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- IN11B-1621: Quantifying How Climate Affects Vegetation in the Amazon Rainforest

  Monday, 12 December 2016

  08:00 - 12:20

  - Moscone South
  - - Poster Hall

Amazon droughts in 2005 and 2010 have raised serious concern about the future of the rainforest. Amazon forests are crucial because of their role as the largest carbon sink in the world which would effect the global warming phenomena with decreased photosynthesis activity. Especially, after a decline in plant growth in 1.68 million km^2 forest area during the once-in-a-century severe drought in 2010, it is of primary importance to understand the relationship between different climatic variables and vegetation. In an earlier study, we have shown that non-linear models are better at capturing the relation dynamics of vegetation and climate variables such as temperature and precipitation, compared to linear models.

In this research, we learn precise models between vegetation and climatic variables (temperature, precipitation) for normal conditions in the Amazon region using genetic programming based symbolic regression. This is done by removing high elevation and drought affected areas and also considering the slope of the region as one of the important factors while building the model. The model learned reveals new and interesting ways historical and current climate variables affect the vegetation at any location. MAIAC data has been used as a vegetation surrogate in our study. For temperature and precipitation, we have used TRMM and MODIS Land Surface Temperature data sets while learning the non-linear regression model. However, to generalize the model to make it independent of the data source, we perform transfer learning where we regress a regularized least squares to learn the parameters of the non-linear model using other data sources such as the precipitation and temperature from the Climatic Research Center (CRU). This new model is very similar in structure and performance compared to the original learned model and verifies the same claims about the nature of dependency between these climate variables and the vegetation in the Amazon region. As a result of this study, we are able to learn, for the very first time how exactly different climate factors influence vegetation at any location in the Amazon rainforests, independent of the specific sources from which the data has been obtained.

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