Predicting global potential natural vegetation with an image recognition AI

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Potential natural vegetation (PNV) is the vegetation cover equilibrium with environmental condition, which would exist at a given location without human land-conversion. For operational mapping of PNV, we developed an empirical model using a deep neural network (DNN), which was trained by an observation based PNV map (Figure 1) and graphical images of global air temperature and precipitation at 0.5 degree resolution. The trained model well reconstructs an observation based global PNV map, demonstrating that this way of DNN application can capture empirical relationships between PNV and climate. Then, the trained model was applied to projected climate at the end of the 21st century, predicting significant shift of global PNV distribution with rapid warming trends (Figure 2).

Keywords: Climate Envelope, Potential Natural Vegetation, Image Recognition AI

Figure 1.
An observation based potential-natural-vegetation (PNV) map of the ISLSCP2.
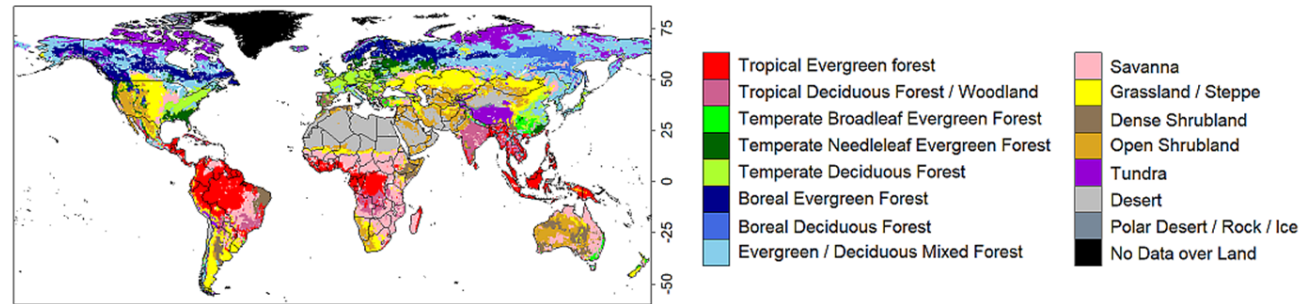

Figure 2.
Predictions of PNV map under the forecasted climate during 2091 to 2100. Monthly means of four forecasted climatic conditions, those are the combinations of two climate models (Had2GEM-ES and Miroc-ESM) and two RCP scenarios (RCP2.6 and RCP8.5), were applied for the DNN model that was trained by present climatic condition in the CRU data.