

Deeper Insights: Developing a Deep Learning Algorithm for Climate Change Prediction

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The Climate Change Prediction Problem

According to the Department of Civil Engineering and Environmental Sciences at Loyola Marymount University, climate change projections continue to be dominated by large uncertainties.

- Complex dynamic models
- Outdated statistical models
- Computationally inefficient “ensemble methods”

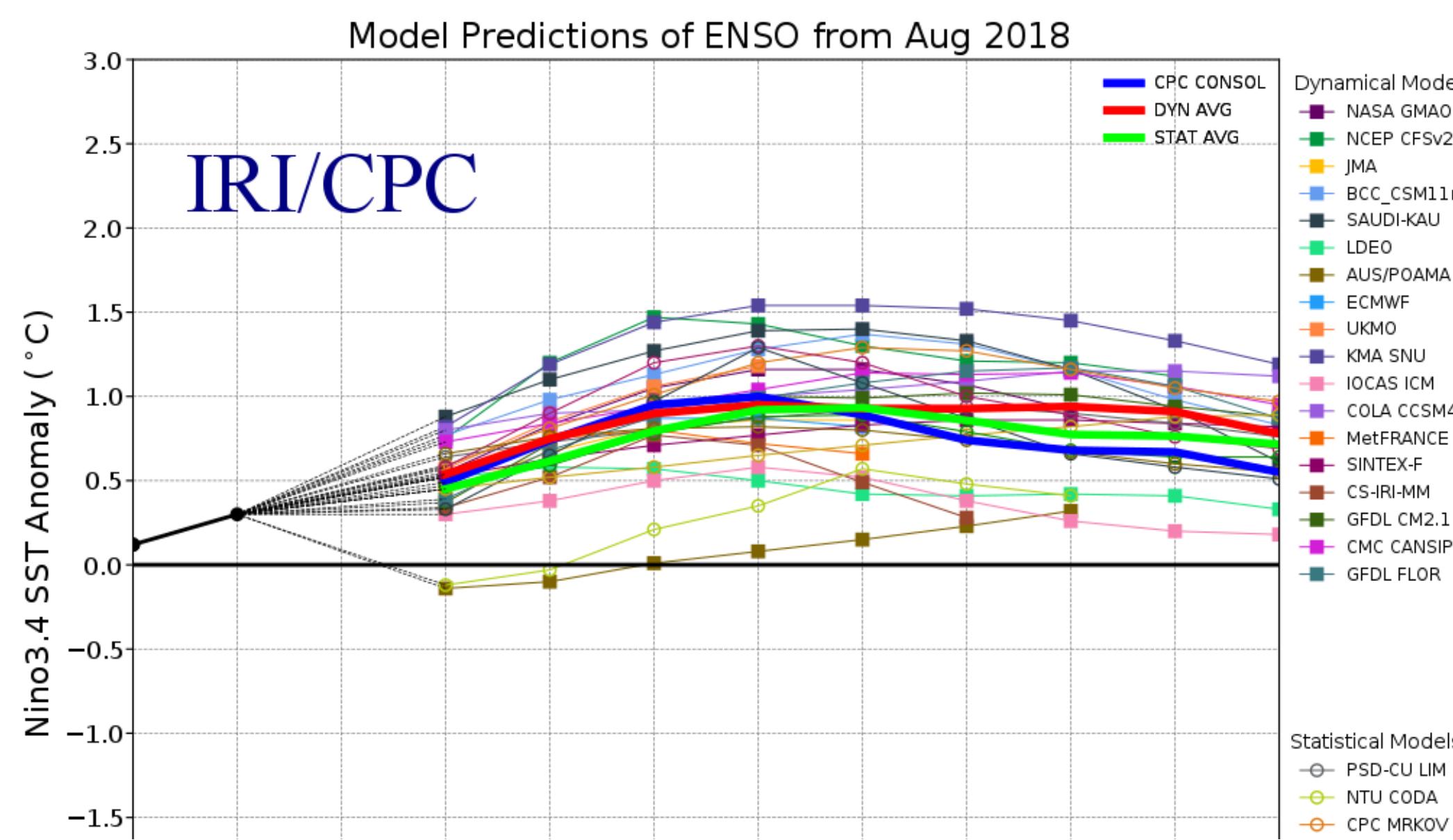


Fig 1: Current statistical models used to predict El Niño

The Solution

Recent research in the field of Artificial Intelligence has provided advances in such topics as:

- Deep Learning Algorithms
- High quality data
- Cloud computing

These advances have increased the likelihood of major breakthroughs in solving climate prediction problems.

The Algorithm

The algorithm is composed of a Long Short-Term Memory Neural Network given that our data represents an evolution of a system in time.

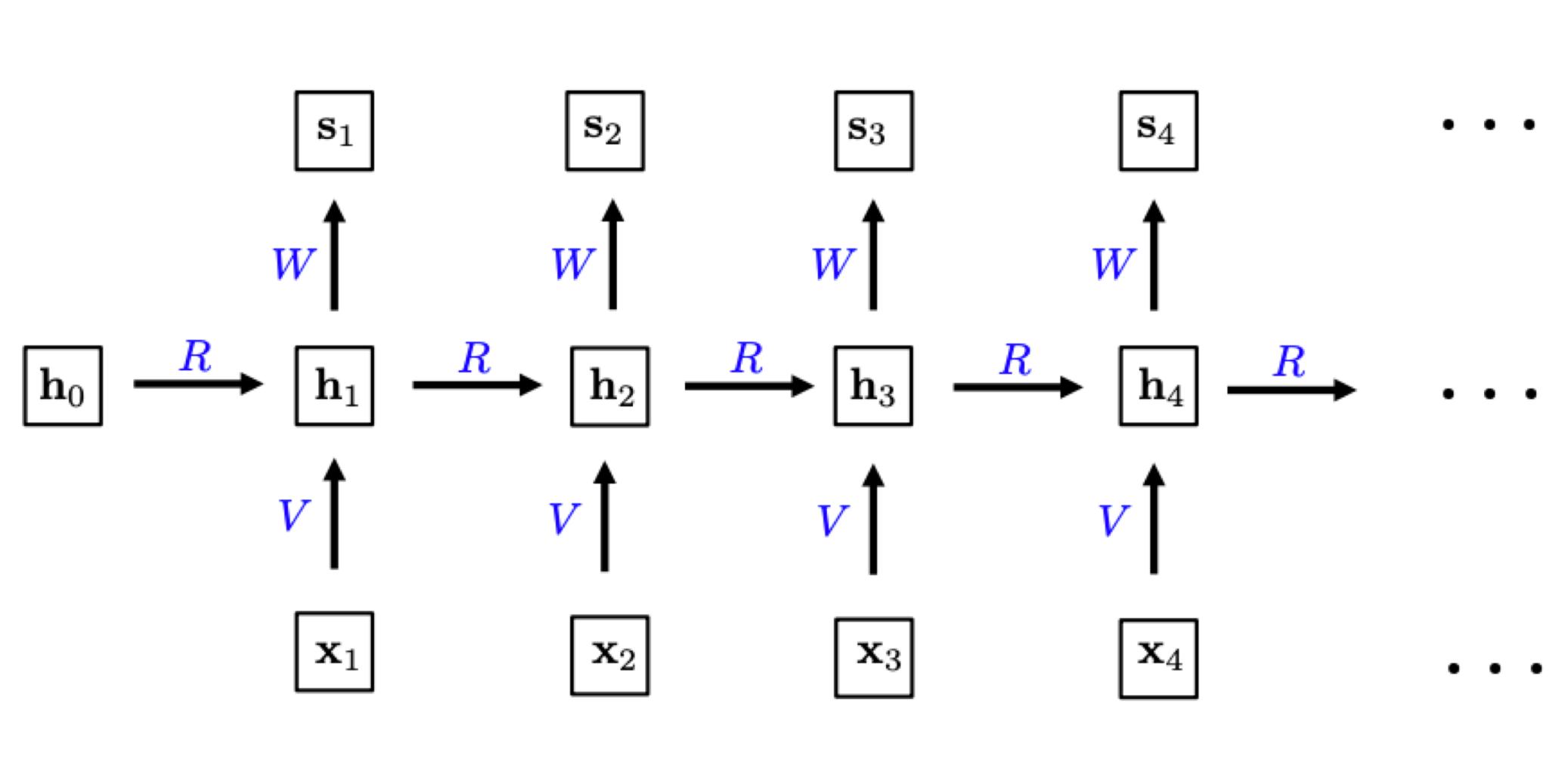


Fig 2: Visual Representation of the LSTM network

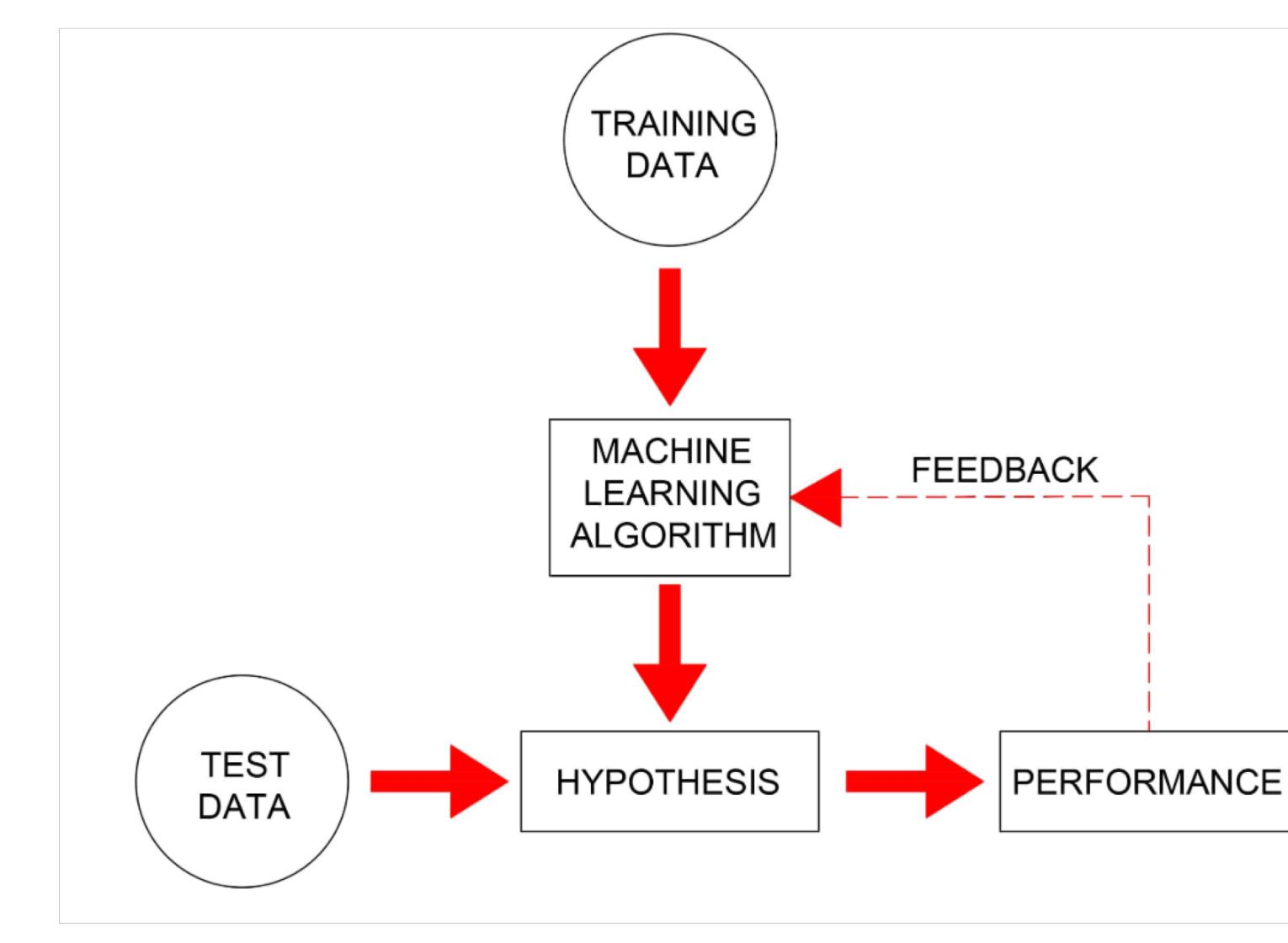


Fig 3: Visualization of a Machine Learning Algorithm's Pipeline

The Data

	Zonal_Winds	Meridional_Winds	Humidity	Air_Temp	Sea_Surface_Temp
0	-6.8	0.7	81.236525	26.14	26.24
1	-4.9	1.1	81.236525	25.66	25.97
2	-4.5	2.2	81.236525	25.69	25.28
3	-3.8	1.9	81.236525	25.57	24.31
4	-4.2	1.5	81.236525	25.30	23.19

$x_0 = \begin{bmatrix} -6.8 \\ 0.7 \\ 81.2 \\ 26.1 \\ 26.2 \end{bmatrix}, x_1 = \begin{bmatrix} -4.9 \\ 1.1 \\ 81.2 \\ 25.7 \\ 26.0 \end{bmatrix}, x_2 = \begin{bmatrix} -4.5 \\ 2.2 \\ 81.2 \\ 25.7 \\ 25.3 \end{bmatrix}, x_3 = \begin{bmatrix} -3.8 \\ 1.9 \\ 81.2 \\ 25.6 \\ 24.3 \end{bmatrix}, x_4 = \begin{bmatrix} -4.2 \\ 1.5 \\ 81.2 \\ 25.3 \\ 23.2 \end{bmatrix}$

Fig 4: Algorithm's Input features

The Prediction Results

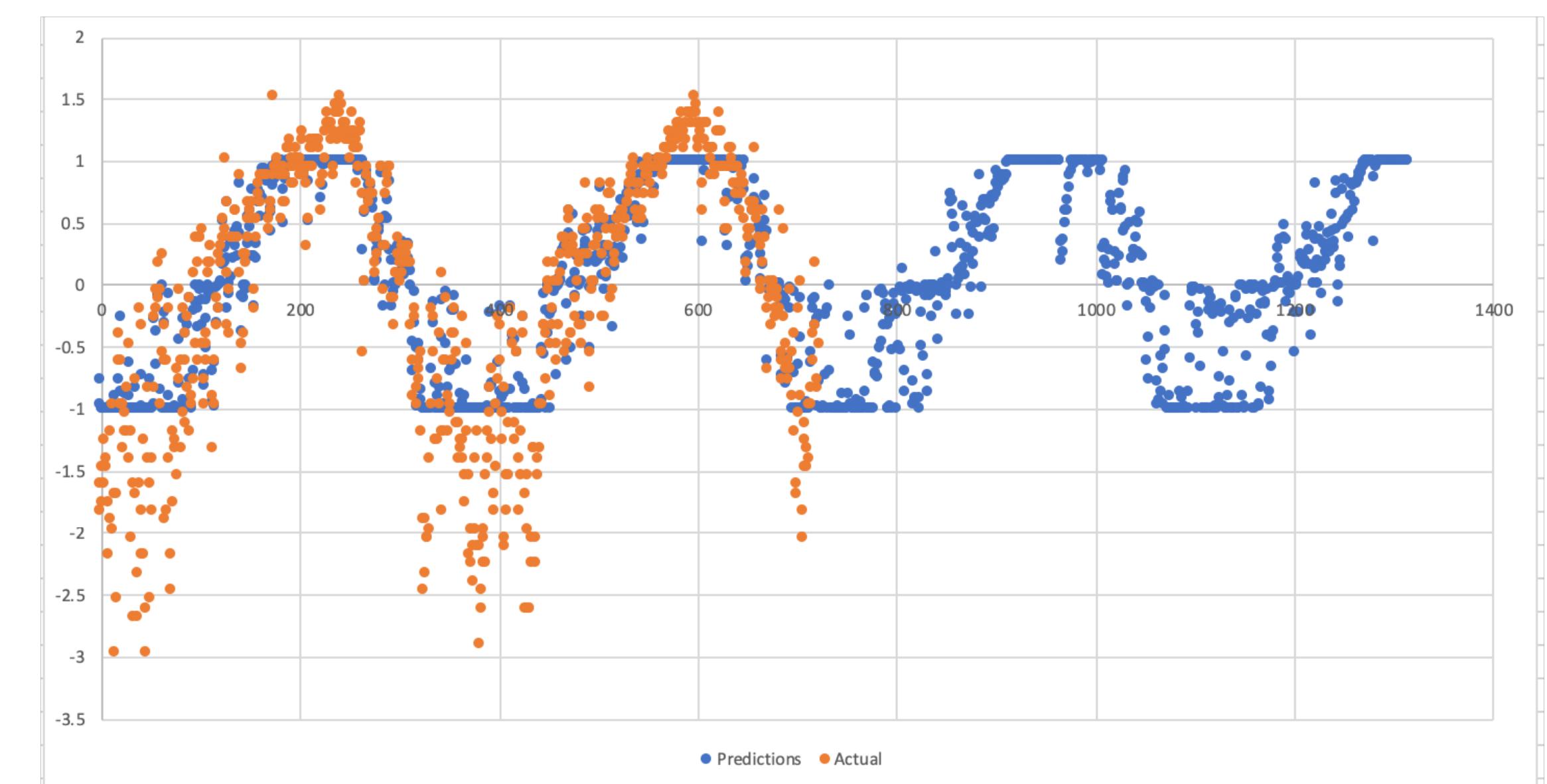


Fig 5: Mean sea surface level temperature as a function of time

The User Interface (UI)

Fig 6: Screen shot of the “about page”

Fig 7: Screen shot of the “predictions page”

The UI is composed of two main web pages:

About Page

- Problem
- Solution
- Challenges

Predictions Page

- Time input query form
- Algorithm predictions

The Technologies

