GeoAI Ground-level NO2 Estimation

Group Name: **read_no2**
Group ID: **10**

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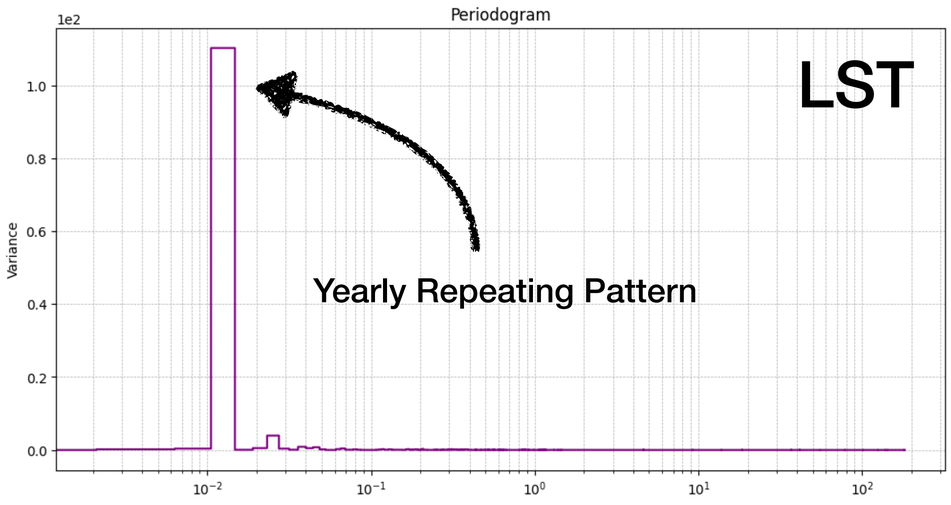
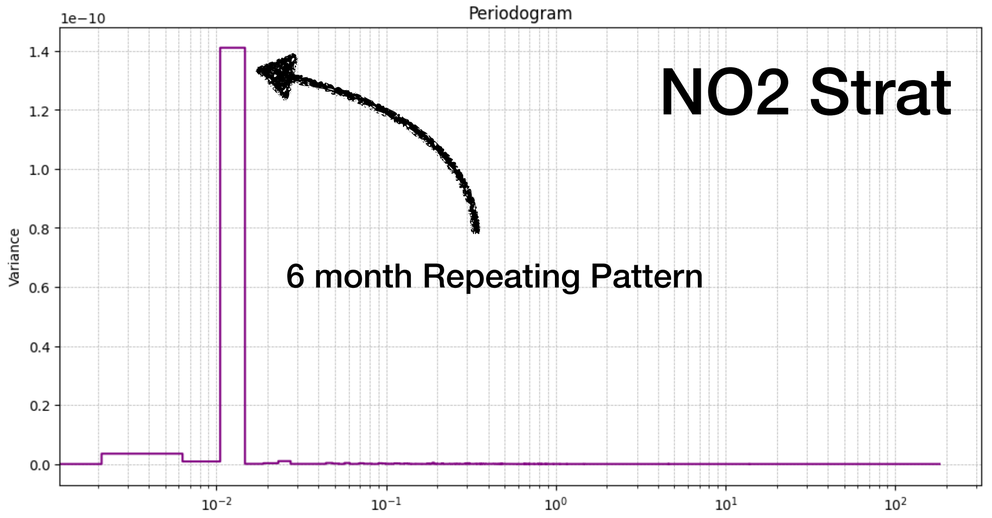
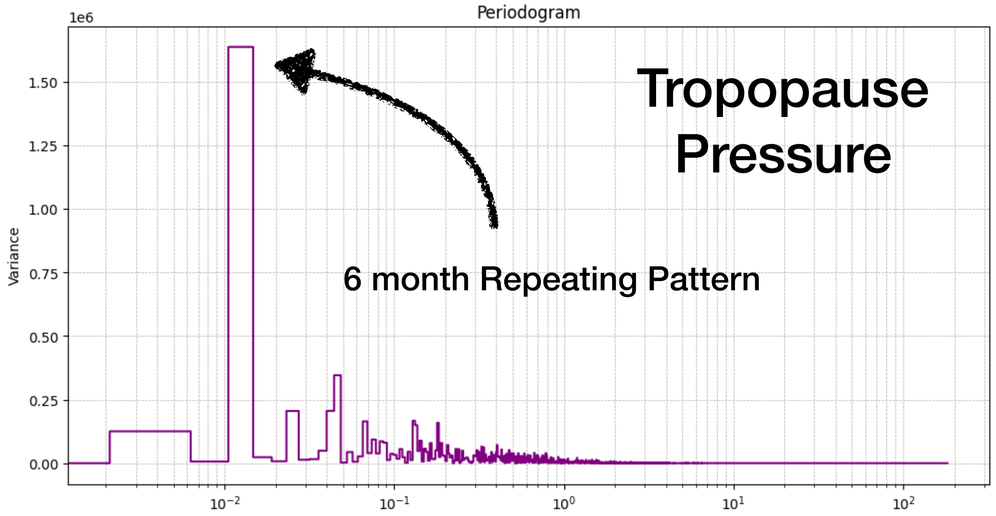
Exploring Temporal Patterns

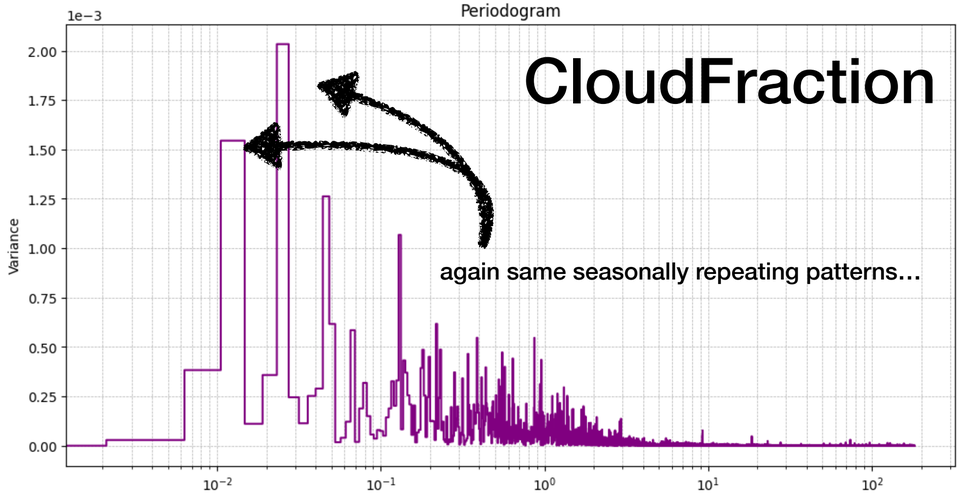
Exploring Temporal Patterns

Seasonality





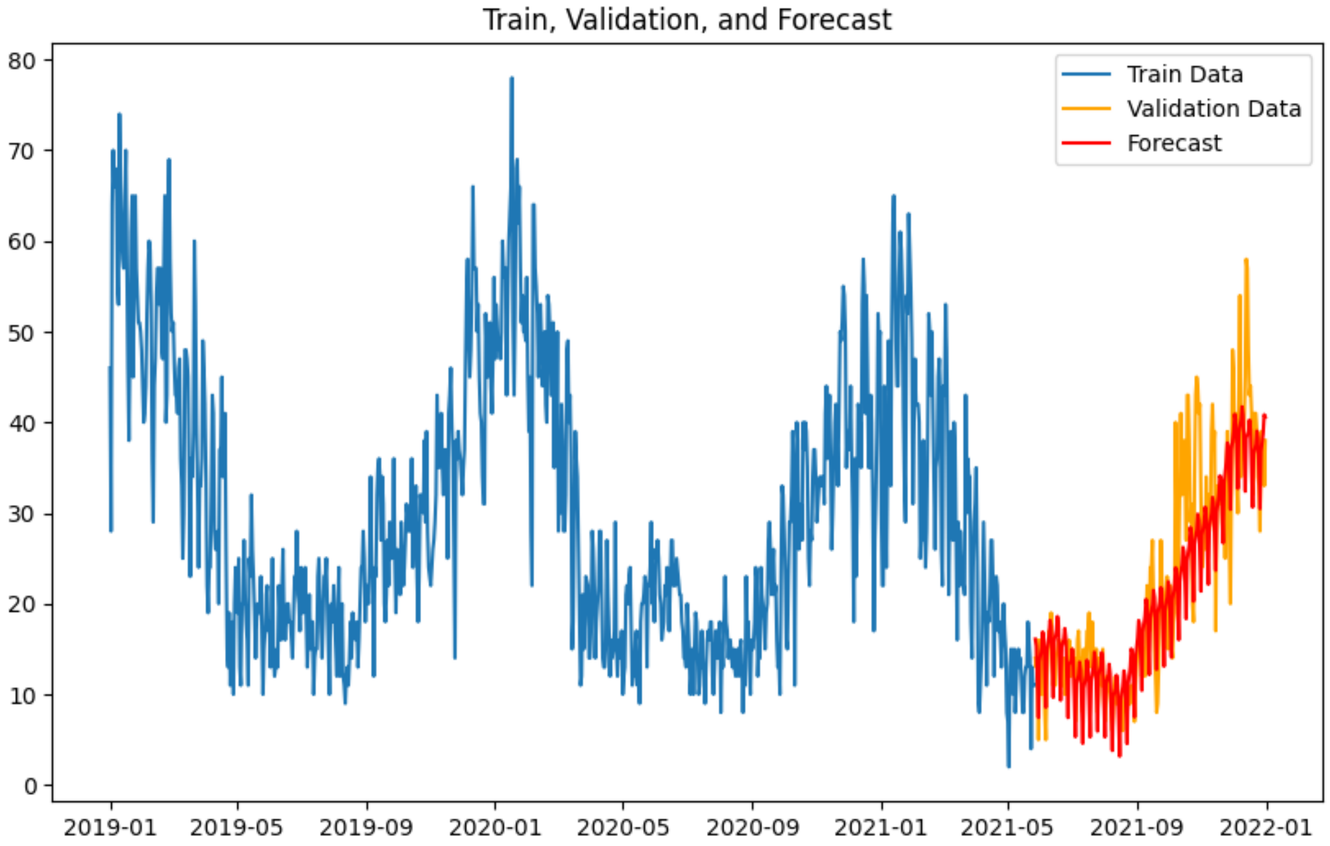




Exploring Temporal Patterns

PROPHET

we then trained a model, using only time data to predict NO2



and we ended up with..

RMSE

16.05983623	18.29849668
Public Score	**Private Score**

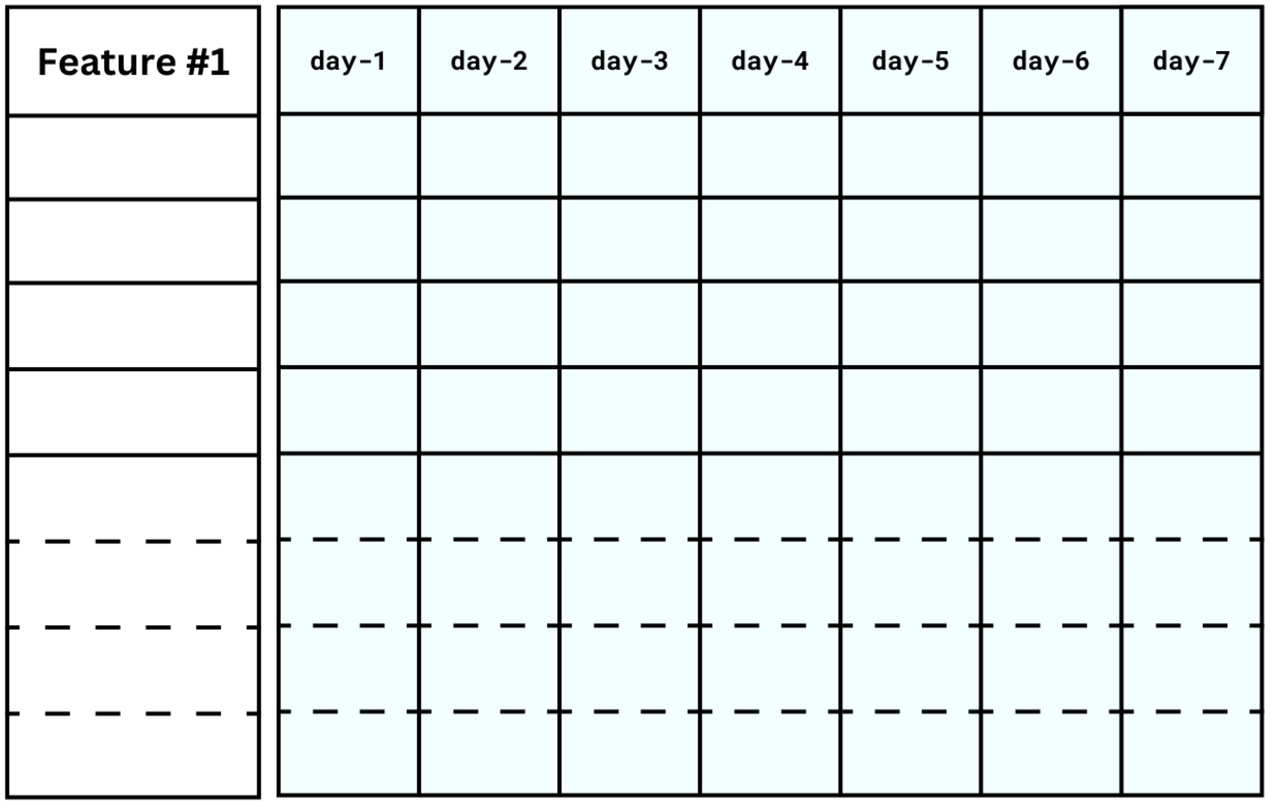
~1 month ago	gaurxvreddy	predictions.c...	**16.05983623**	**18.29849668**

Introducing Temporal Patterns to Regression

Let’s take a single feature
Feature #1…

Introducing Temporal Patterns to Regression

Introduced Cycles using **Lag Variables**

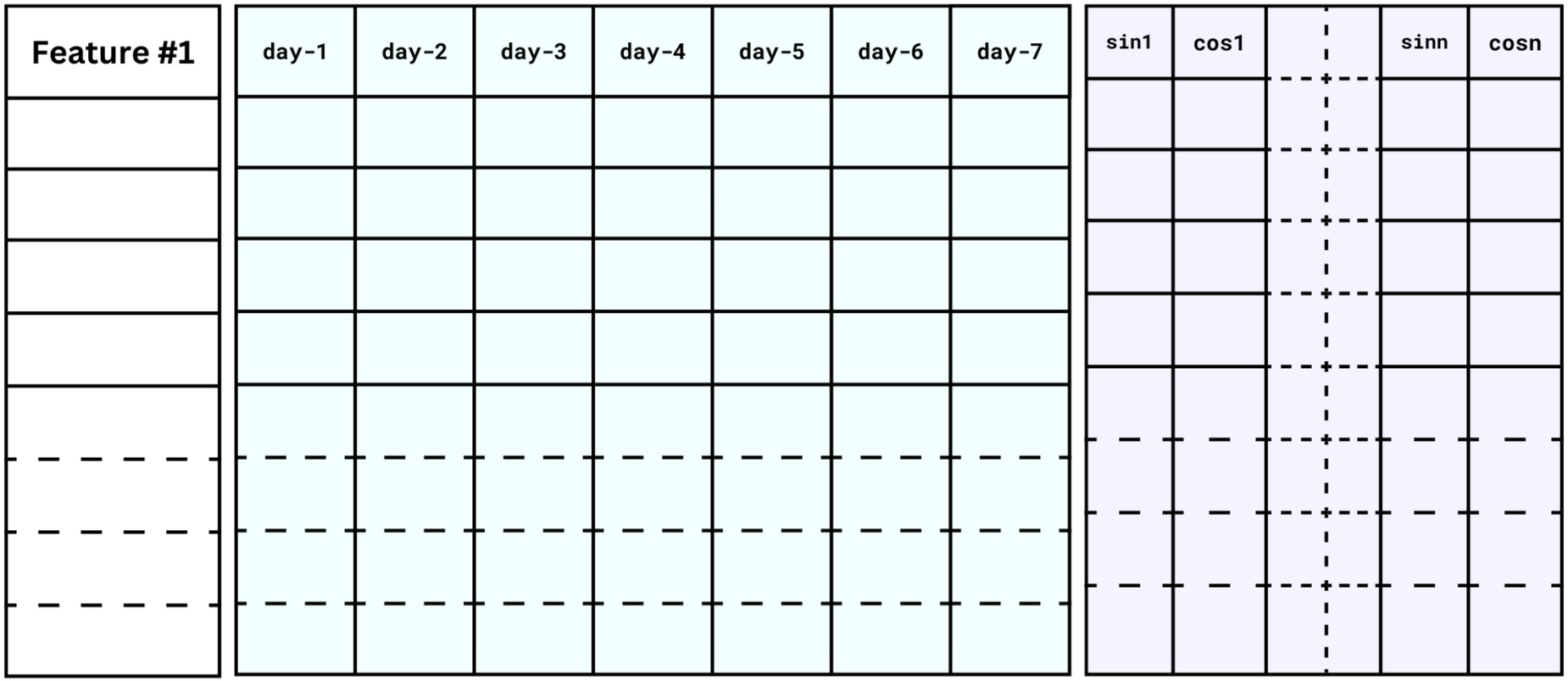


For each feature we added their
respective past 7 days values

Introducing Temporal Patterns to Regression

Introduced Cycles using **Lag Variables**

Introduced Seasonality using **Harmonic Functions**



For each feature we added their respective past 7 days values

Introduced Fourier transformations to encode their periodic patterns

Dealing with Missing Values

Filling Missing Values

Statistical-based filling

Mean
Moving Averages

Local regression imputation

Locally Estimated Scatterplot Smoothing
(LOESS)

Filling Missing Values

Statistical-based filling

Mean
Moving Averages

Local regression imputation

Locally Estimated Scatterplot Smoothing
(LOESS)

Did Not Work ❌

Filling Missing Values

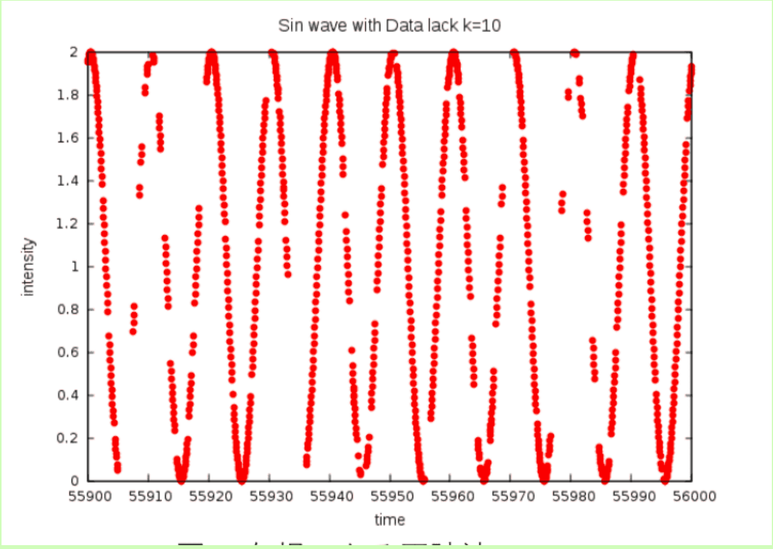
Statistical-based filling

Mean
Moving Averages

Local regression imputation

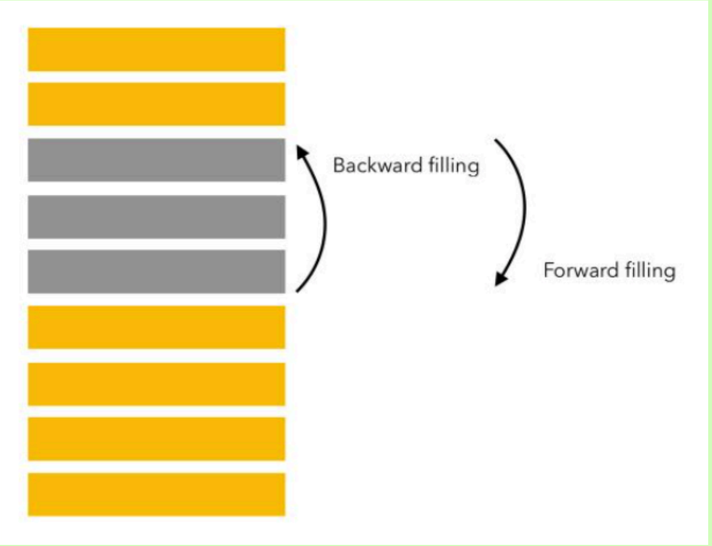
Locally Estimated Scatterplot Smoothing (LOESS)

Fourier Transformation



Forward & Backward Filling

*After sorting the data based on Date and Location

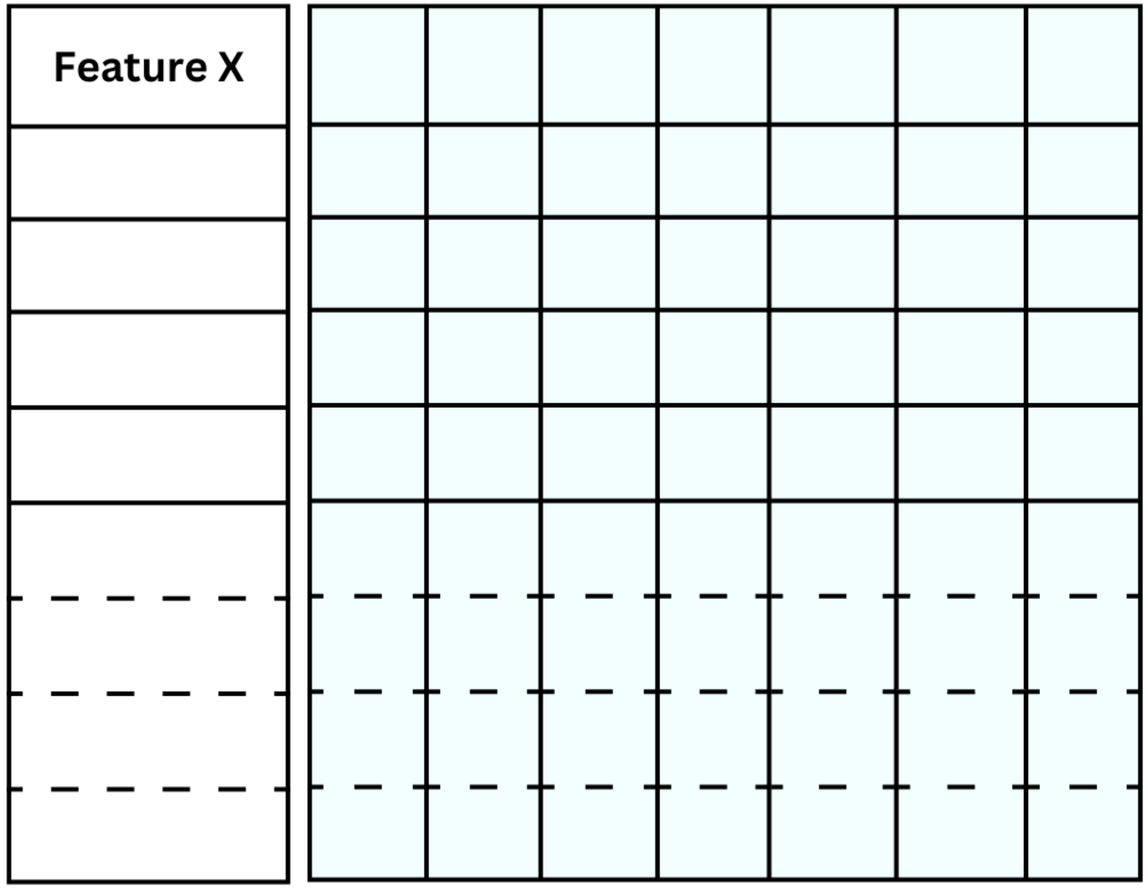


Feature Engineering

Feature Engineering

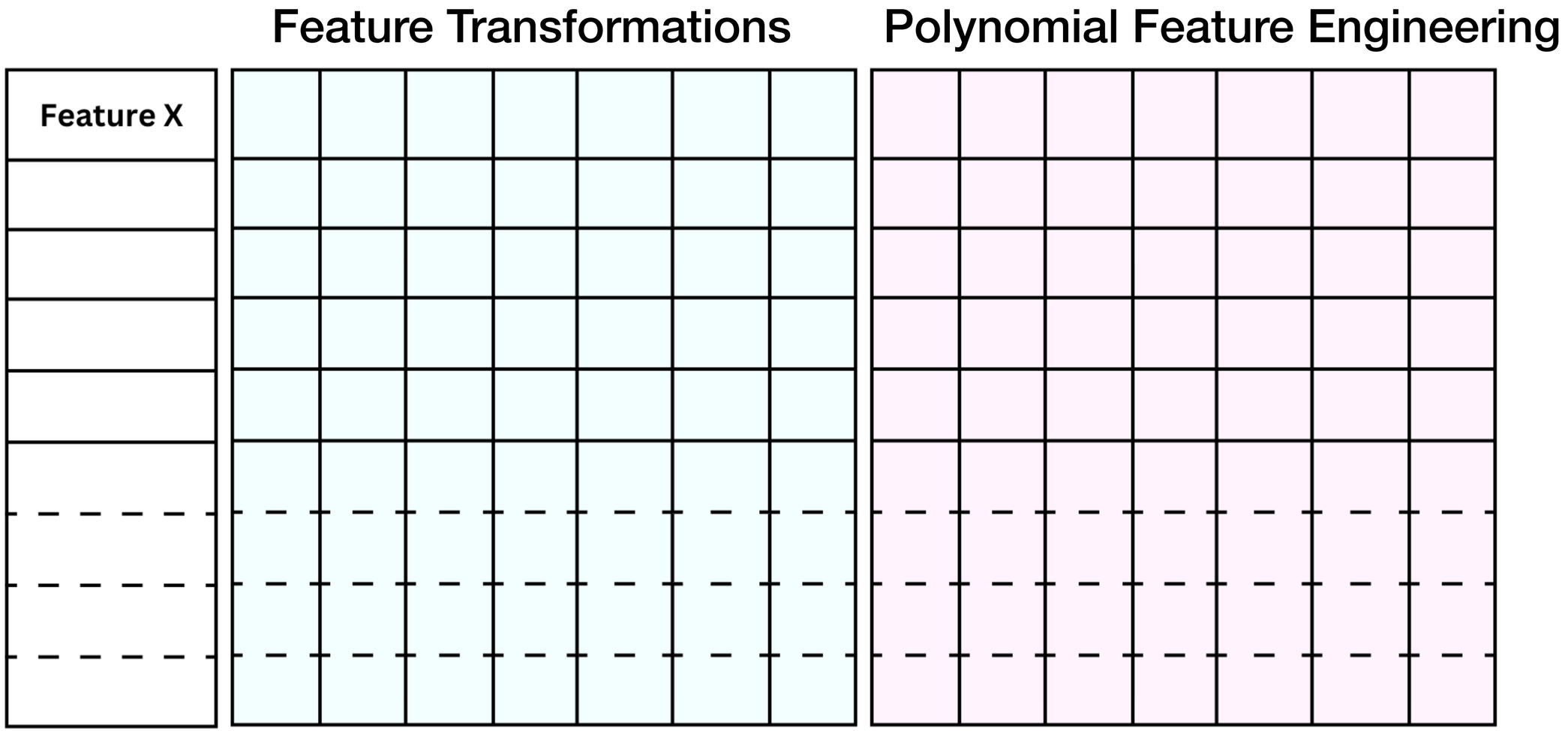
Feature Engineering

Feature Transformations



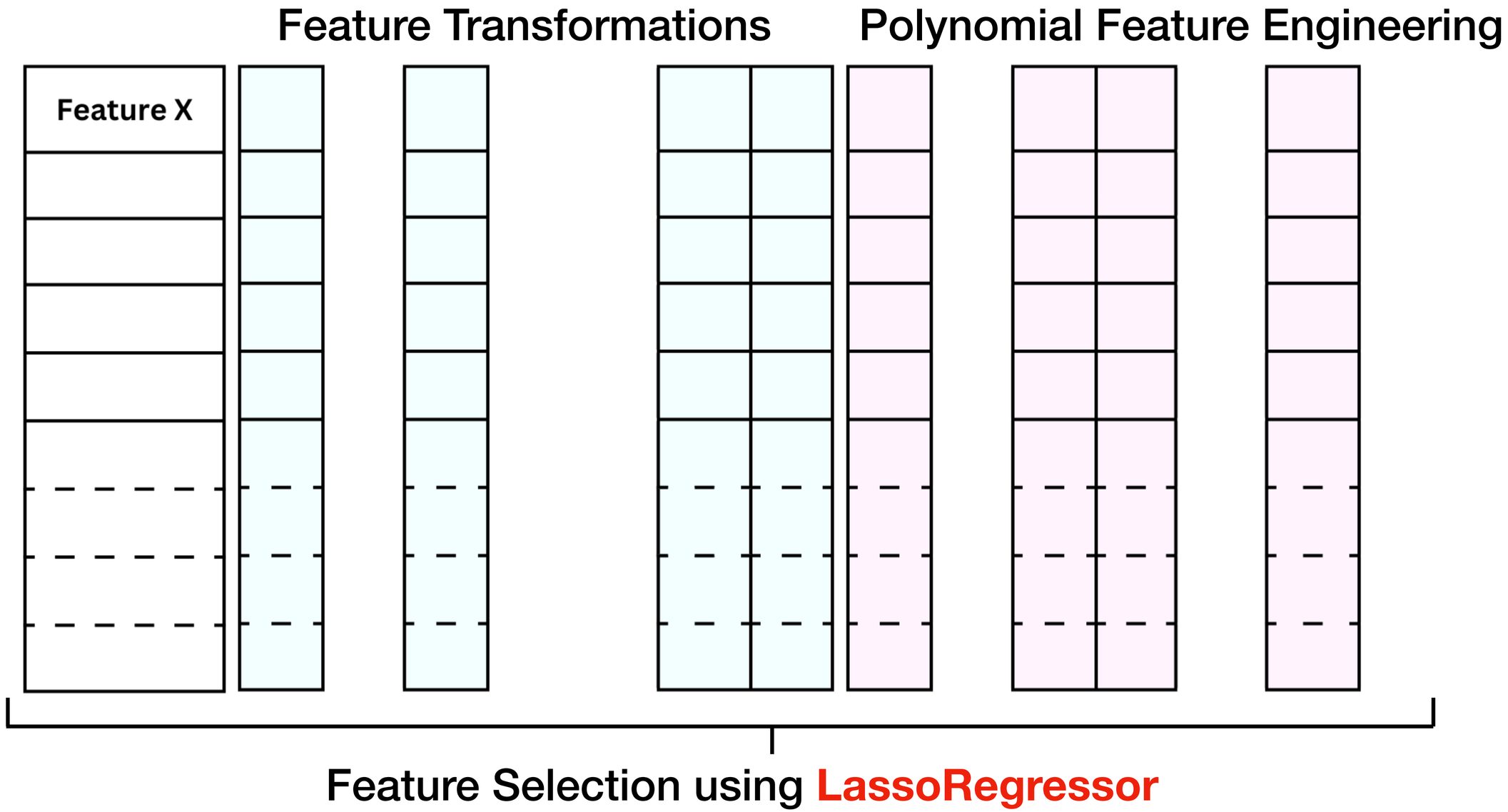
1. Identity Transformation
2. Logarithmic Transformation
3. Square Root Transformation
4. Square Transformation
5. Reciprocal Transformation

Feature Engineering



Generated using the PolynomialFeatures utility with a specified degree

Feature Engineering



Final Model Results

XGBoost

Time Series (FB Prophet)	16.059
Clustering based on Lat & Lon	14.770
+ Land Surface Temperature	12.219
+ AAI + Precipitation	11.325
+ NO2 Features	10.021
+ Feature Engineering + Polynomial Features + Lasso Feature Extraction	**8.773**

57th Rank

Future Scope

Ensemble Learning