
Model Metrics Summary

All models used scaled input features, and polynomial regression included transformation into degree-3 polynomial features.

Model Features:
- Anomaly
- CO2
- CH4
- N2O
- Actual Temperature
- Year
- Month

1. Random Forest Regressor

Features Used:
- All scaled input features (X_train_scaled)

Hyperparameters:
- `random_state`: 42

Model Parameters:
- Default parameters of the RandomForestRegressor() from sklearn

Performance Metrics:
- Mean Squared Error (MSE): 0.0059
- R^2 Score: 0.9096

Cross-Validation Results:
- Mean cross-validation test score: 0.7494
- Mean cross-validation train score: 0.9001
- Standard deviation in test scores: 0.1050
- Standard deviation in train scores: 0.0118

2. XGBoost Regressor

Features Used:
- All scaled input features (X_train_scaled)

Hyperparameters:
- `random_state`: 42

Model Parameters (from Grid Search):
- `n_estimators`: 300
- `max_depth`: 7
- `learning_rate`: 0.01
- `subsample`: 0.6
- `colsample_bytree`: 1.0
- `gamma`: 0
- `reg_alpha`: 0.01
- `reg_lambda`: 10.0

Performance Metrics:
- Mean Squared Error (MSE): 0.0042
- R^2 Score: 0.9350

Cross-Validation Results:
- Mean cross-validation test score: 0.7317
- Mean cross-validation train score: 0.9169
- Standard deviation in test scores: 0.0871
- Standard deviation in train scores: 0.0173

3. Polynomial Regression (Degree 3)
Features Used:
- Polynomial Features (Degree 3)
- All scaled input features (X_train_scaled)

Hyperparameters:
- Degree of polynomial features: 3

Performance Metrics:
- Mean Squared Error (MSE): 0.006237
- R^2 Score (Test Set): 0.9901

- R^2 Score (Training Set): 0.9923

Cross-Validation Results:
- Cross-validation was used to determine the optimal degree for polynomial regression.