Soil Maps – Turning Old into New

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## AutoMAPticS – Automatic Mapping of Soils

Introduction

Knowledge about the spatial distribution of soil types and properties is crucial for the assessment of their ability to support a range of services, from food production, to biodiversity and pollution buffering. Whilst soil surveys have been carried out in many countries, the area coverage and scale of resulting soil maps are far from being ideal for planning applications at national level (Dobos *et al.*, 2006). Additionally, the lack of consistency between soil classifications and legends across countries contributes towards a slow progression in integrating soil datasets, even in Europe (ESBN, 2005).

GIS together with artificial intelligence (AI) maximize the information content of existing soil maps by learning the rules that have, more or less explicitly, led to the mapping of soil classes across the landscape, and then use that knowledge to predict the spatial distribution of soil classes or properties at similar resolutions.

Thus, one of the main objectives of AutoMAPticS , a project partiallly based on the development of artificial neural network (ANN) models, is to predict soil classes in (i) currently unmapped areas of Portugal, and (ii) harmonise soil legends across regions with distinct soil mapping classifications, using Portuguese and Spanish soil spatial datasets to a) improve the level of transnational data integration and b) assess existing data.

Existing Soil Maps
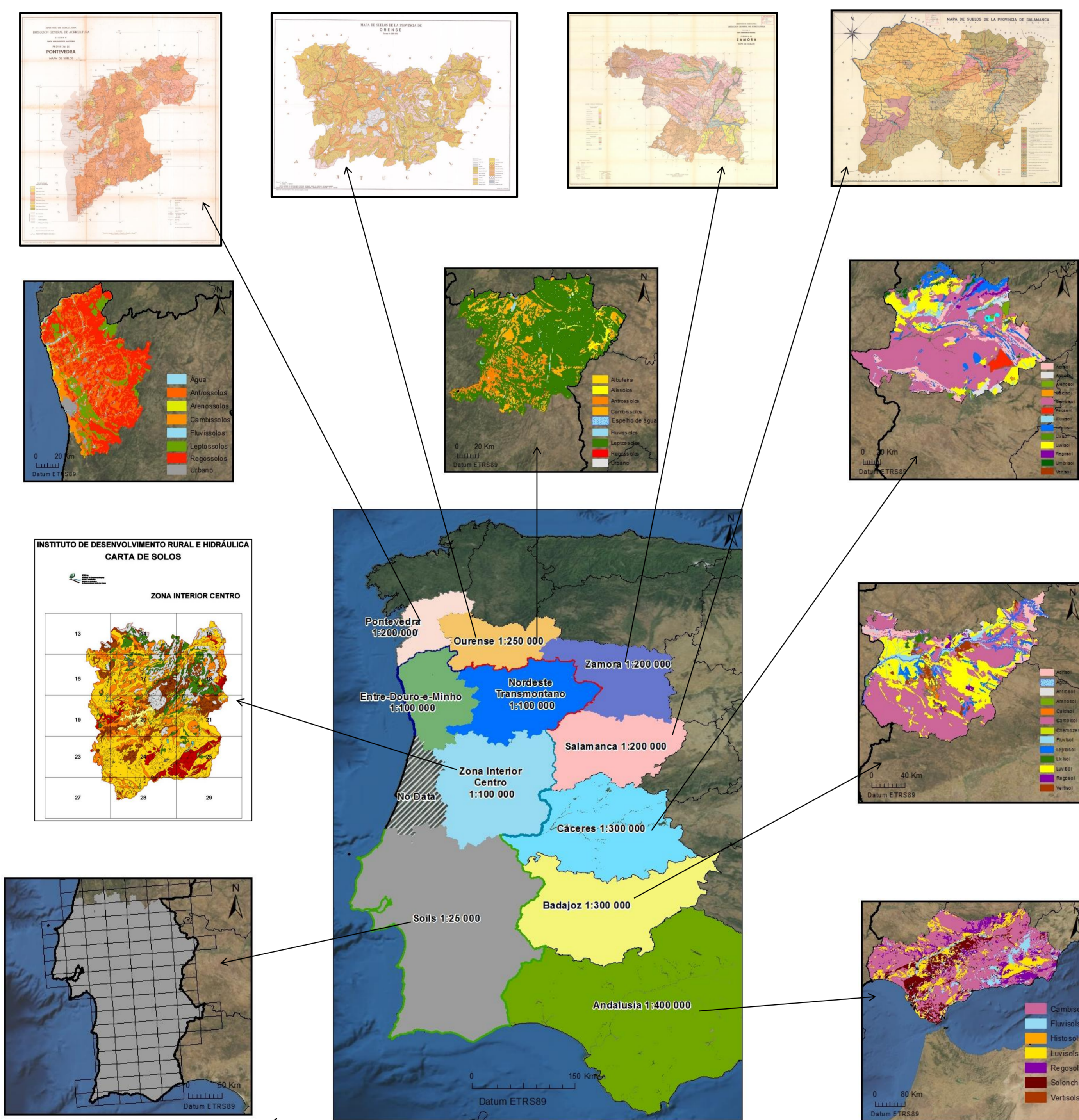
Data Constraints

➢ Soil map coverage remains incomplete
➢ There is a lack of cartographic uniformity between different regions:
✓ Scales (1:50000 and 1:100000)
✓ Taxonomic Systems (National and International (FAO))
✓ Framework (Physiographic vs Taxonomic)

Data Advantages

➢ 43% of the area has international standards of soil maps for which a very large number of geo-referenced soil samples were collected
➢ There are geo-referenced soil profile data at several sites in the unmapped areas
➢ Maps at different scales for the same areas provides the means for a thorough assessment of predicted soil maps

Spatial Modelling of Soils

Issues Addressed

Predicted soil types and properties at new locations

➢ Input Data Resolution
➢ Types of ANN models
➢ ANN model parameters
➢ Global vs Local ANNs
➢ Training Areas
➢ Geographical Transferability
➢ Fuzziness

Artificial Neural Network
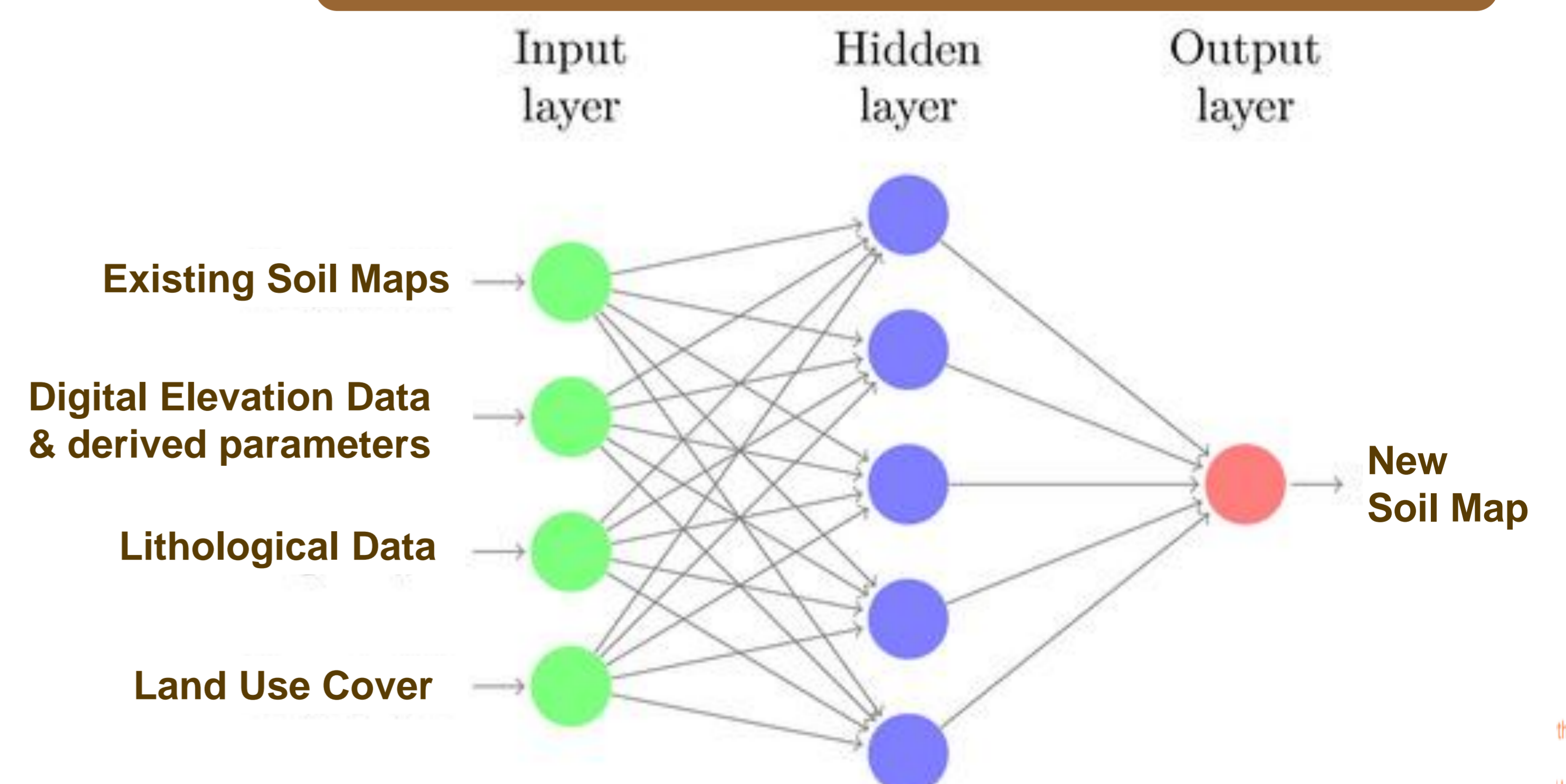
References

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ESBN (EUROPEAN SOIL BUREAU NETWORK) (2005) *Soil Atlas of Europe*. European Commission, Office for Official Publications of the European Communities, L-2995 Luxemburg, 128pp.

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