Abbreviations Used in the Research Paper

Abbreviation	Full Term	Explanation
ML	Machine Learning	A field of study that uses algorithms to learn from data.
NWP	Numerical Weather Prediction	Weather forecasting using numerical methods based on physical laws.
SVM	Support Vector Machine	A supervised learning model used for classification and regression.
RF	Random Forest	An ensemble learning method using multiple decision trees.
CNN	Convolutional Neural Network	A deep learning algorithm primarily used for image data.
RNN	Recurrent Neural Network	A type of neural network suited for sequence data.
LSTM	Long Short-Term Memory	A special kind of RNN capable of learning long-term dependencies.
GNN	Graph Neural Network	Neural networks that operate on graph structures.
TPE	Tree-structured Parzen Estimator	A Bayesian optimization algorithm used for hyperparameter tuning.
RMSE	Root Mean Square Error	A metric that measures the average magnitude of the error.
ACC	Anomaly Correlation Coefficient	A measure of correlation between forecast and observed anomalies.
SSR	Spread Skill Ratio	Ratio of ensemble spread to forecast error.
CSI	Critical Success Index	Measures the accuracy of forecasts for categorical events.
HSS	Heidke Skill Score	Measures forecasting skill compared to random chance.
POD	Probability of Detection	The fraction of observed events that were correctly forecasted.
POFD	Probability of False Detection	The fraction of false alarms out of all non-events.
FAR	False Alarm Rate	The proportion of false alarms among predicted events.
MAE	Mean Absolute Error	The average of absolute differences between prediction and observation.
MSE	Mean Squared Error	The average of squared differences between prediction and observation.
MAEd / MAE-theta	MAE for dynamical indices d and theta	Mean absolute error applied to dynamic indices.
MSEd / MSE-theta	MSE for dynamical indices d and theta	Mean squared error applied to dynamic indices.

NMAE / NMSE	Normalized MAE/MSE	Normalized versions of MAE and MSE using mean and std deviation.
DID	Dynamical Indices Difference	Difference between predicted and actual dynamic indices.
LT	Lyapunov Time	Timescale over which small differences in initial conditions diverge.
TU	Time Unit	Characteristic time unit used in KF system.
WD	Wasserstein Distance	A measure of distance between probability distributions.
ERA5	ECMWF Reanalysis 5	High-resolution atmospheric reanalysis dataset.
KF	Kolmogorov Flow	A simplified model of 2D fluid flow used in physics.
KS	Kuramoto-Sivashinsky	A PDE model known for complex spatiotemporal behavior.
DI	Dynamical Indices	Indices representing system complexity and persistence.
Z-score	Z-score Normalization	Normalization technique using mean and standard deviation.