Assessing machine-learning algorithms for digital soil mapping in an agricultural lowland area: a case study of Lombardy region

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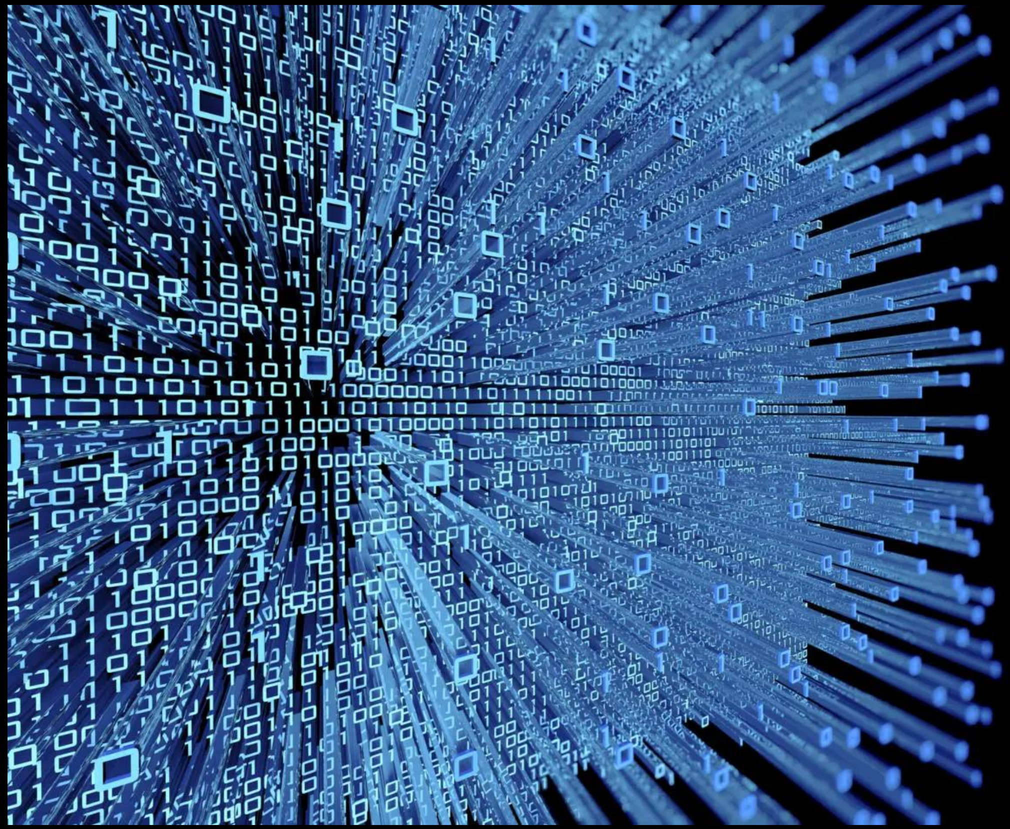
Goals

- ❑ Evaluate different supervised ML algorithms for DSM in a lowland area using terrain attributes;
- ❑ Identify the best-performing predictive models;
- ❑ Interpret the modelled relationships;
- ❑ Spatial prediction of soil properties



Martin Heller, 2019

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Study Area

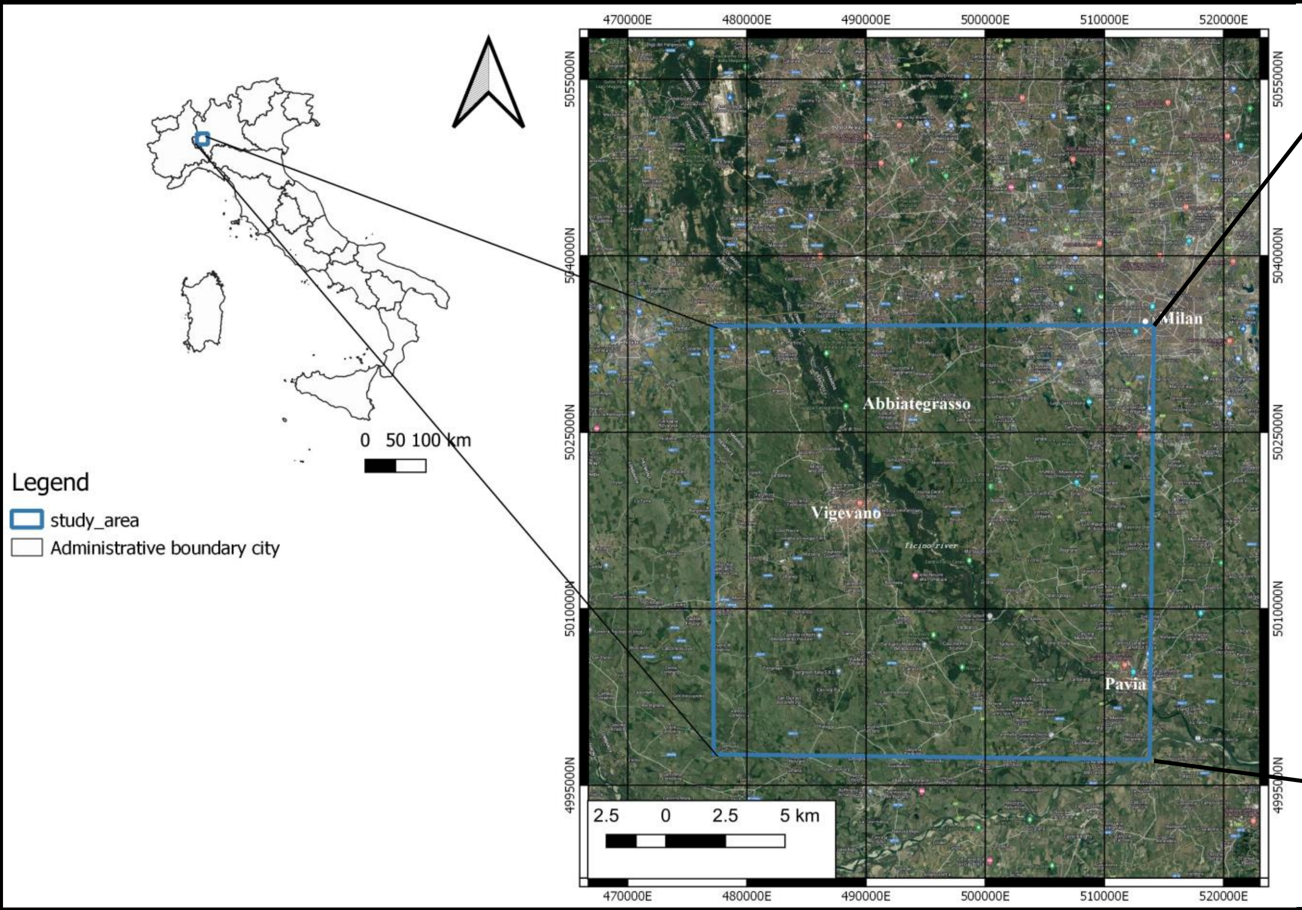

Fig 1. – Location of the study area

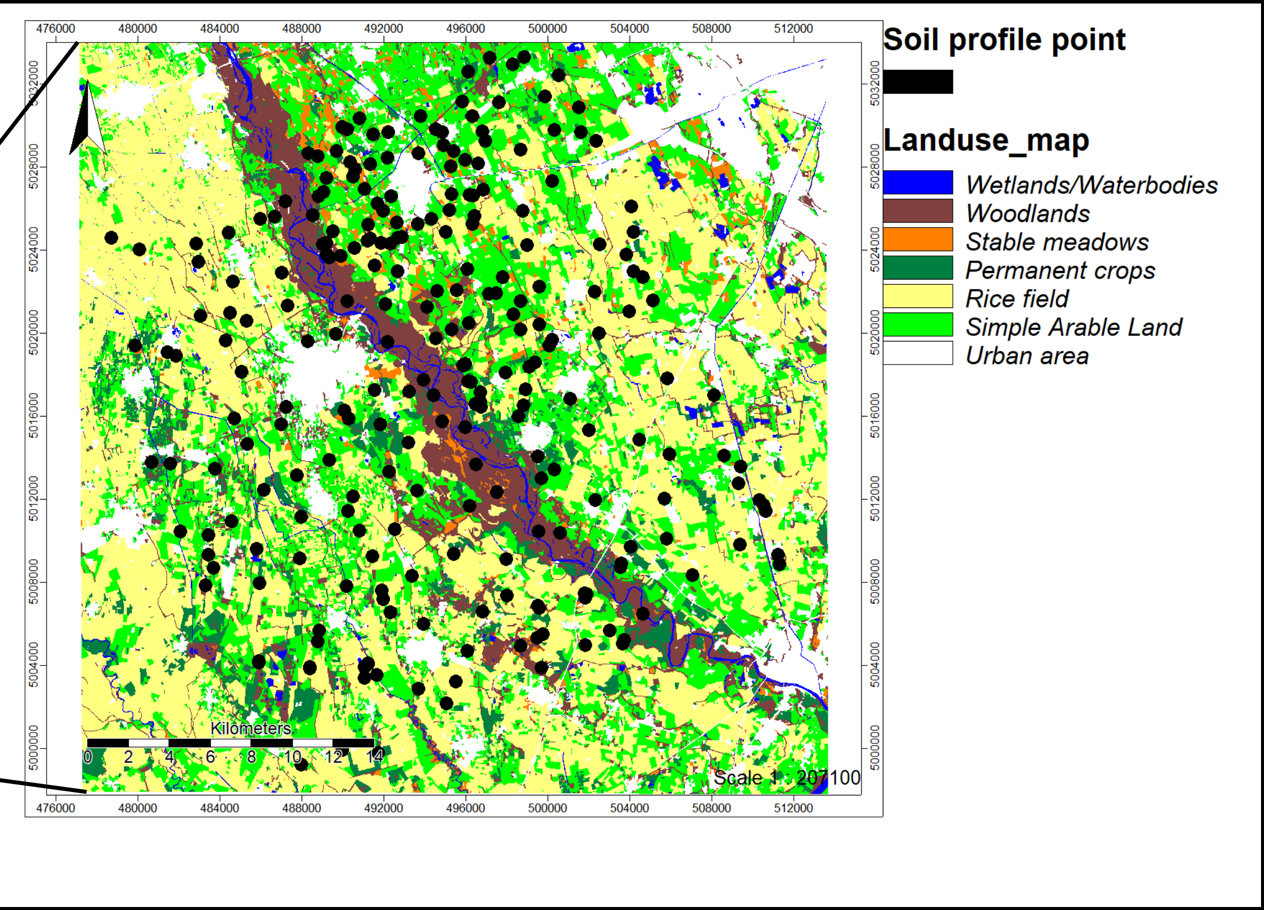

Fig. 2 –Land use of the study area

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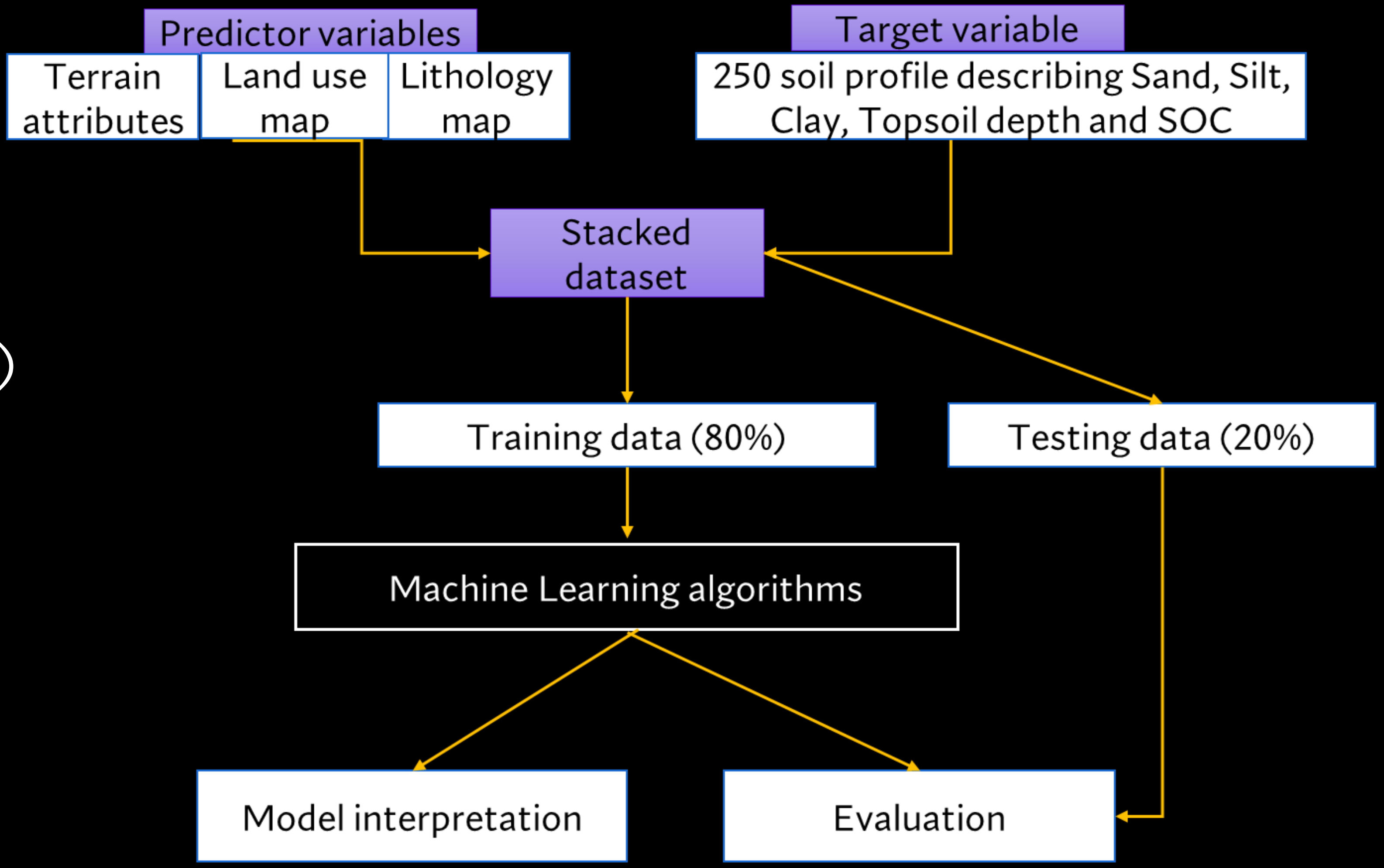
Methodology

Machine Learning Algorithms:

- Random Forest (RF) *Breiman (2001)*
- Support Vector Machine (SVM) *Cortes, Vapnik, & Saitta, (1995)* with radial basis function
- Gradient Boosting Machine (GBM)
- Generalized Addictive Machine (GAM)

Flow chart:



Hyperparameters were optimised on *CARET* package in R

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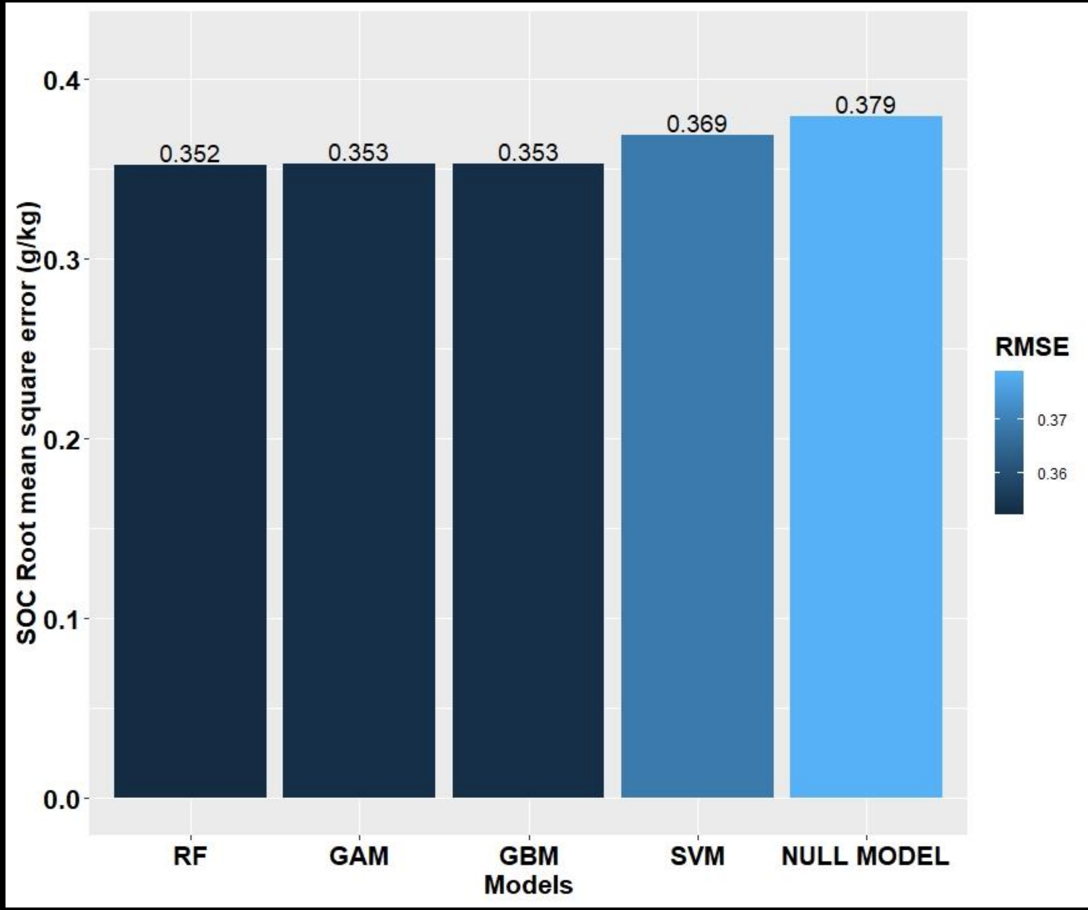
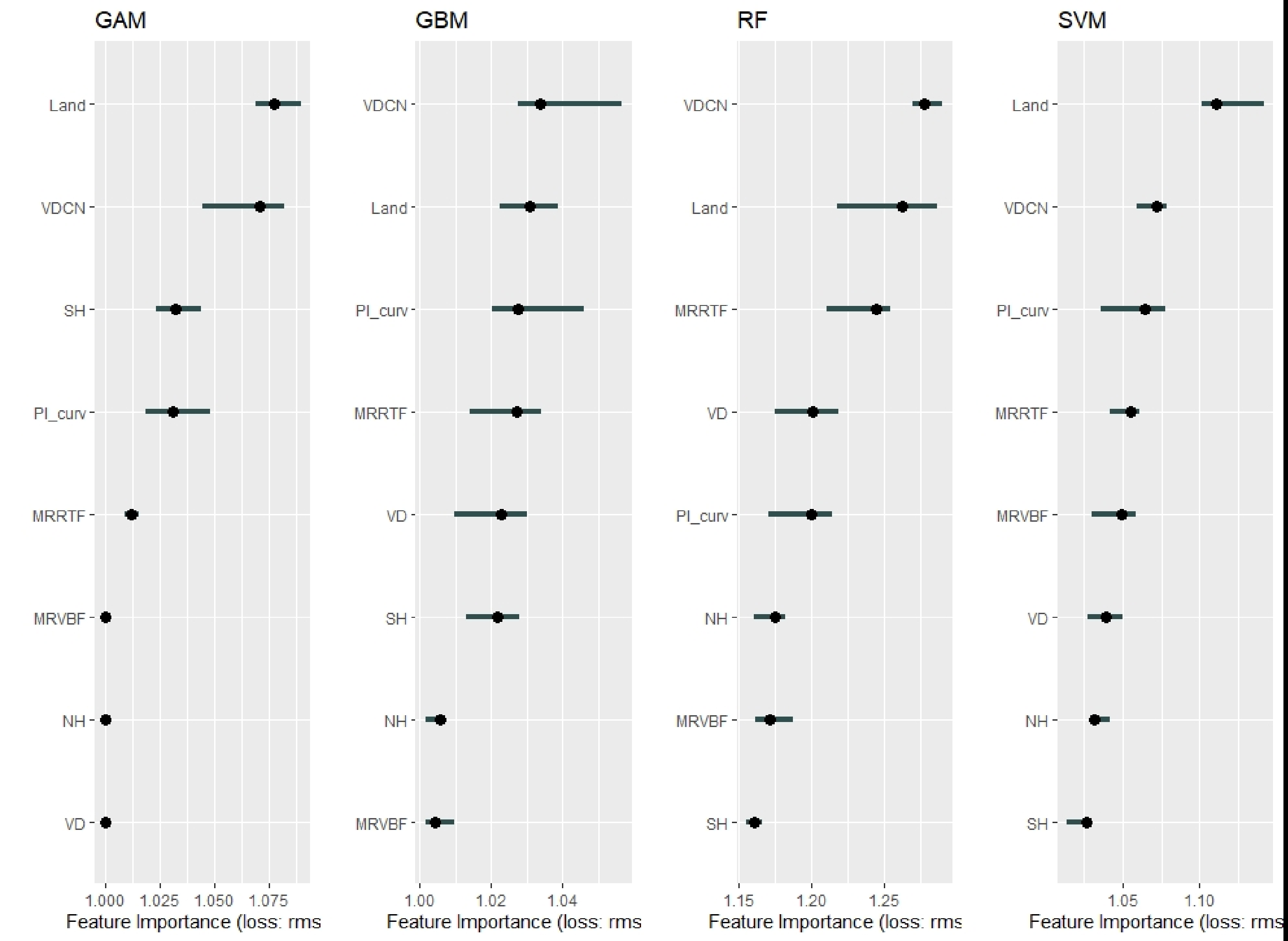
Results for SOC

Model Performance for SOC (g/kg):



Variable importance for SOC:



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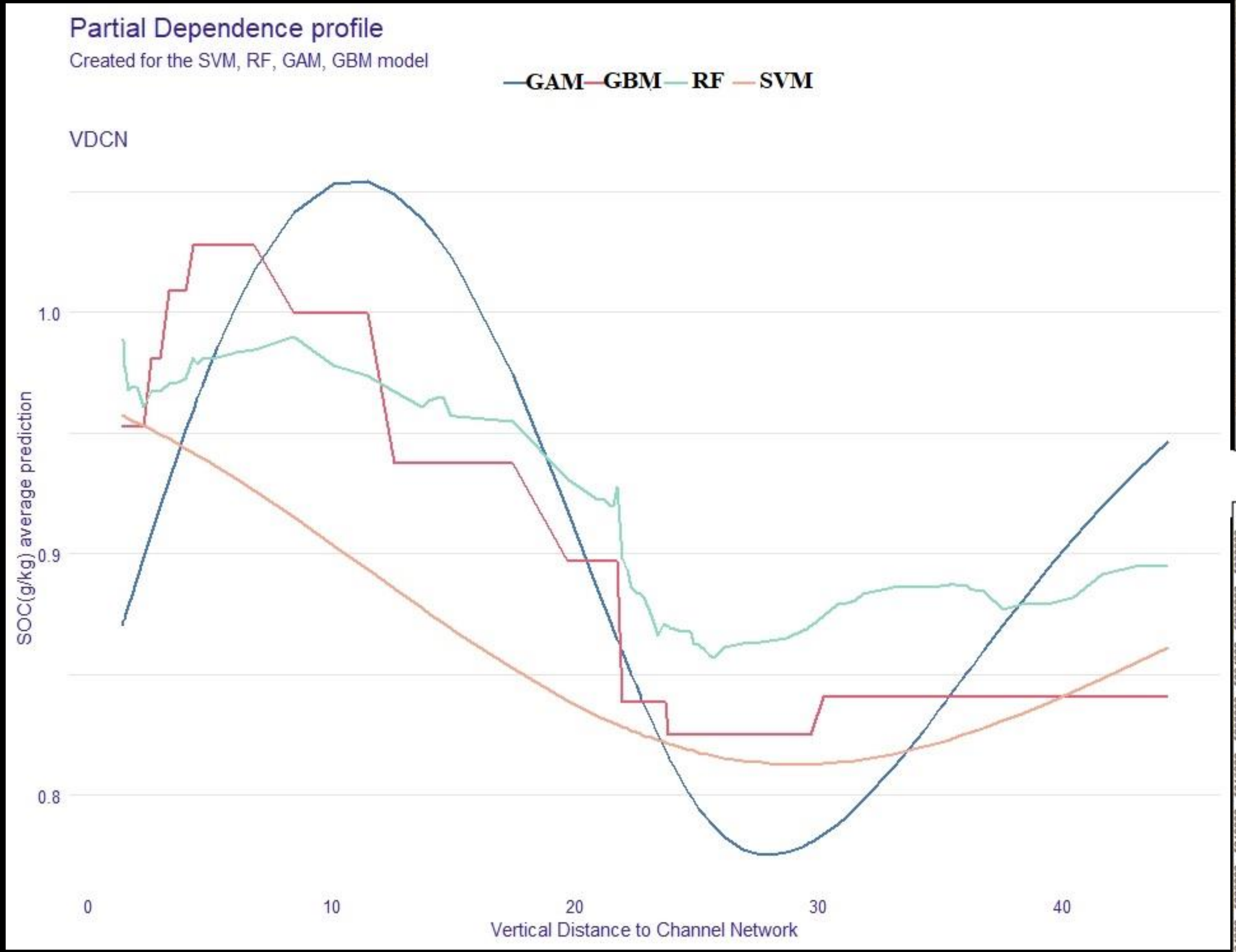
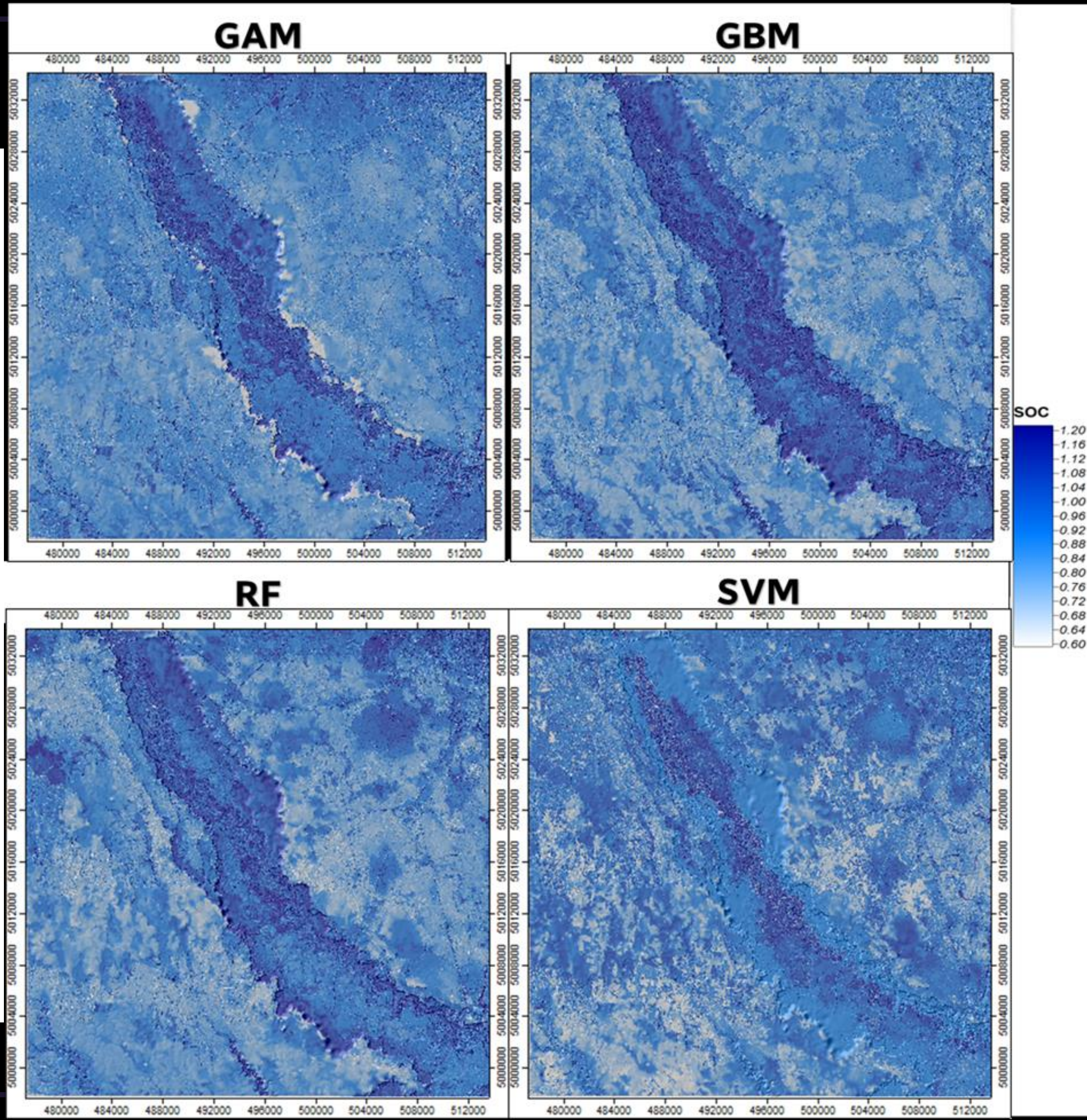
Partial dependence plot for SOC:



SOC map prediction overlay on Hillshade:



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Conclusion

- Preliminary results shows moderate performances of ML models for this lowland area;

→ Model predictions show incoherent spatial patterns;

→ Next step: include additional predictor variables;

- Vertical distance to Channel Network is an important variable as proxy for the evolution stage of soil in this area.

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