El Niño, one of the major meteorological phenomena of today’s world, is a period in which ocean temperatures in the Equatorial Pacific are unusually warm (Tropical Ocean Atmosphere Project) and is more formally defined as the occurrence of a “sea surface temperature departure from normal (for the 1971-2000 base period) in the Niño 3.4 region greater than or equal in magnitude to 0.5 degrees C (0.9 degrees Fahrenheit), averaged over three consecutive months” (NOAA News Online). It is characterized by “unusually high atmospheric sea level pressures… in the western tropical Pacific and Indian Ocean regions, and unusually low sea level pressures… in the southeastern tropical Pacific” (Tropical Ocean Atmosphere Project). El Niño causes increased rainfall across the southern tier of the US and in Peru, which has caused destructive flooding, and drought in the West Pacific, sometimes associated with devastating brush fires in Australia. Unfortunately, these damages linked to El Niño can cause billions of dollars in damages (Pielke and Landsea 2030), making methods of predicting El Niño so important.

There are many different methods which can be used to develop El Niño predictions, one of which is the use of an evolutionary algorithm. An evolutionary algorithm is a method of developing a predictive model and follows the following basic structure (What is an Evolutionary Algorithm?):

1. Generate many random models
2. Test each model for effectiveness/accuracy
3. Create new models using characteristics of the better models of step 2
4. Repeat steps 2 and 3 until desired effectiveness/accuracy is reached

As can be seen, the evolutionary algorithm is named as such due to its similarity with Charles Darwin’s theory of evolution.

Previous work has been done demonstrating the effectiveness of an El Niño prediction model which made use of an evolutionary algorithm (Álvarez et al.). However, this work is quite limited. First, the model only looked at the Japan Meteorological Agency (JMA) Index, the sea surface temperature of a region in the tropical Pacific. Other El Niño prediction models use many other factors, such as sea surface temperatures in other regions or air pressure deviations from the norm. Furthermore, the study only produced a model but did not test it for accuracy. These issues could be improved through the incorporation of additional and diverse factors into the model. In fact, by developing different models using different factors, insights regarding the importance of each factor in predicting El Niño may arise. Also, the models could be tested for accuracy by looking at how well they would have predicted past El Niños. Finally, rather than simply predicting the occurrence of an El Niño, the new model could also predict the event’s severity—arguably the more important measure.

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