

# Maskinlæring og dræning

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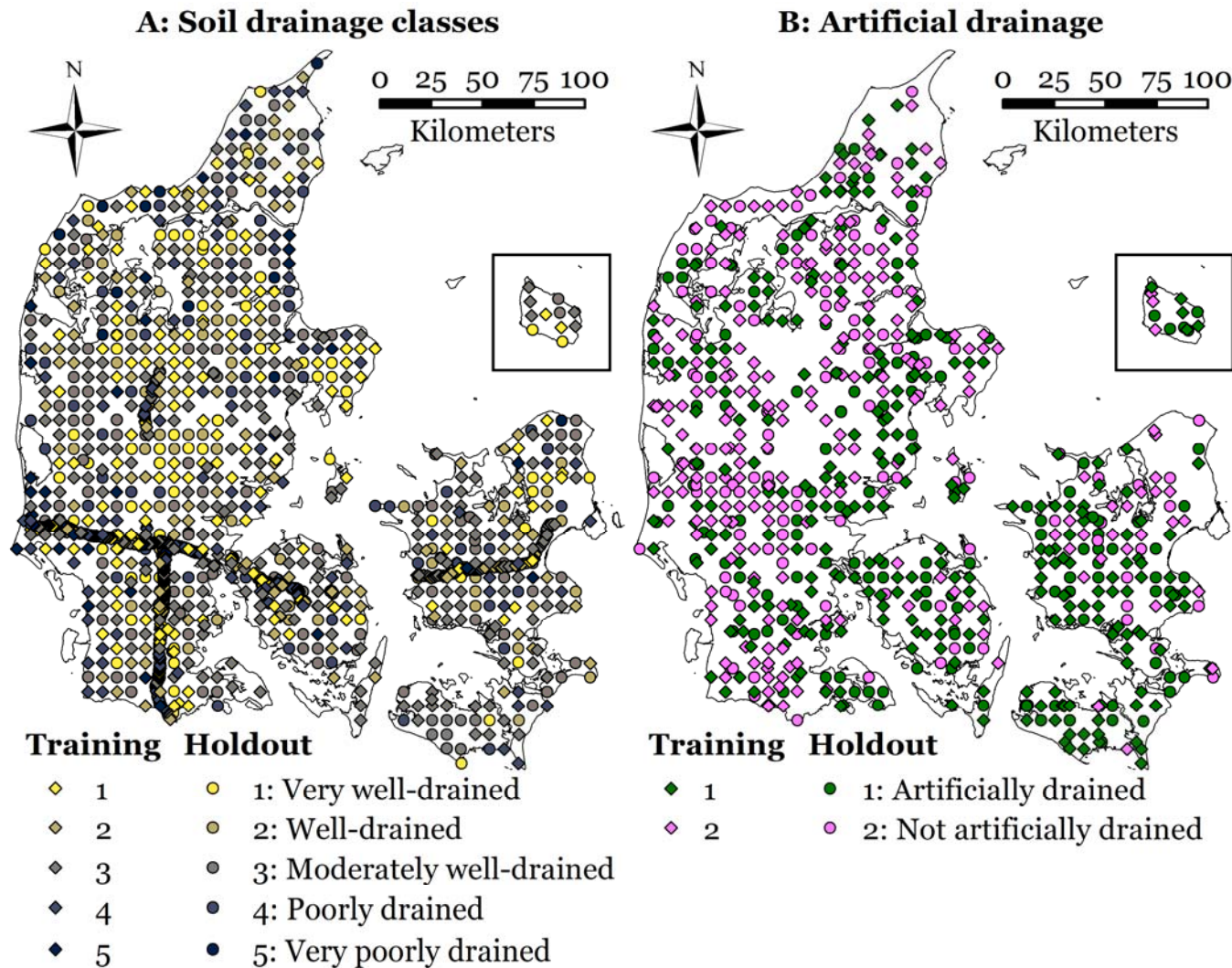
Aarhus University

Hydrologidag

2019, October 22



# Observed natural and artificial drainage



# Soil drainage classes

Very well-drained soils



Well-drained soils



Moderately well-drained soils



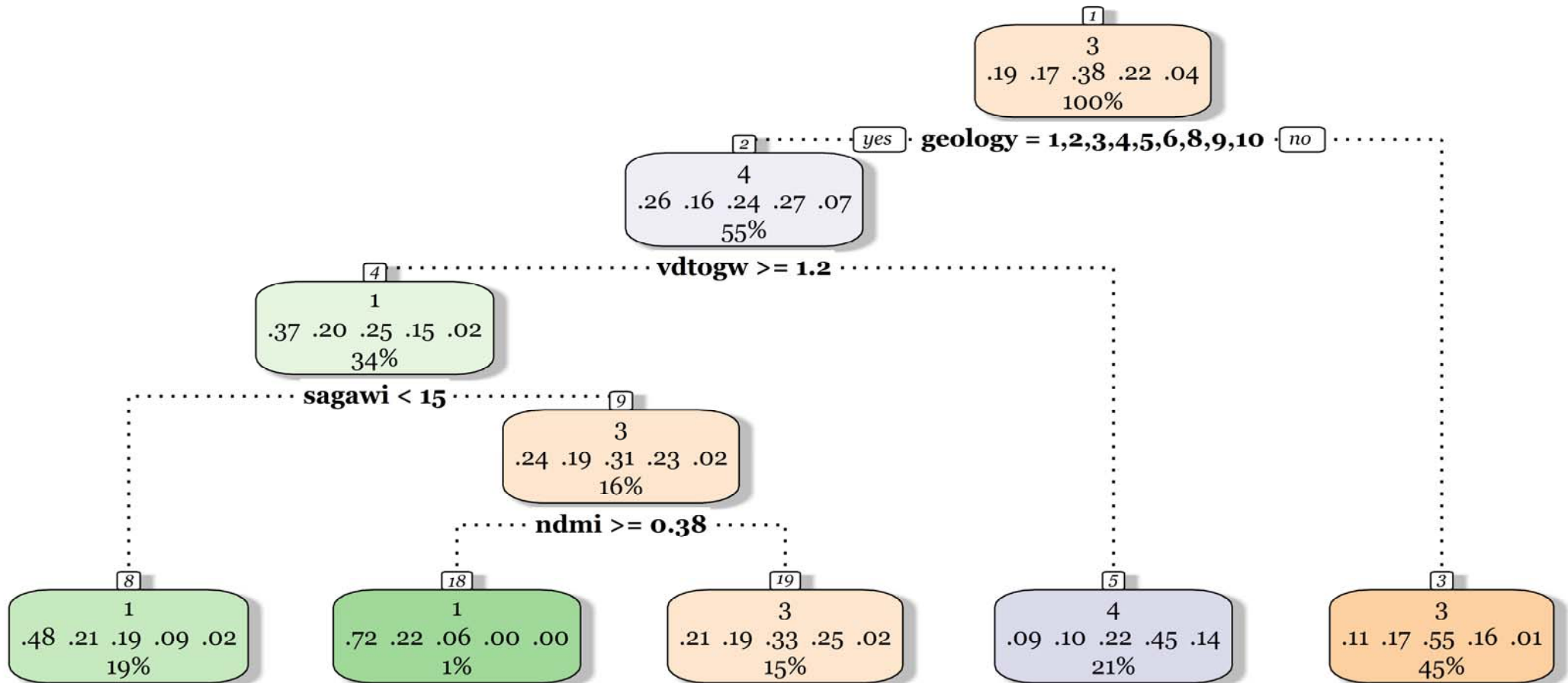
Poorly drained soils



Very poorly drained soils



# Classification trees



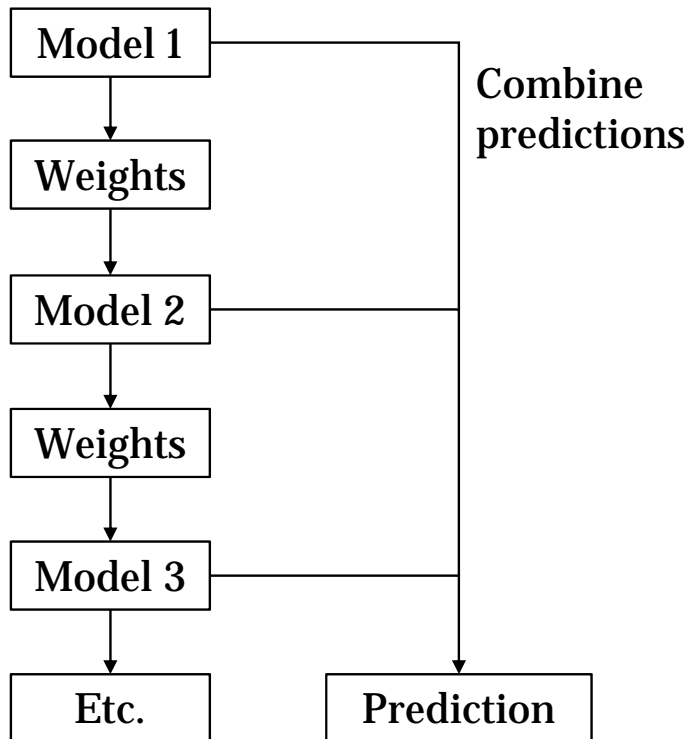


# Differential costs for misclassification

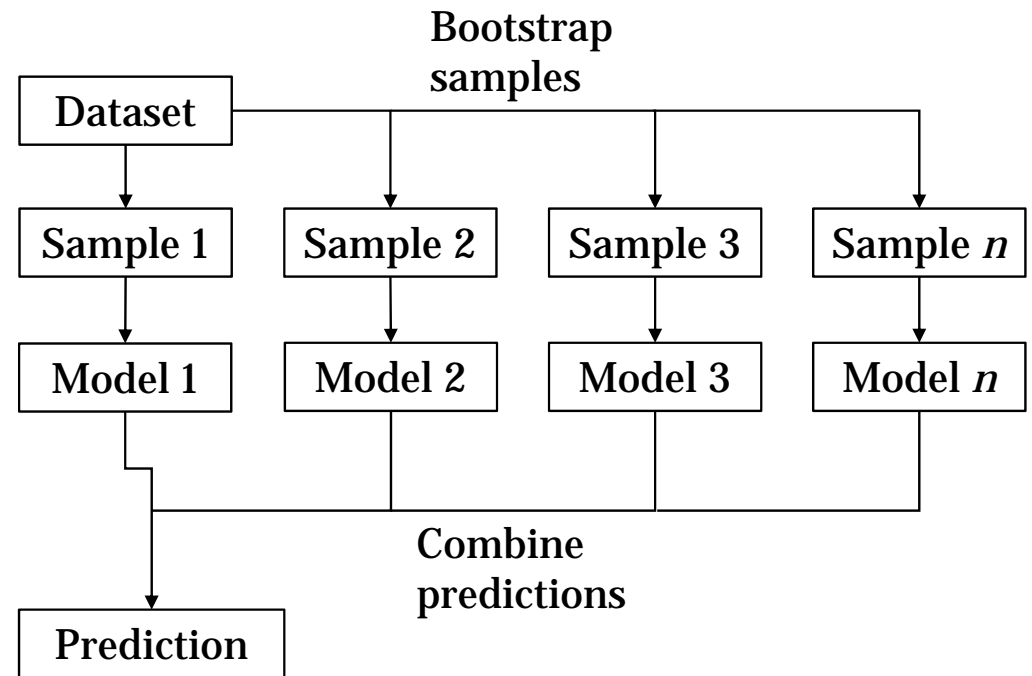
		<b>Observed soil drainage class</b>				
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>Predicted soil drainage class</b>	<b>1</b>	0	1	2	3	4
	<b>2</b>	1	0	1	2	3
	<b>3</b>	2	1	0	1	2
	<b>4</b>	3	2	1	0	1
	<b>5</b>	4	3	2	1	0

# Boosting and bagging

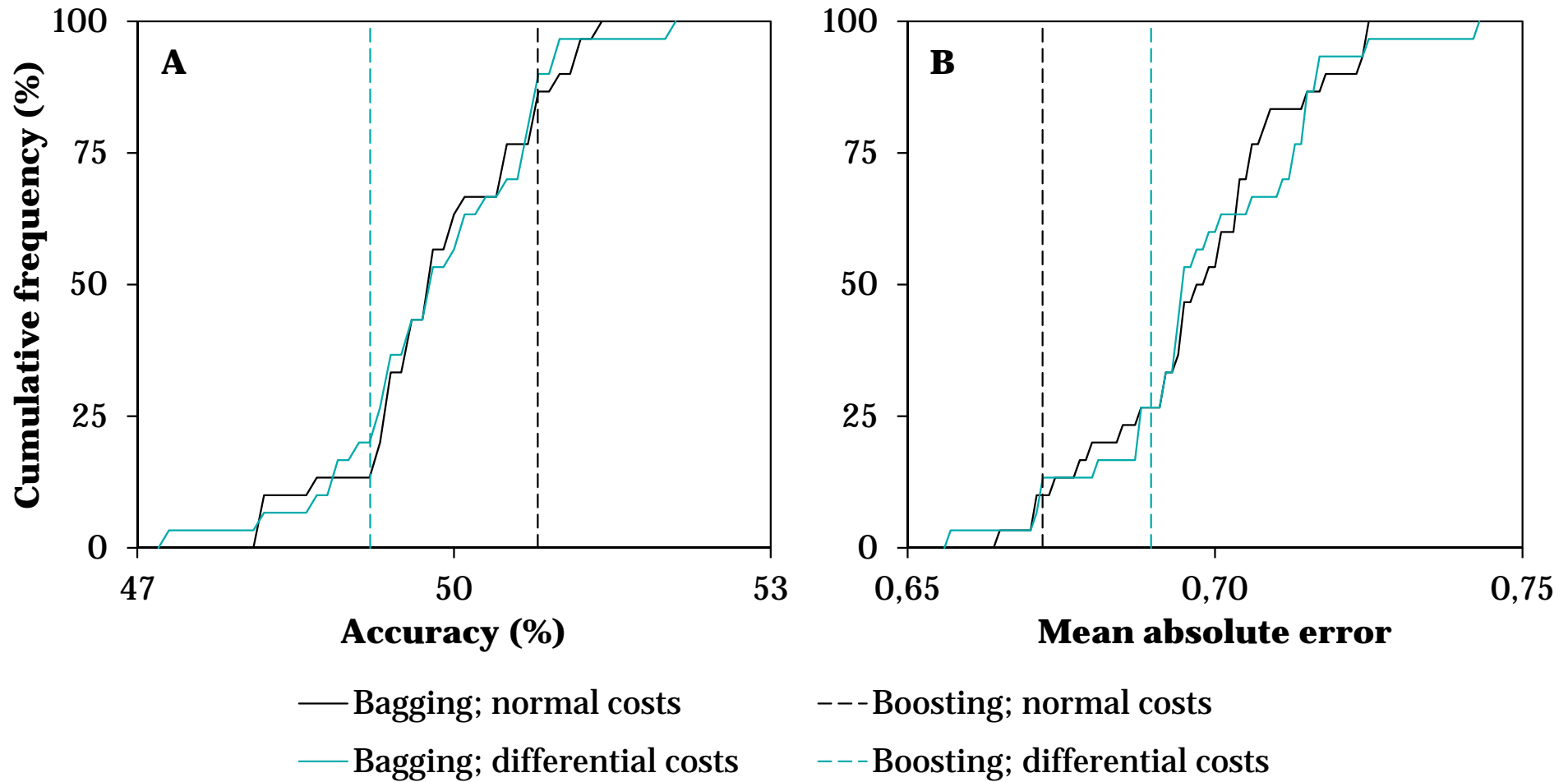
## Boosting



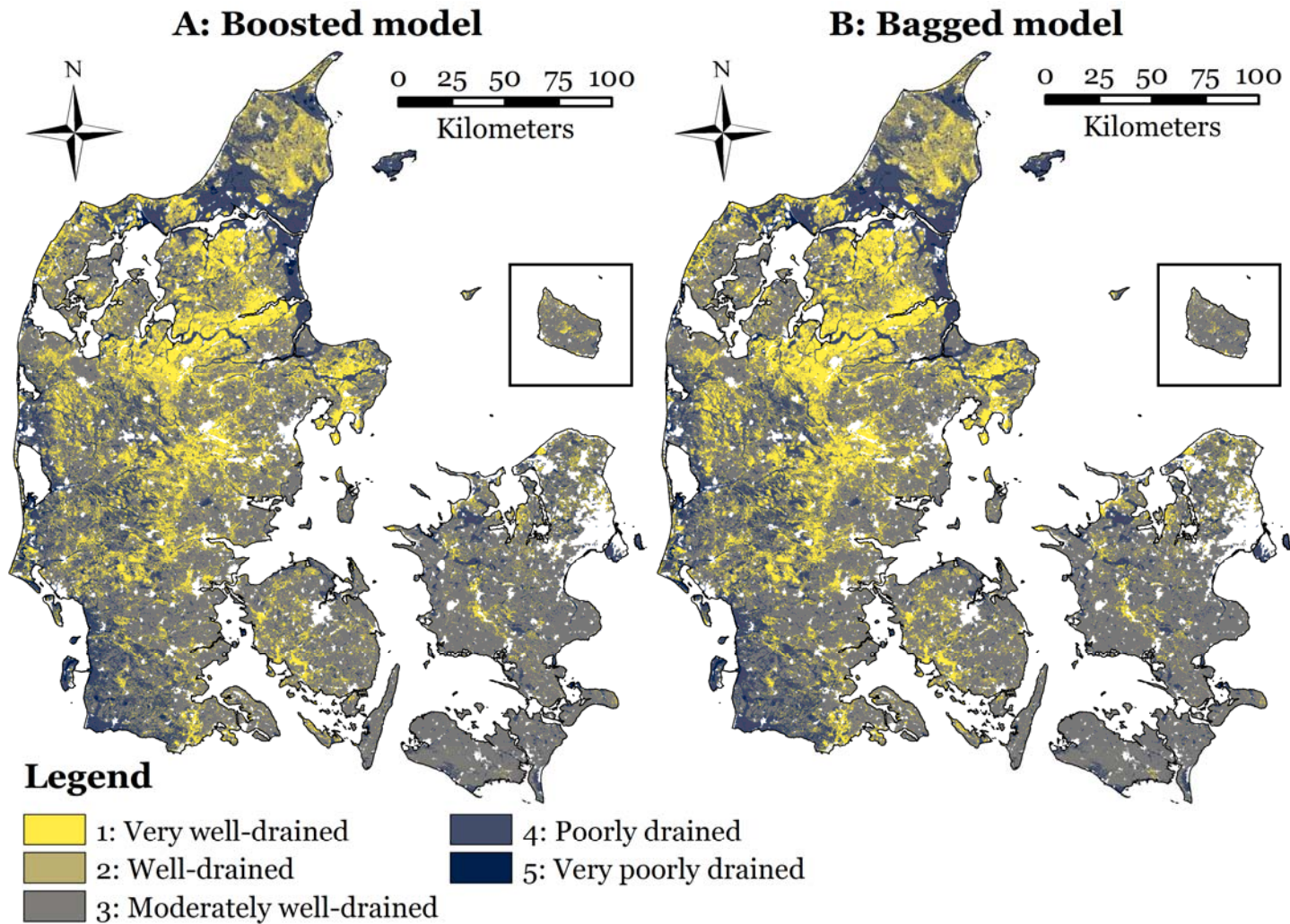
## Bagging



# Soil drainage class accuracy

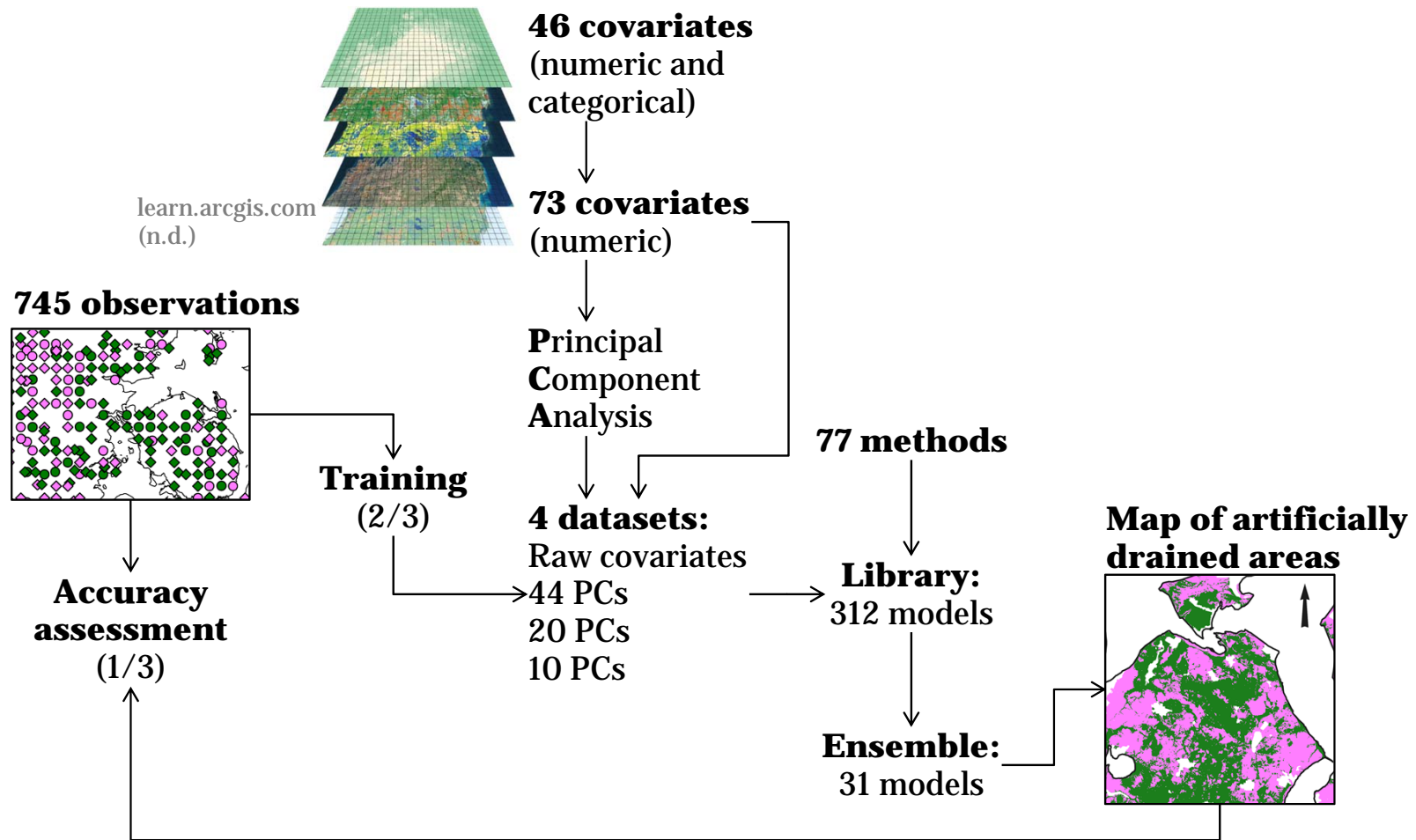


# Maps of soil drainage classes



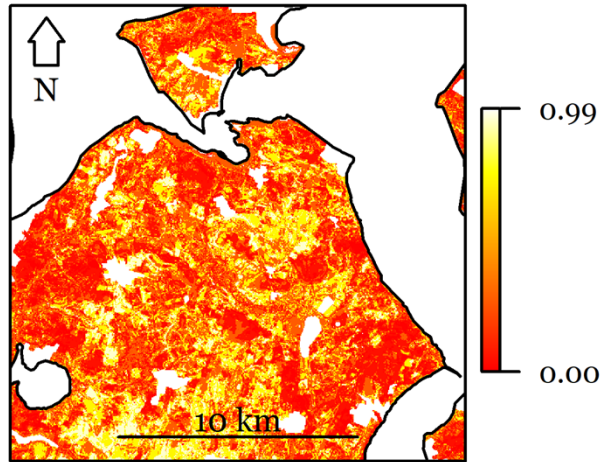


# Mapping artificial drainage

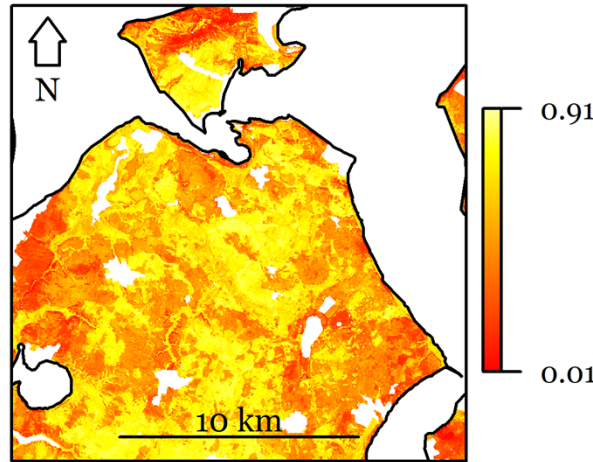


# Predicted drainage probability

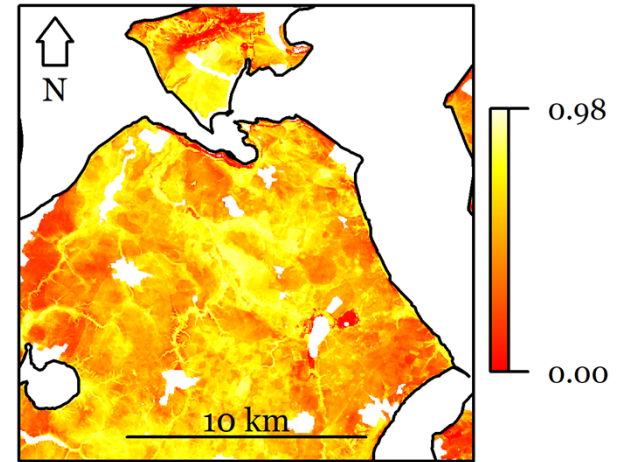
**A: LogitBoost, 10 PCs**



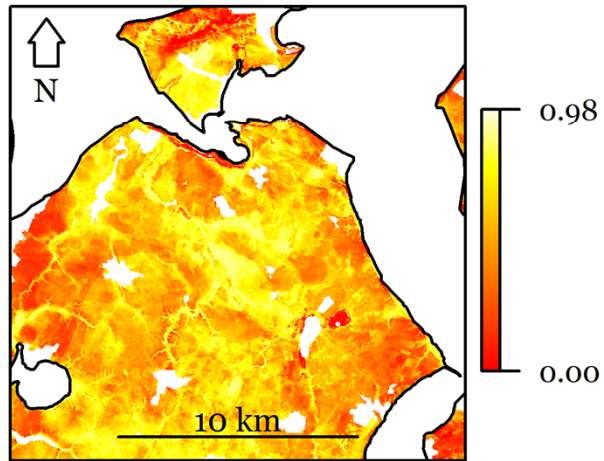
**B: xgbTree, 10 PCs**



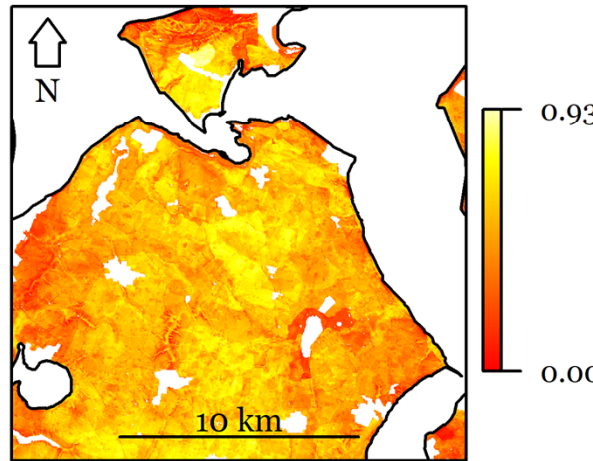
**C: gcvEarth, 10 PCs**



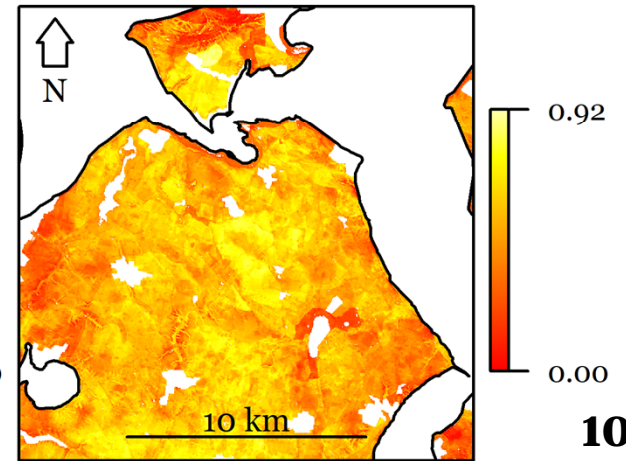
**D: fda, 10 PCs**



**E: glmStepAIC, 10 PCs**

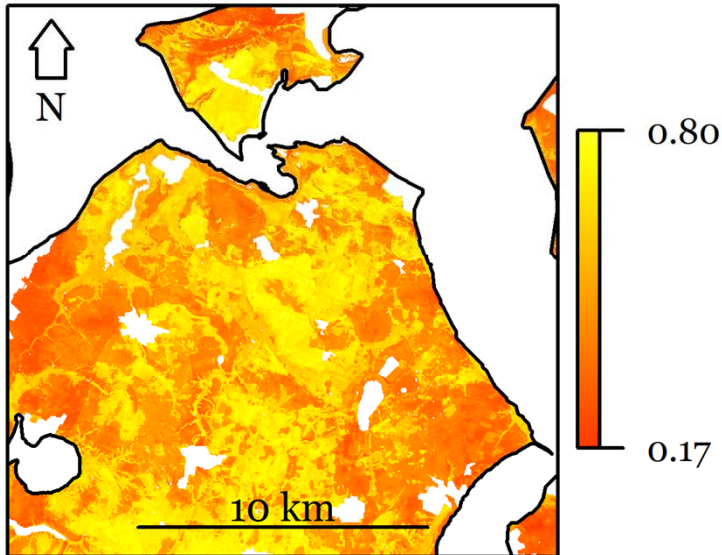


**F: lda2, 10 PCs**

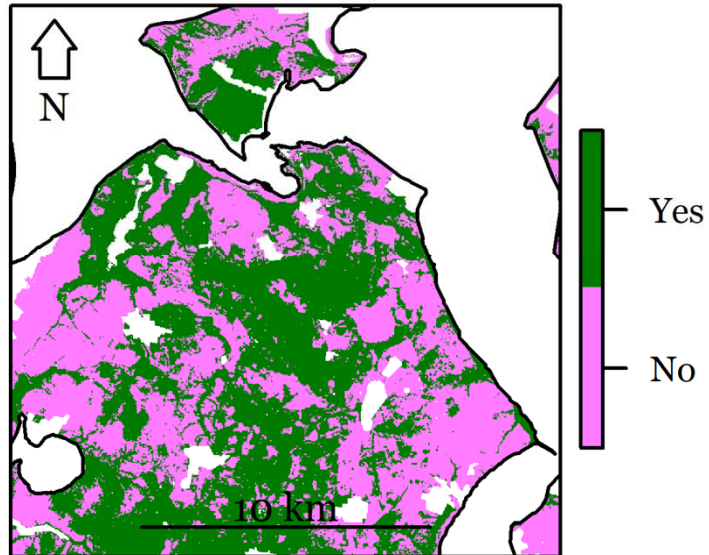


# Combining drainage probabilities

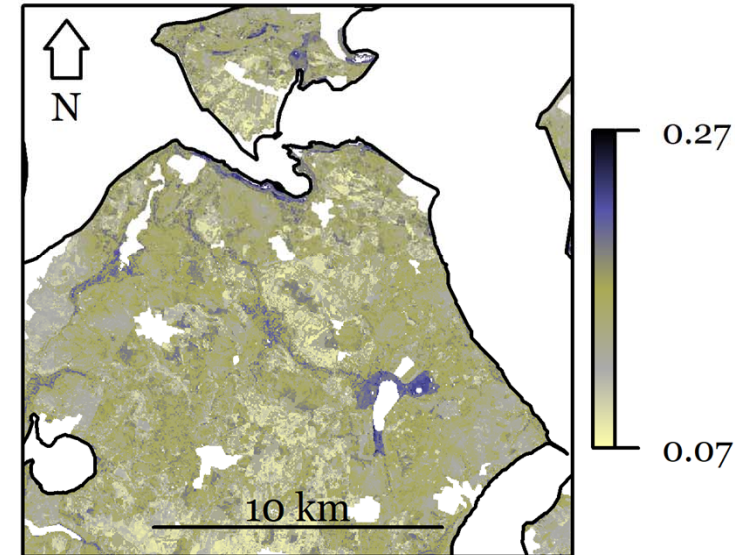
**G: Mean probability**



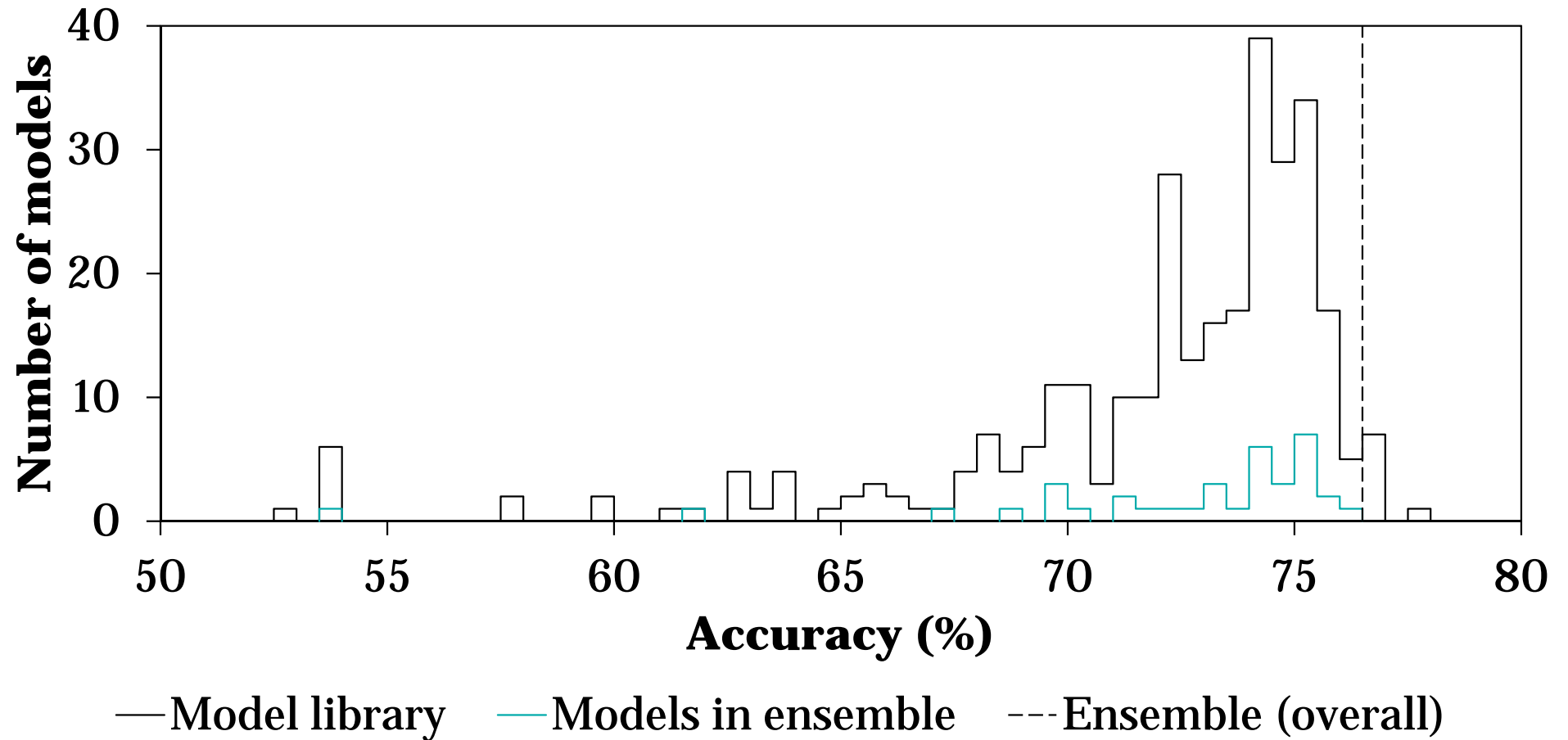
**H: Artificially drained**



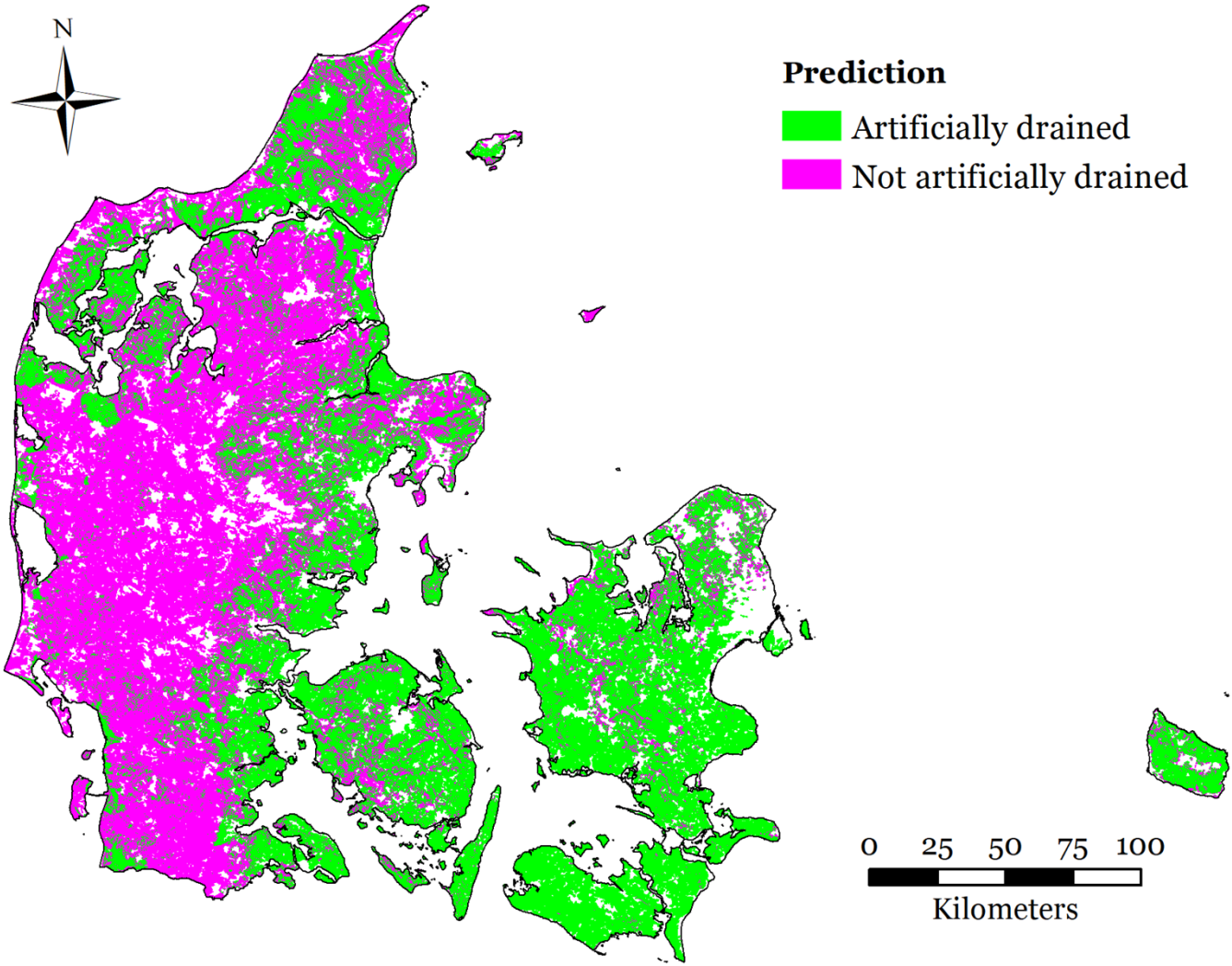
**I: SD of probabilities**



# Ensemble accuracy



# Predicted artificial drainage





# Top 10 covariates

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## Soil drainage classes

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Landuse

Geology

Downhill gradient to surface water

Wetlands

Clay (%); 100 - 200 cm

Geographic regions

Landscape elements

Depth of sinks

Horizontal distance to surface water

Vertical distance to surface water

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## Artificial drainage

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Clay (%); 60 - 100 cm

Clay (%); 30 - 60 cm

Clay (%); 0 - 30 cm

Clay (%); 100 - 200 cm

Precipitation

Geographic regions (W. Jutland)

Soil drainage class

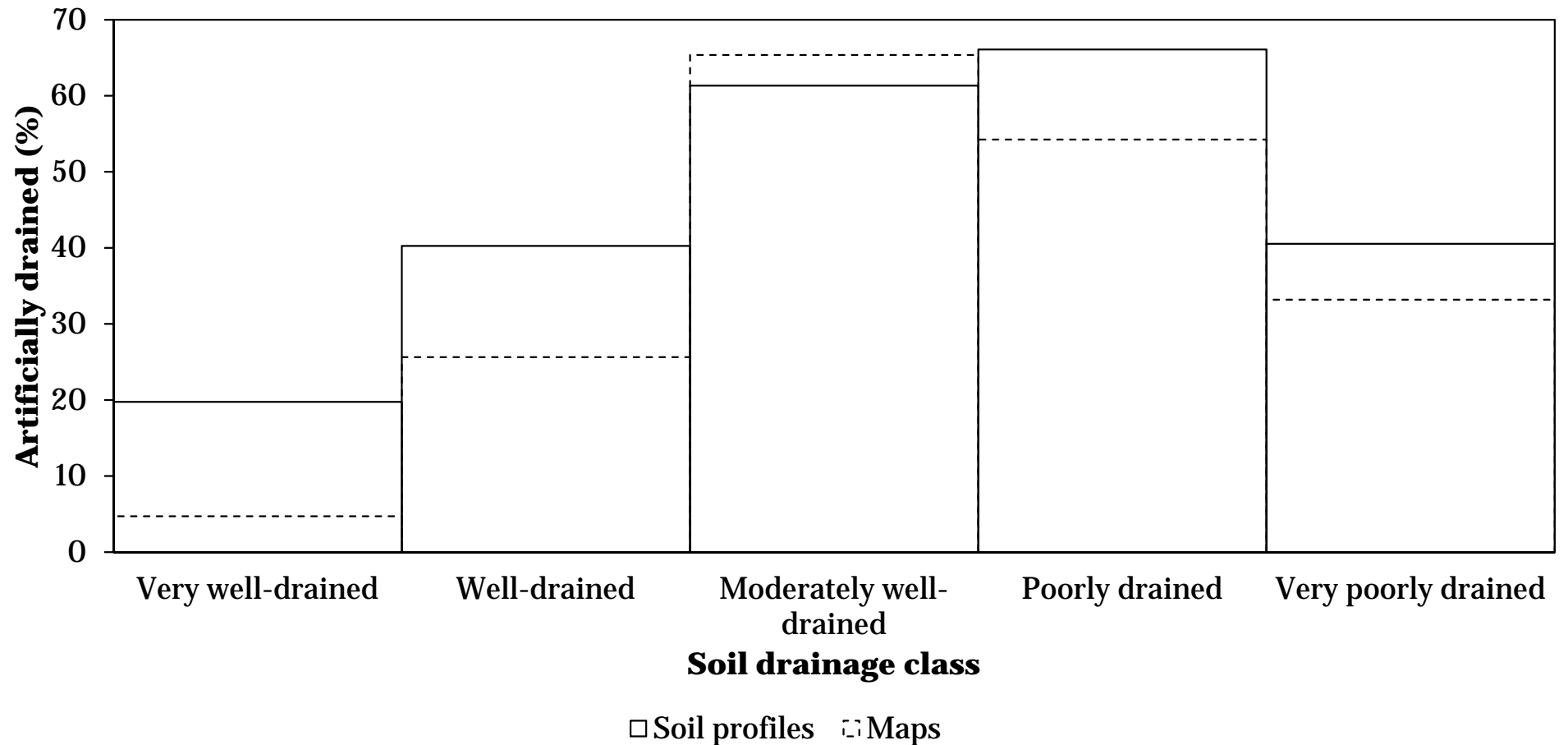
Geology (Clay till)

Geology (Sand till)

Depth to groundwater; model

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# Natural and artificial drainage



# Conclusion

Soil drainage classes predicted with 50% accuracy.

Artificial drainage predicted with 77% accuracy.

Predicted relationships between natural and artificial drainage match real patterns.