Spatially Enabling
Australia and New Zealand

Project 4.12 | Paddock Scale Mapping of Soil Carbon

Project Leader Prof D Lamb, Precision Agriculture Research Group, University of New England, dlamb@une.edu.au

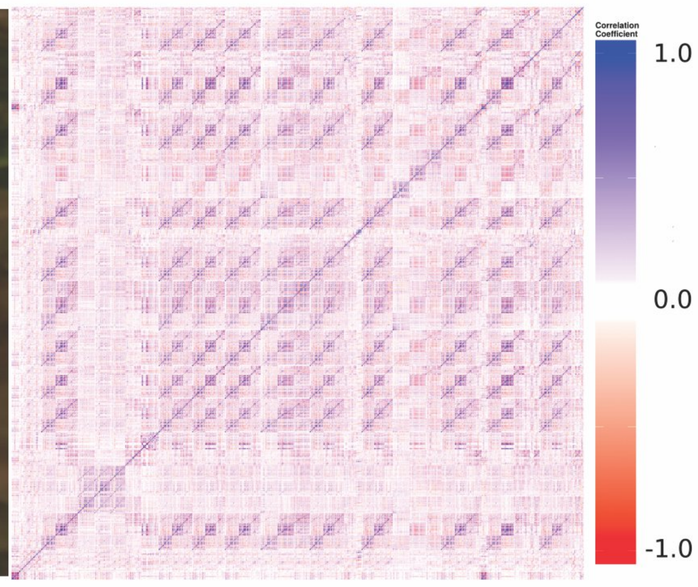
Research Team Mr BR Fitzpatrick, Queensland University of Technology; Prof P Grace, Queensland University of Technology; Prof D Lamb, University of New England; Prof K Mengersen, Queensland University of Technology

Project Participants Queensland University of Technology; University of New England

Objectives Generate knowledge of: a) the variability and trends in below ground carbon in farmscapes and b) the benefits and limitations of applying spatially-enabled processes to quantifying below ground carbon

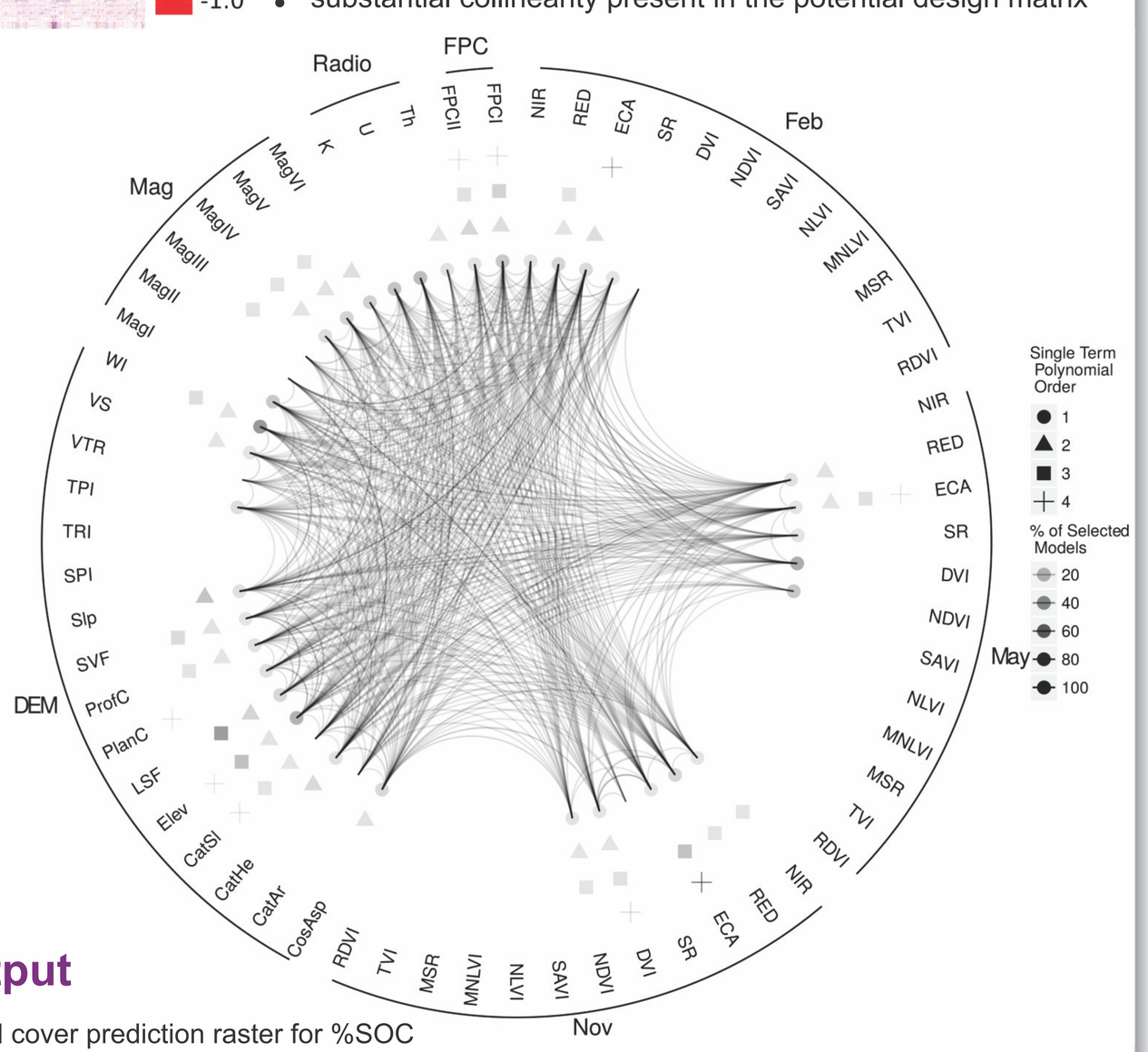
Outcomes A combination of methods selected from the statistical literature and implemented in the open source R language for statistical computing

- search large sets of potential covariates for those most useful for predicting soil carbon
- use selected full cover covariate layers to interpolate soil core derived measurements to full cover predictions for soil carbon



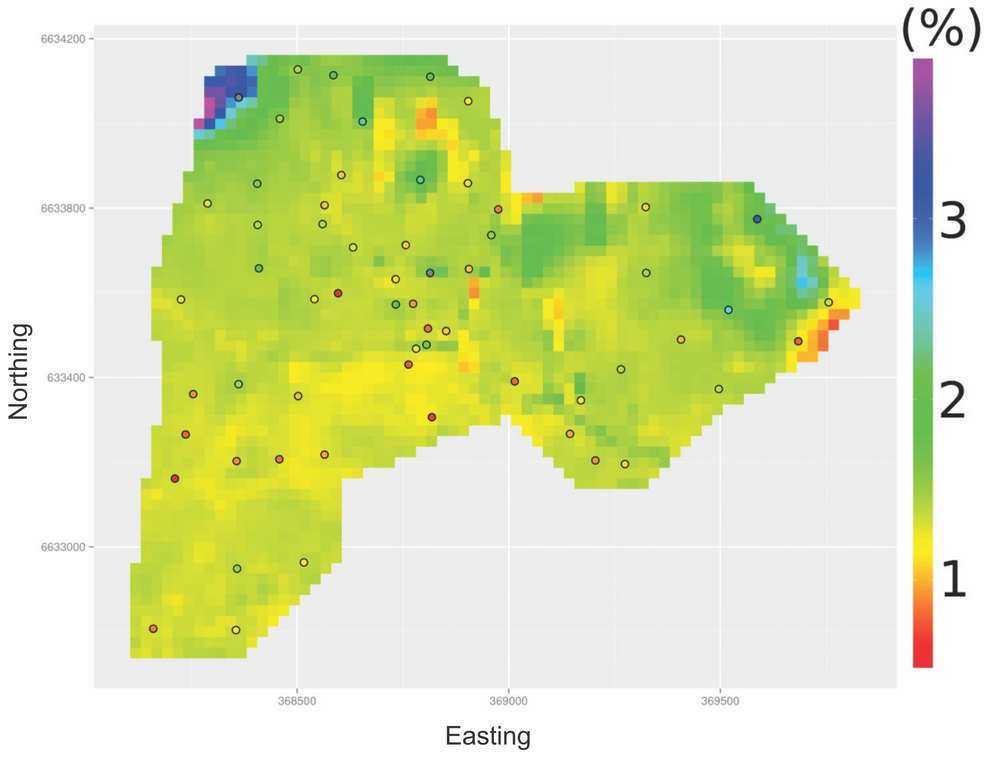
Input

- 60 soil core samples of percentage soil organic carbon (%SOC) from the Newholme field station of UNE, NSW
- 63 potentially useful environmental variables as full cover rasters to use as covariates
- each of the 63 covariates considered to polynomial order 4 along with all possible pairwise linear interactions resulted in 2205 potential covariate terms
- substantial collinearity present in the potential design matrix



Process

- 500 unique divisions of data into training sets of 35 observations and validation sets of 25 observations
- LASSO variable selection conducted on each training set with shrinkage parameter selected to minimise validation set prediction error
- 500 selected models model averaged with weights inversely proportional to the validation set prediction error sums of squares
- Model averaged predictions calculated for all pixels in the covariate rasters to construct the prediction raster for %SOC



Output

- Full cover prediction raster for %SOC
- Graphical depiction of relative utility of covariate terms for predicting %SOC
- Custom written functions in the open source R language for statistical computing to execute this method

Key References

Efron, B., Hastie, T., Johnstone, I., & Tibshirani, R. (2004). Least Angle Regression. The Annals of Statistics, 32(2), 407–451.

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