Science Societies

Prediction accuracy of empirical relationships comparable to machine learning

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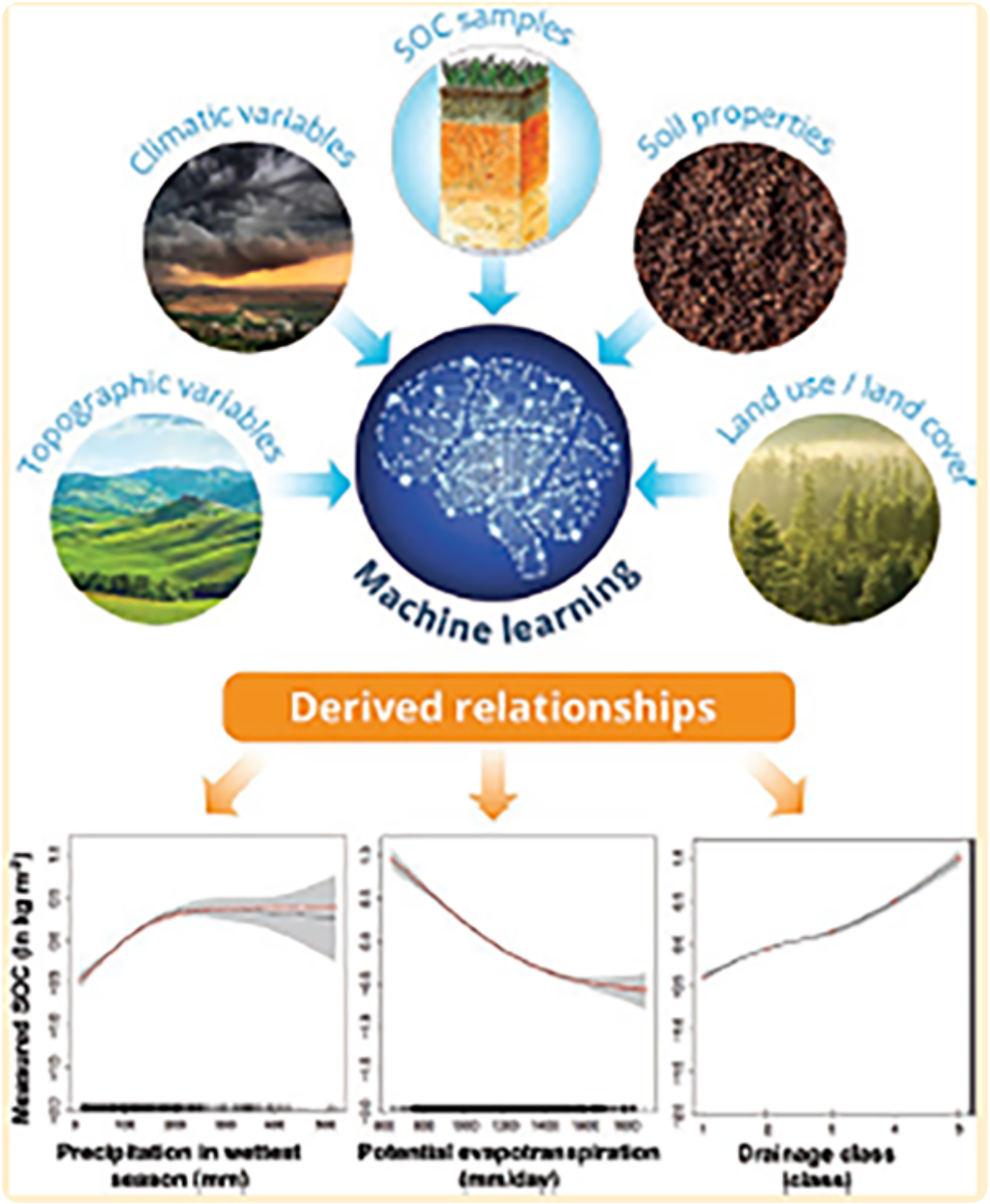

Machine learning to derive predictive relationships between environmental factors and soil organic carbon stocks. Image by Brent Haglund, Sandia National Laboratories.

Relationships between environmental factors and soil organic carbon (SOC) are used in earth system models (ESMs) to predict changes in SOC and carbon–climate feedbacks. Currently, there is large uncertainty in predicting SOC response to changing climate. Accurate representation of environmental controllers of SOC in ESMs could reduce these uncertainties.

Researchers used data of environmental factors, field SOC observations, and machine-learning (ML) approaches to derive empirical relationships between environmental factors and SOC stocks. From this, SOC stocks were predicted, the accuracy of which was compared with the ML predictions.

Prediction accuracy of the derived empirical relationships was comparable to that of ML while using only a subset of the environmental factors used in the ML approach. These empirical relationships can serve as important benchmarks to evaluate environmental control representations of SOC stocks in ESMs, which could reduce uncertainty in predicting future carbon–climate feedbacks.

The approach used in this study generates insights into how environmental factors are controlling SOC stocks and differs from the ML approach, which offers few insights into the mathematical relationships between input and output variables.

Dig deeper

Mishra, U., Yeo, K., Adhikari, K., Riley, W.J., Hoffman, F.M., Hudson, C., & Gautam, S. (2022). Empirical relationships between environmental factors and soil organic carbon produce comparable prediction accuracy to machine learning. *Soil Science Society of America Journal*. **https://doi.org/10.1002/saj2.20453**

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