

# ARTIFICIAL NEURAL NETWORKS FOR SOIL DRAINAGE CLASS MAPPING IN DENMARK

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# SOIL DRAINAGE

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- Important factor reflecting **soil water saturation**
- Impacting:
  - **Plant growth, soil biota**
  - **Biophysical processes:** nutrient cycling, pesticide leaching, greenhouse gas release, soil compaction, surface erosion

# SOIL DRAINAGE CLASSES



Defined from observations of water tables, soil wetness, landscape position and soil morphology

# SOIL DRAINAGE CLASS MAPPING

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- Providing tools for crop, forest and environmental management purposes
- **Decision trees** (Møller et al., manuscript)
- **Artificial Neural Networks** (ANN; Zhao et al., 2008, 2013)

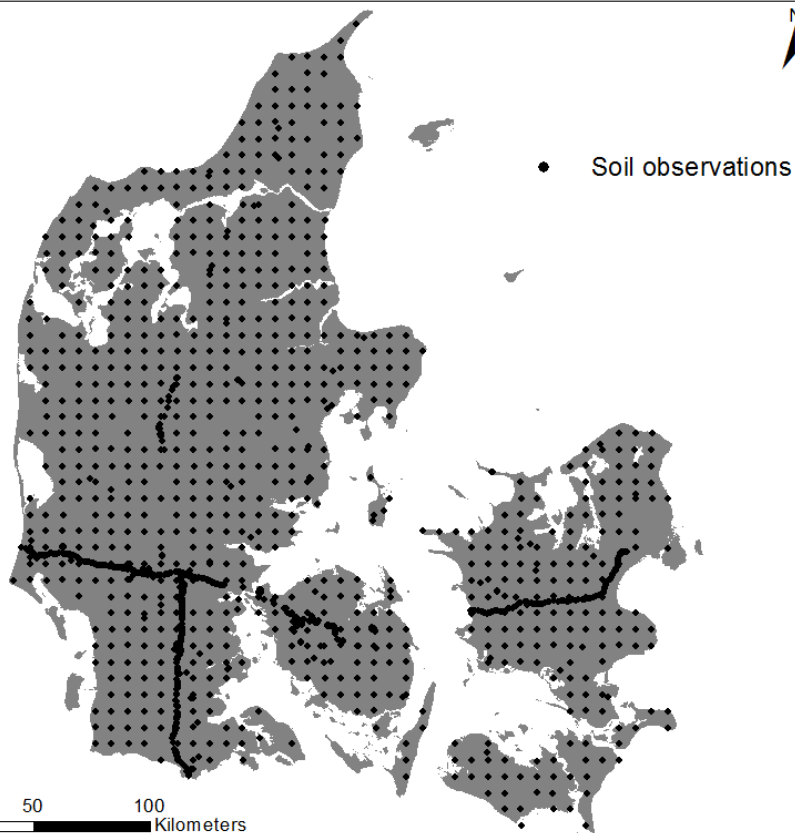


## Input data (1)

- 1702 soil observations
- Training (2/3) / validation (1/3)

Drainage class	Whole data set	Training data	Validation data
1	331	221	110
2	286	191	95
3	639	426	213
4	373	248	125
5	73	49	24
<b>Total</b>	<b>1702</b>	<b>1135</b>	<b>567</b>

Møller et al., manuscript



## Input data (2)

31 environmental predictors:

- › Geology, landscape and land use
- › Terrain parameters derived from DEM
- › Spectral indices derived from remote sensing data

# MODELLING RESULTS

	Decision trees	ANN
Validation	<i>All predictors</i>	<i>All predictors</i>
Accuracy	<b>0.52</b>	<b>0.50</b>
Kappa	<b>0.33</b>	<b>0.30</b>
MAE	<b>0.65</b>	<b>0.58</b>

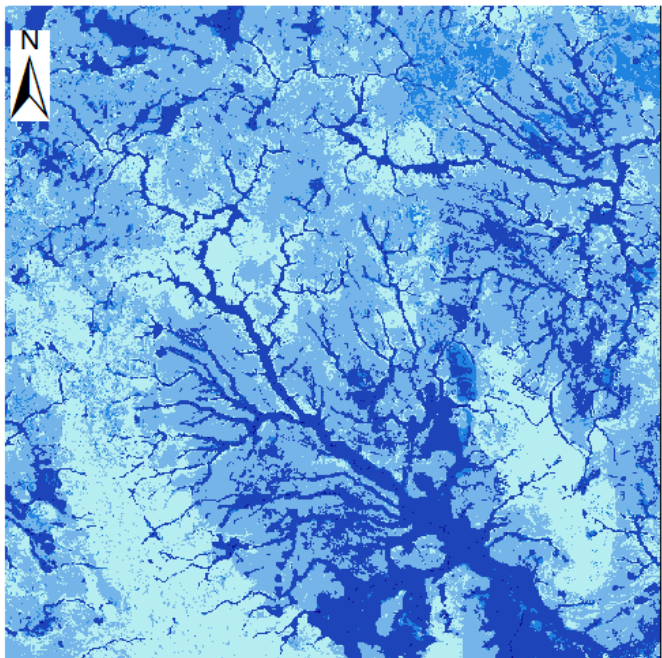
	ANN		
Validation	<i>All predictors</i>	<i>(1) excluded</i>	<i>(1) and (2) excluded</i>
Accuracy	0.50	0.52	0.54
Kappa	0.30	0.33	0.35
MAE	0.58	0.55	0.52

- (1) Cropping history → **incomplete information**  
 (2) Reclassified slope aspect → **redundant information**

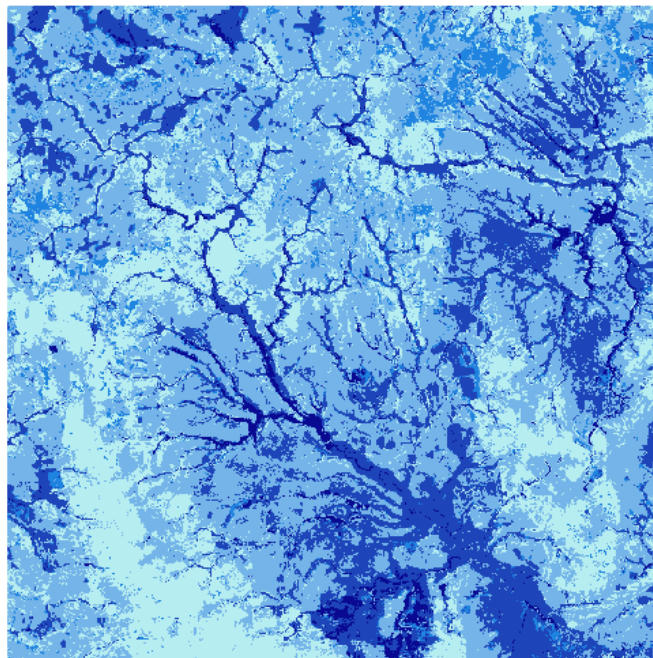


# PREDICTOR CONTRIBUTION

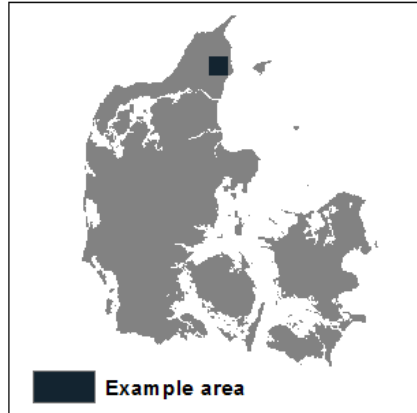
Decision trees	ANN
Wetlands	Clay content (100 – 200 cm)
Slope to channel network	Wetlands
Clay content (100 – 200 cm)	Slope to channel network
Land use	Clay content (30 – 60 cm)
Geology	Geology



**Decision tree**



**ANN**



**Predicted soil drainage classes**

