Uncovering Effects of Climate Variables on Global Variation

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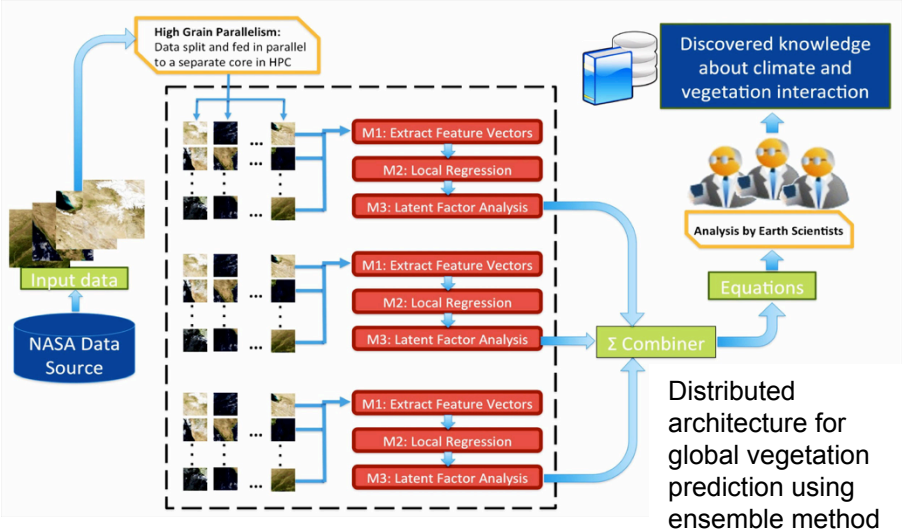
Objective

- Develop methodology to correlate data related to ecosystem dynamics, climate factors, anthropogenic disturbances, and extreme events.
- Implement symbolic regression algorithm at the NASA Earth Exchange (NEX). to identify relationships among measured parameters:
  - Precipitation, solar radiation, temperature.
  - Vegetation characteristics.
  - Drought, heat waves, forest fires, irrigation
- Demonstrate technology to answer three science questions:
  - What are the impacts of two Amazon droughts?
  - What are factors impacting vegetation anomalies?
  - How do vegetation factors vary globally?



Distributed architecture for global vegetation prediction using ensemble method

Accomplishments

- Translated constrained symbolic regression to form linear equations and demonstrated significant improvement over state-of-the-art linear systems in predicting vegetation as a function of climate variables.
- Extended symbolic regression to form non-linear equations. Validated using small scale data set.
- Scaled non-linear regression to global level using data and task parallelization.
- Analyzed equations in conjunction with domain expert feedback to understand the effect of climate variables on Amazon vegetation. Demonstrated that hierarchical modeling identifies regions of the Amazon with different climate variables driving vegetation, as measured by Normalized Difference Vegetation Index (NDVI).
- Finalized code into a GitHub repository for easy access, download, and future applications/extensions.

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$TRL_{in} = 2$ $TRL_{out} = 4$