AMSIMP

Website: https://amsimp.com

GitHub: https://github.com/amsimp

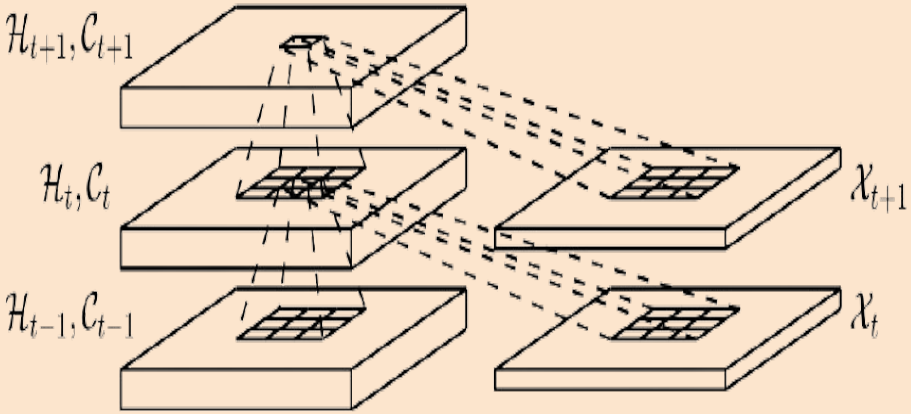
@amsimp_team

Advantages of Using Machine Learning

Weather forecasting has traditionally been done by physical models of the atmosphere, which are unstable to perturbations. An attractive alternative is to use neural networks to train simulators from observational data.

Besides the initial training process, it is less computationally intensive than a traditional physical model.

Convolutional Long Short-Term Memory



The model within the software was built on the convolutional LSTM architecture (ConvLSTM). A major drawback of LSTMs in its handling of spatiotemporal data is due to its usage of full connections in input-to-state and state-to-state transitions in which no spatial information is encoded.

To overcome this problem, a distinguishing feature of a ConvLSTM cell is that all the inputs and gates of the ConvLSTM layer are 3D tensors whose last two dimensions are spatial dimensions.

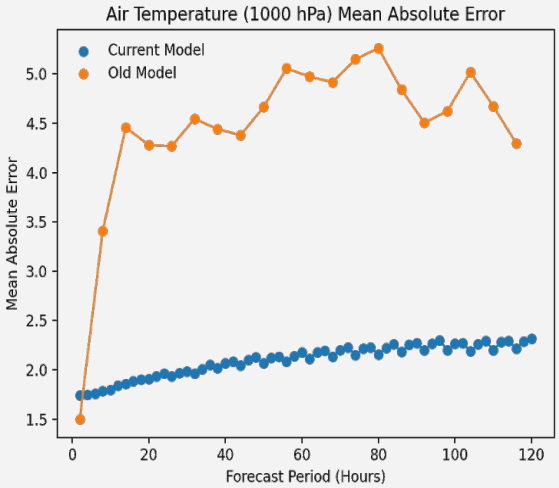
Open Source Software

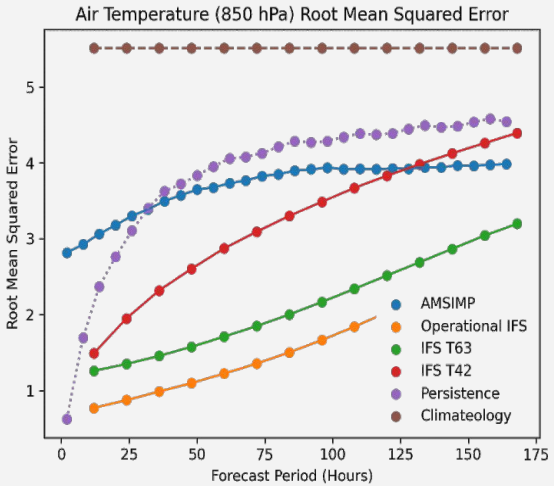
Open source software is software with source code that anyone can inspect, modify, and enhance. Linux and Chromium are both examples of such software.

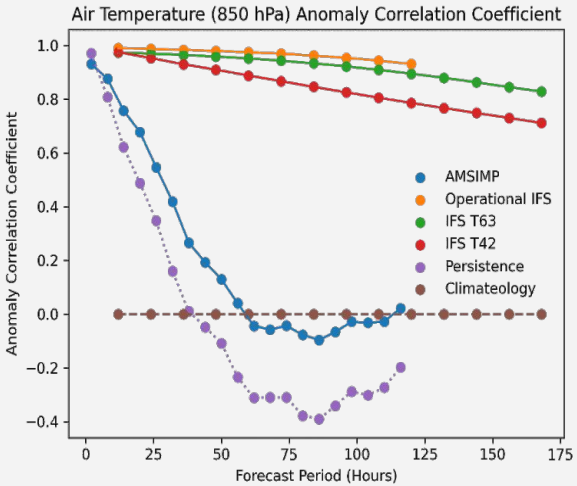
The advantages of open source software include:

- Higher quality software.
- Regular updates.
- Quick fixes.

Results


Air Temperature (1000 hPa) Mean Absolute Error
Current Model
Old Model
Mean Absolute Error
Forecast Period (Hours)


Air Temperature (850 hPa) Root Mean Squared Error
Root Mean Squared Error
Forecast Period (Hours)
AMSIMP
Operational IFS
IFS T63
IFS T42
Persistence
Climateology


Air Temperature (850 hPa) Anomaly Correlation Coefficient
Anomaly Correlation Coefficient
Forecast Period (Hours)
AMSIMP
Operational IFS
IFS T63
IFS T42
Persistence
Climateology

Conclusions

Looking Back

- The model is 6.18 times faster in comparison to a physical model of a similar resolution. The results are promising; however, the architecture's spatial awareness is lacking.
- Choosing a lower resolution reduced the computation burden, however, it may have had a significant impact on performance.

Looking Ahead

- To preserve spatial locality, the dataset on the globe will be approximated using the cubed sphere.
- The model will be trained on a higher resolution dataset, most likely trained at a resolution of approximately 25 kilometres.
- It will be trained of a wider variety of atmospheric parameters.