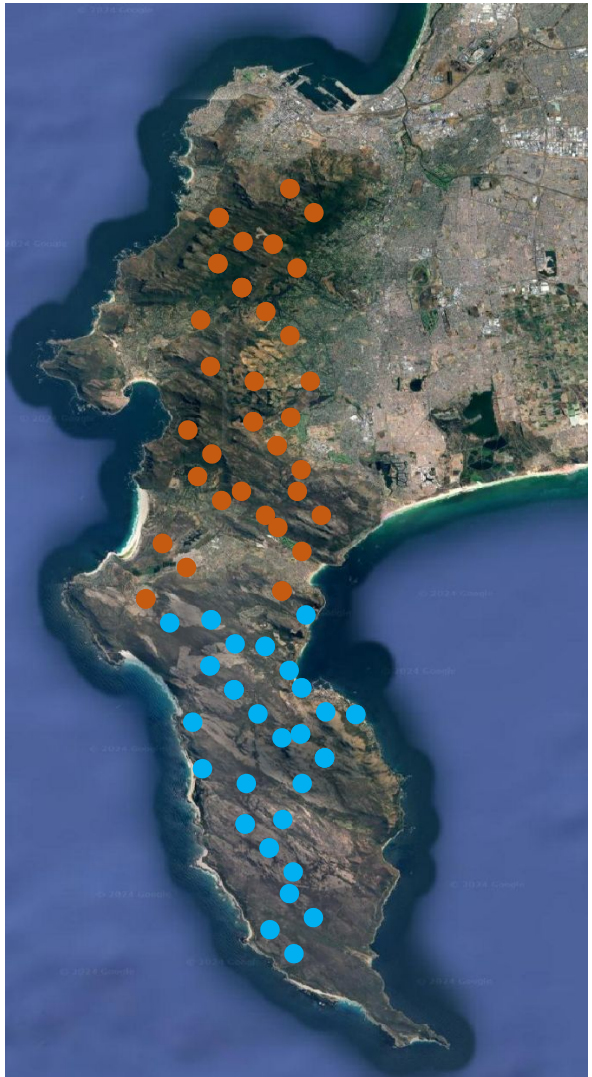


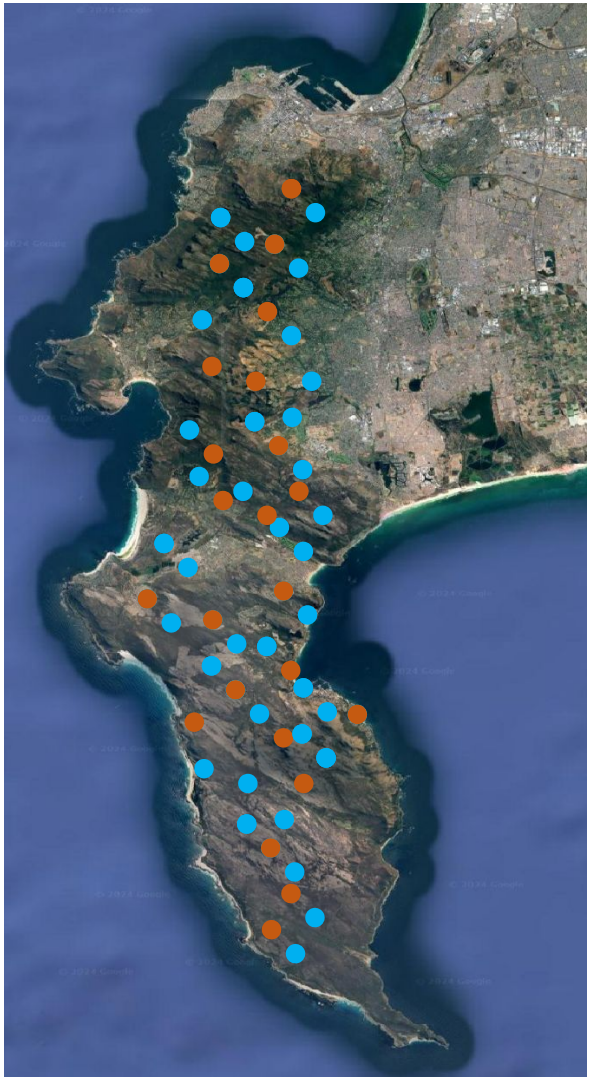




Cooper et al 2020 RSE

Data: Labels





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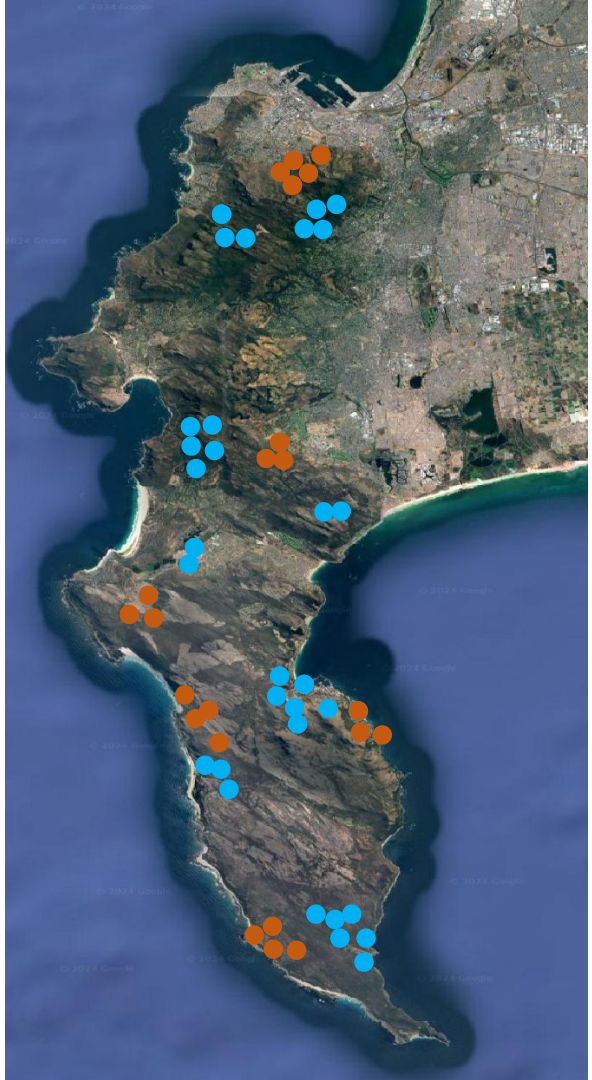

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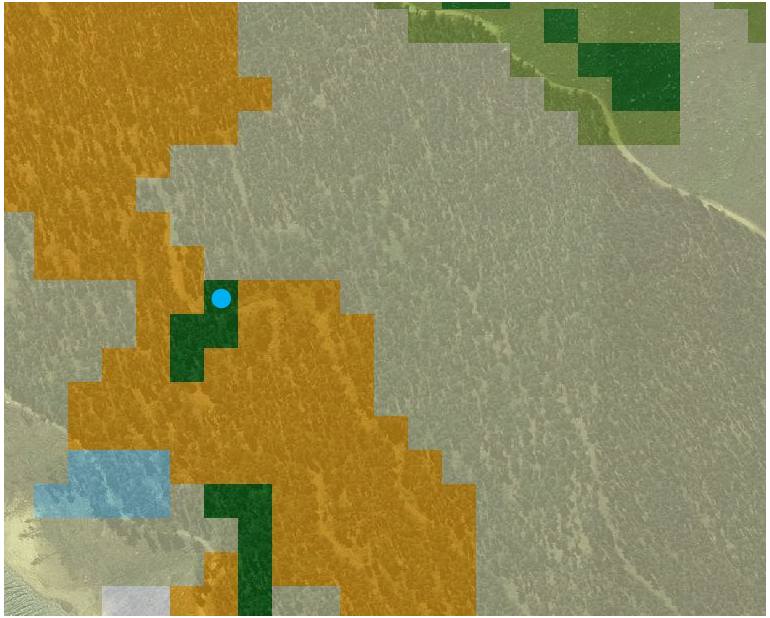

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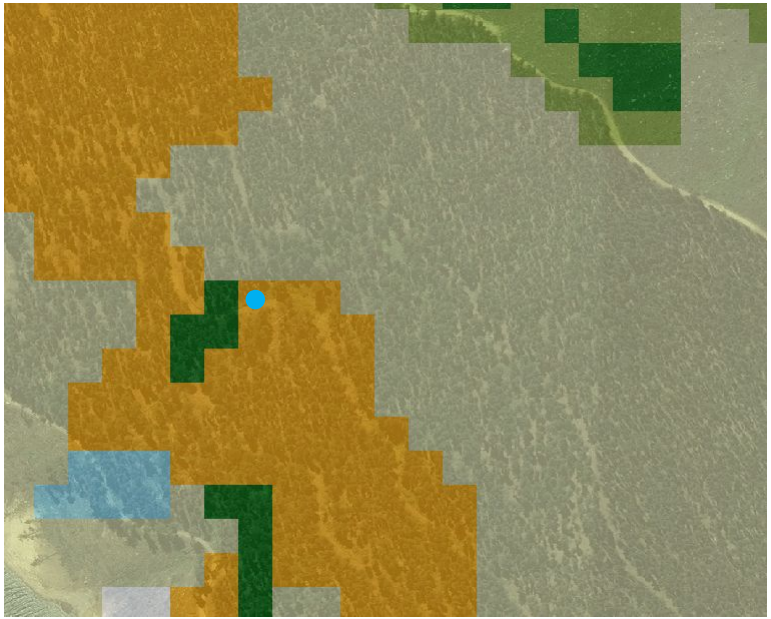

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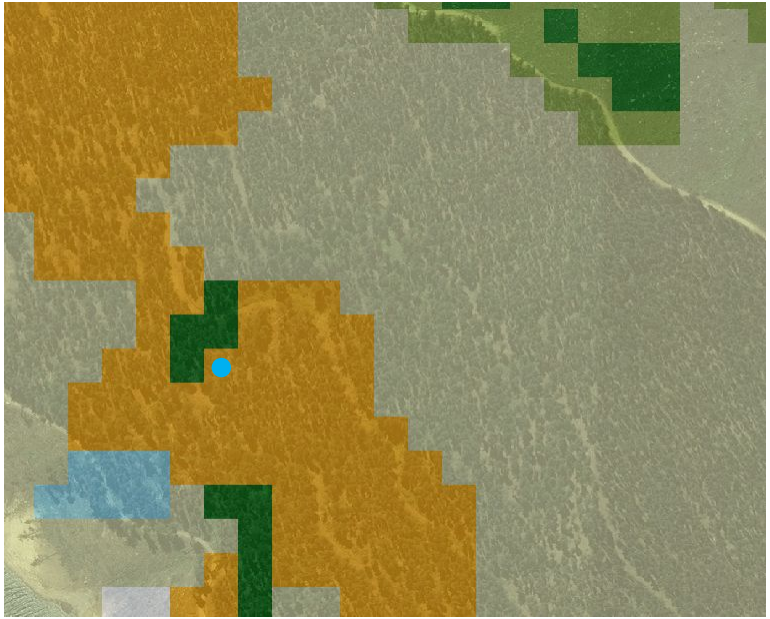

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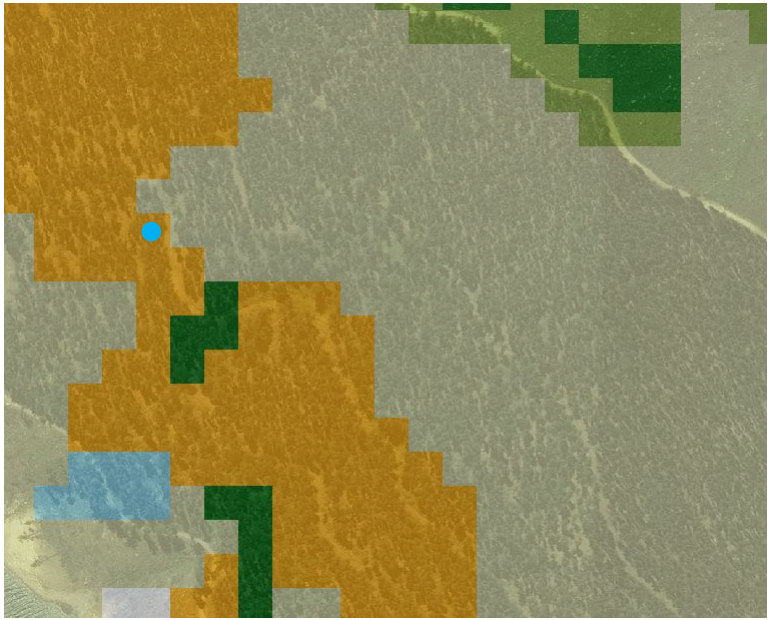

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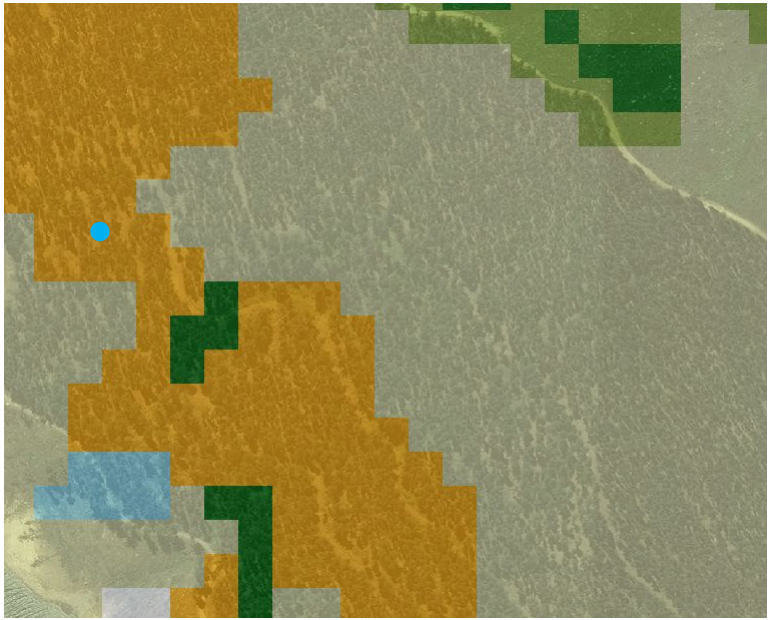

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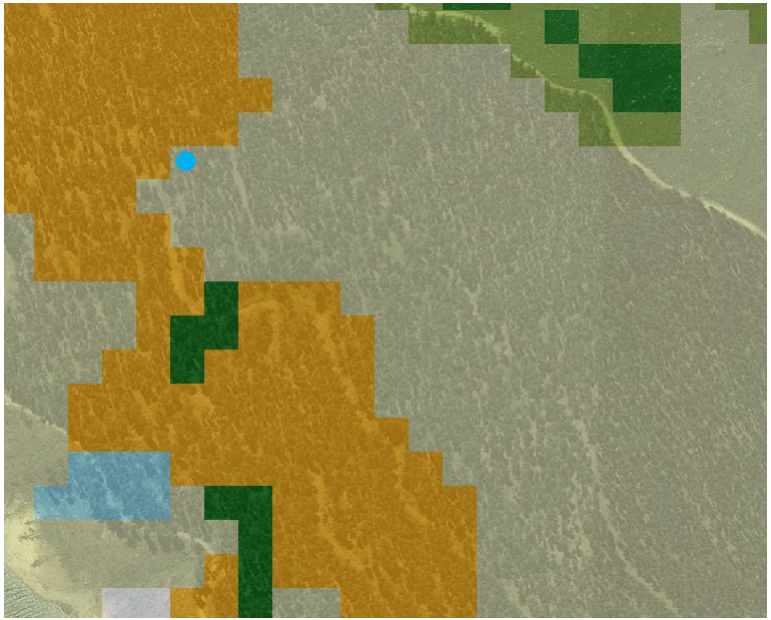
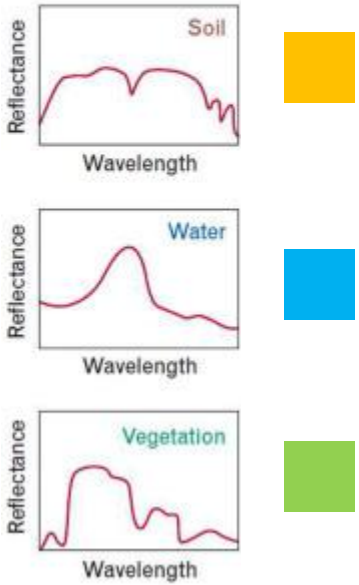
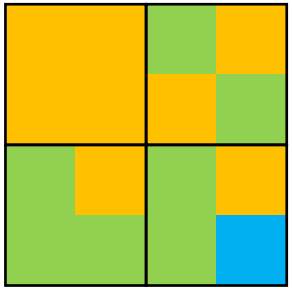


Models



Unmixing

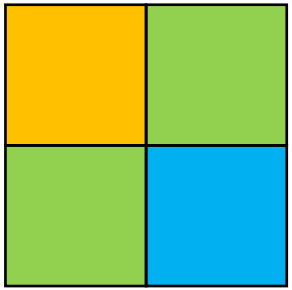
Reality



Prediction

W: 0% S: 100% V: 0%	W: 0% S: 50% V: 50%
W: 0% S: 25% V: 75%	W: 25% S: 25% V: 50%

Classification

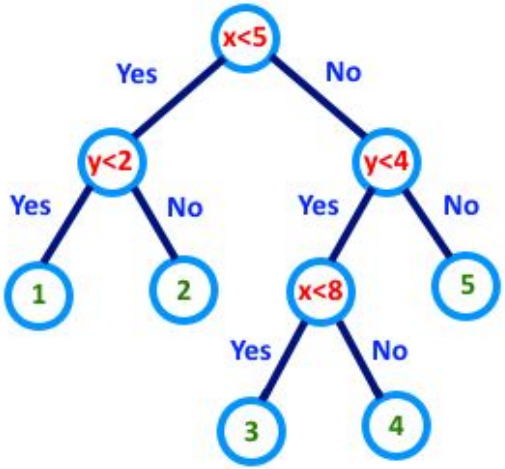


W: 3% S: 93% V: 4%	W: 3% S: 12% V: 85%
W: 1% S: 22% V: 77%	W: 98% S: 1% V: 1%

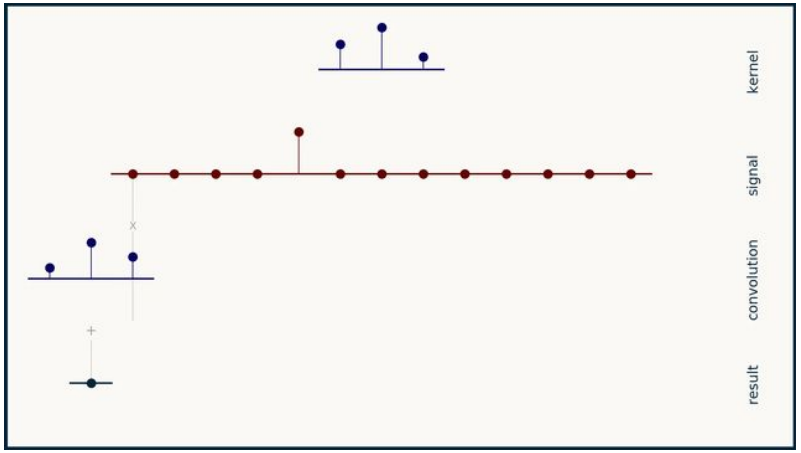
Soil	Veg
Veg	Water

Models

Trees

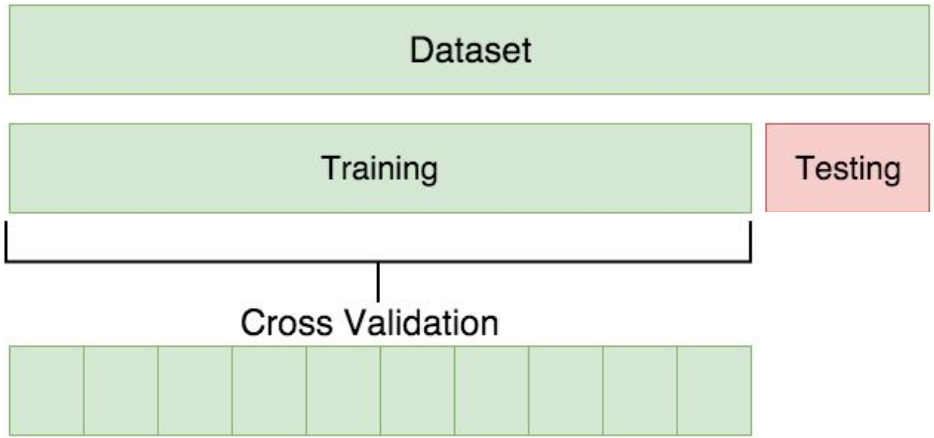


Neural networks

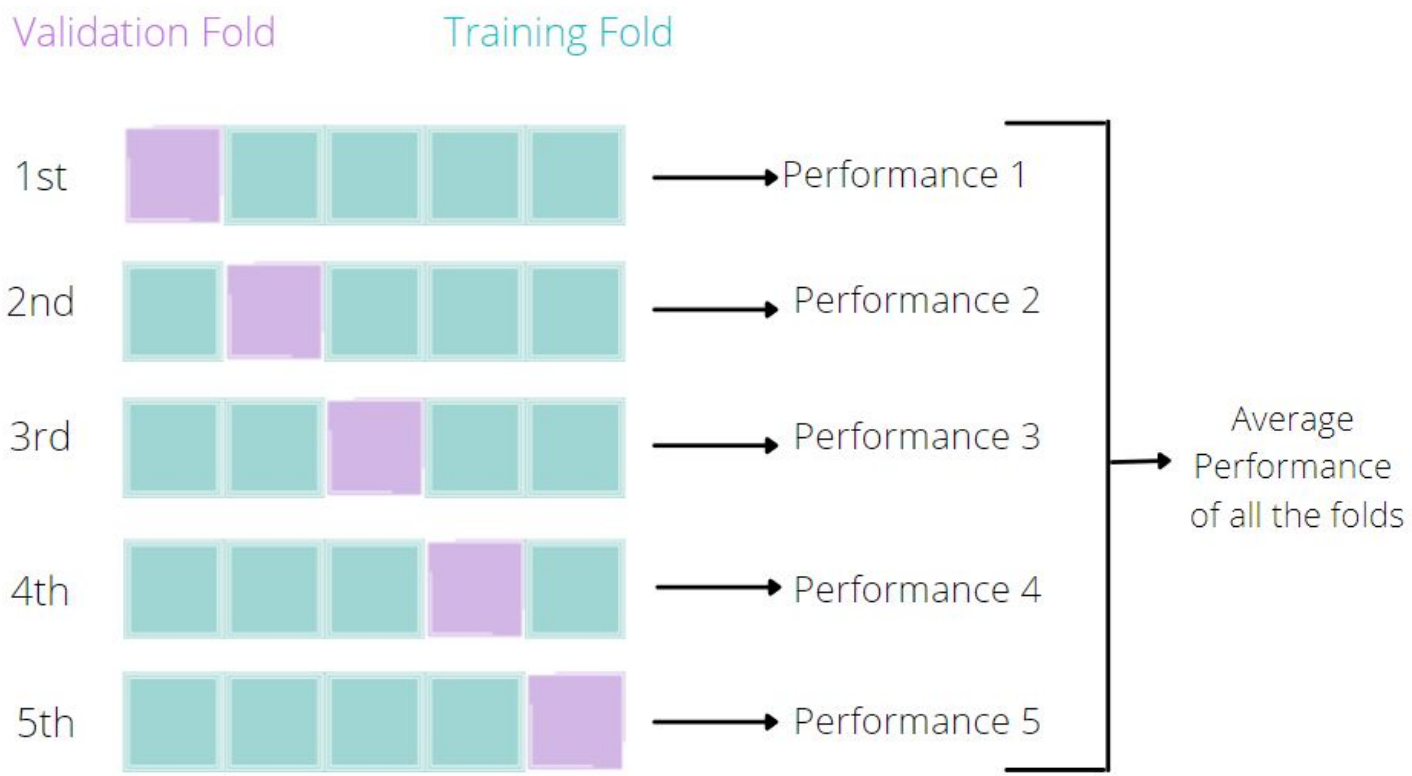


Decision tree < Random Forest < Boosted Trees

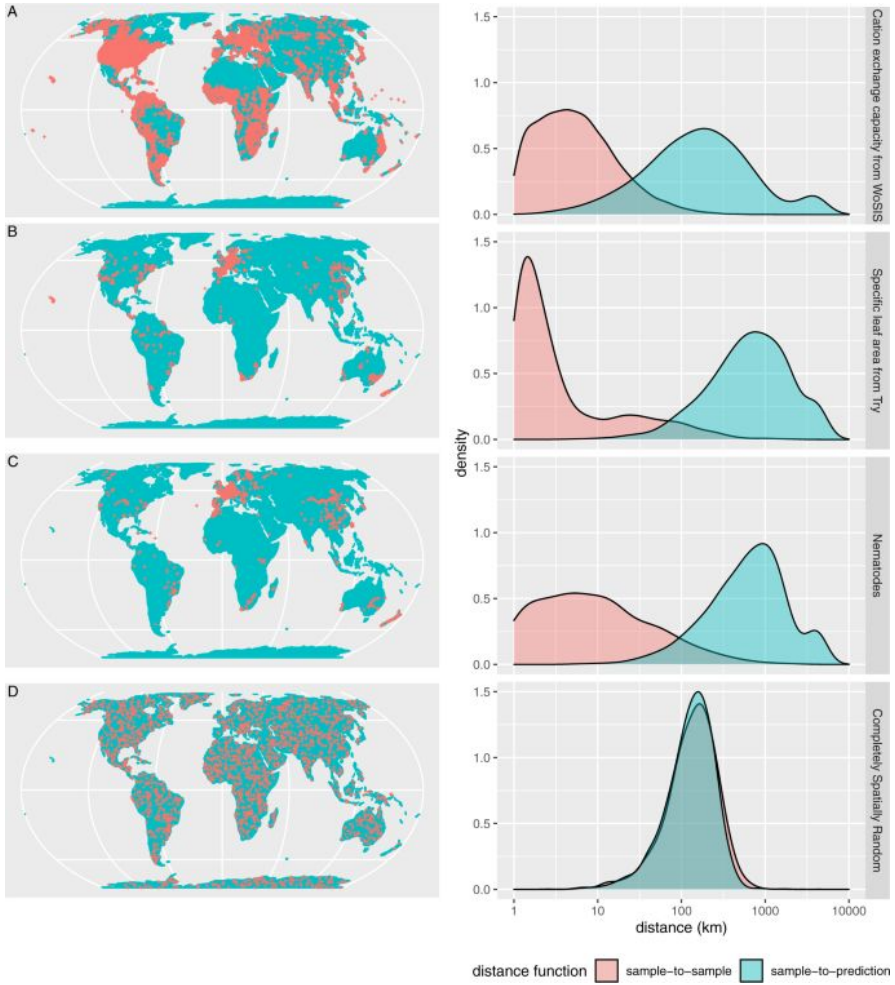
Evaluation



Evaluation

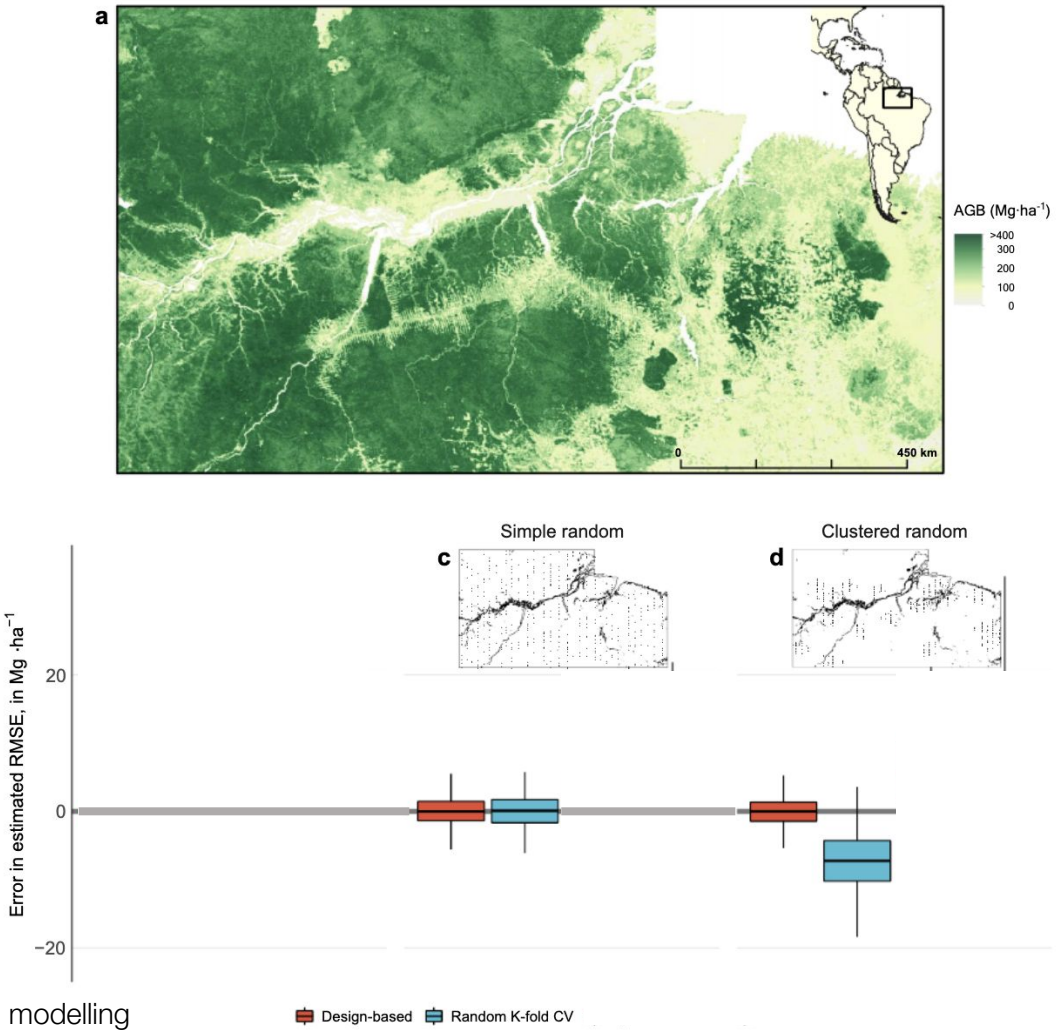

Validation Fold
Training Fold
1st
2nd
3rd
4th
5th
Performance 1
Performance 2
Performance 3
Performance 4
Performance 5
Average
Performance
of all the folds

Evaluation



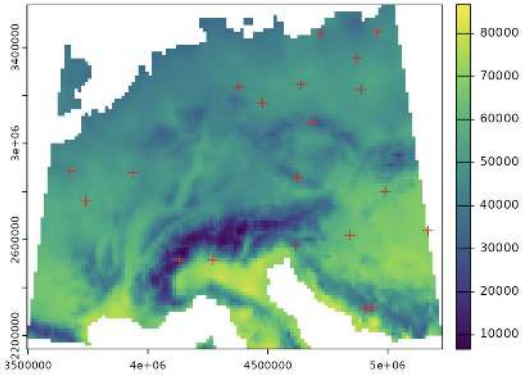
Meyer & Pebesma 2022 Nat Comms

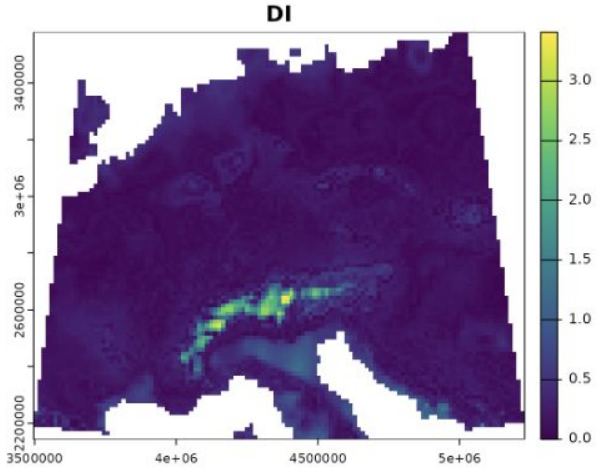
Evaluation

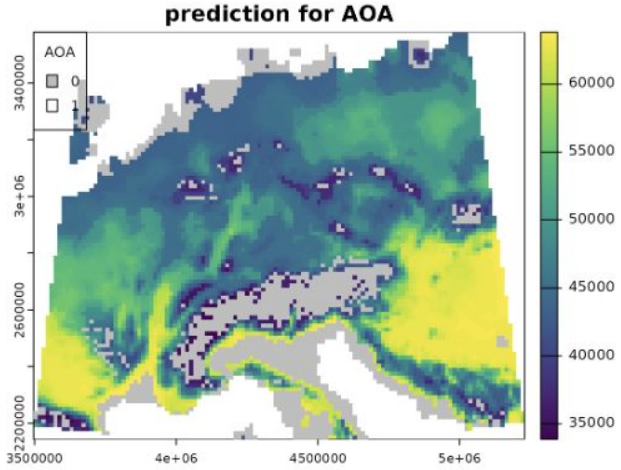


Wadoux et al 2021 Ecological modelling

Prediction

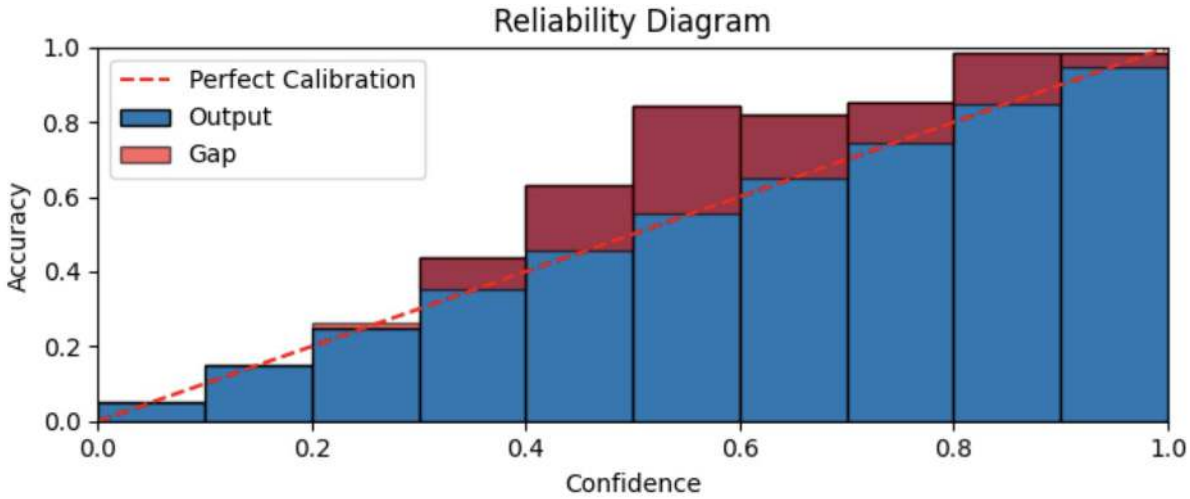




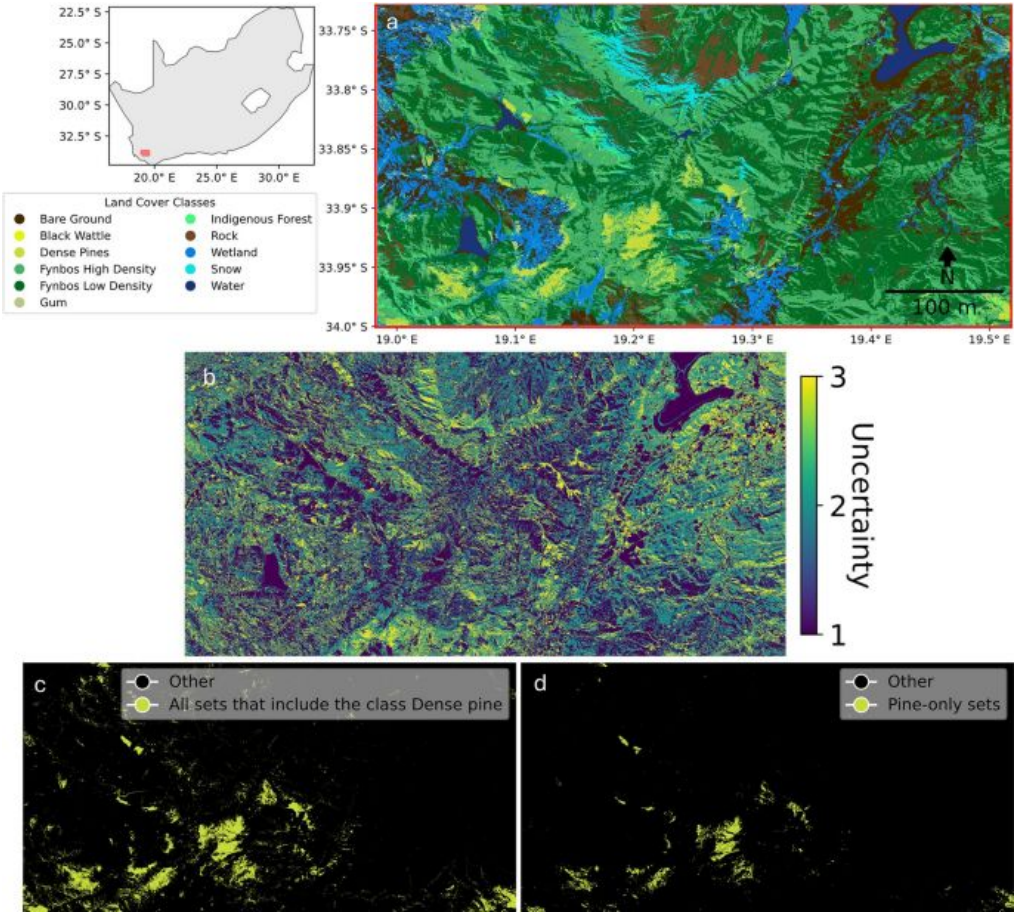


Meyer & Pebesma 2021 MEE

Prediction


Reliability Diagram
Perfect Calibration
Output
Gap
Accuracy
Confidence
0.0
0.2
0.4
0.6
0.8
1.0

Prediction



Singh et al 2024 *Sci Reports*