# **Improvement of data-driven weather prediction via data augmentation by time-sliding method**

## Abstract

Modern deep learning techniques are replacing traditional numerical weather prediction (NWP) models in the meteorological forecasting space, which has caused a significant revolution. In this new paradigm, this research offers a novel strategy that breaks from the common utilization of high-resolution data, which is frequently constrained by computing limitations, by using low-resolution data (2.5 degrees) for weather prediction and climate data analysis. Our main focus is evaluating data-driven weather prediction (DDWP) frameworks, specifically addressing sample size adequacy, structural improvements to the model, and the ability of climate data to represent current climatic trends. By using the Adaptive Fourier Neural Operator (AFNO) model via FourCastNet and a proposing lagged dataset, which is originally from the ECMWF Reanalysis v5 (ERA5), this paper improves on conventional approaches by adding more variables and a novel approach to data augmentation and processing. Our findings reveal that despite the lower resolution, the proposed approach demonstrates considerable accuracy in predicting atmospheric conditions, effectively rivaling higher-resolution models. This is further augmented by the strategic use of lagged data, enhancing model performance significantly. Furthermore, the study confirms the model's proficiency in reflecting current climate trends and its potential in predicting future climatic events, underscoring its utility in climate change strategies. This research marks a pivotal step in the realm of meteorological forecasting, showcasing the feasibility of lower-resolution data in producing reliable predictions and opening avenues for more accessible and inclusive climate modeling. The insights gleaned from this study not only contribute to the advancement of climate science but also lay the groundwork for future innovations in the field.