Assignment 3

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AIM –

To Predict the future climate/geographical suitability of Rice in India using the MaxEnt model.

Requirements –

- MaxEnt model and Java Environment to run the model.
- Fututre Climate data from WorldClim website, in particular, using the 2050 ***MIROC-ES2L*** *maximum and minimum temperature* data in this assignment.
- Rice crop prediction data.
- Shape file for India for the QGIS platform .
- QGIS
- Rstudio/ TinnR or any other editor+console for R language.

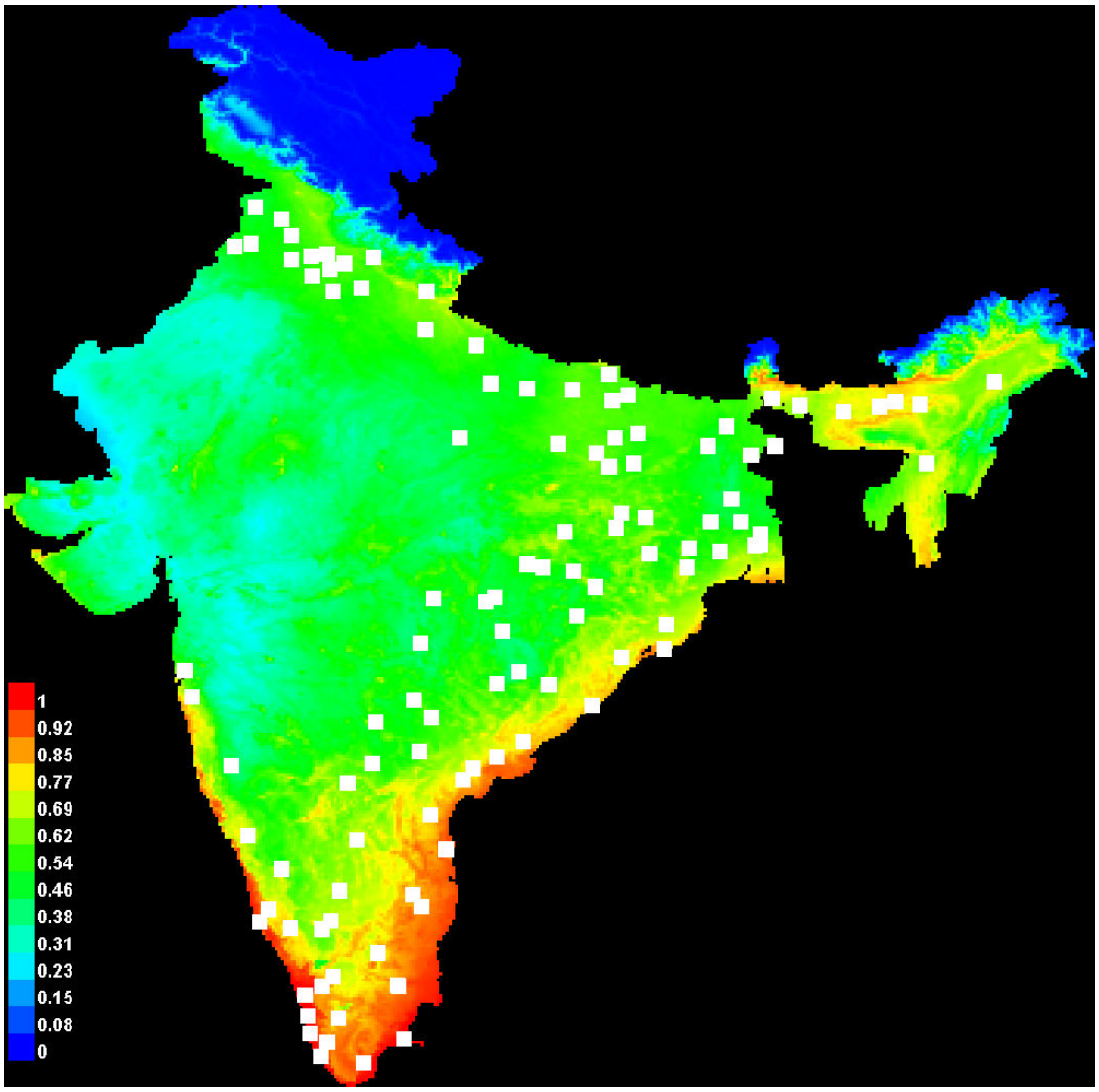
About Maxent –

> Maxent is an open source software for modeling species niches and distributions by applying a machine-learning technique called maximum entropy modeling. From a set of environmental (e.g., climatic) grids and georeferenced occurrence localities, the model expresses a probability distribution where each grid cell has a predicted suitability of conditions for the species.

Procedure –

- Download and install the QGIS software which we will use to extract data.
- Download the future environmental data from WorldClim website, we are using the 2041-2060 MIROC-ES2L data as specified in the requirements section. This data will be in tif files, and for the whole globe.
- To get the data for India, open these files in QGIS. Once the project is opened, click on add vector layer under the layers tab. When prompted to select the vector layer, choose the India shape file.
- After this, check the Extraction options in the Raster tab. Select the Clip Raster by Masked Layer and choose a destination for the output.
- Do so for both the files.
- MaxEnt uses ASC files, and we convert these tif files into asc using Rstudio.
- Using the script provided for conversion to asc, we get our MaxEnt input files.
- In MaxEnt, select the rice csv file in Sample Layer tab and both the asc files we have in the Environmental Layers tab. Select an output destination.
- A pictorial representation can now be found along with some plots under the *plots* folder provided in output.

Observation –



- As mentioned in the key provided near the bottom left of the picture, Red indicates a high suitability, Blue indicates extremely low suitability.
- Therefore, predicted by the model, **Andhra Pradesh, Tamil Nadu, Kerala and Karnataka,** especially along the coastline, will be *highly suitable* for rice cultivation in the 2041-2060 year range.
- Even the Eastern region of Telangana, parts of Odisha and West Bengal are fairly suitable for rice cultivation.

Conclusion –

- The suitability for rice crop cultivation shows a decreasing trend as we go North from the Southern end.
- The Eastern side is more suitabile than the Western side.
- A general observation suggests high moisture paired with moderate climatic conditions as an ideal environment for cultivation.