The evaluation of a "better" model depends on the specific goal and context of your analysis. Different metrics are used to assess different aspects of model performance, and the choice of which metric to prioritize depends on the problem you are trying to solve.

Here's a general guideline for common regression evaluation metrics:

**RMSE (Root Mean Square Error):** A lower RMSE indicates a better model. RMSE measures the average error between predicted and actual values, and lower values mean that the model's predictions are closer to the actual data points.

**MSE (Mean Square Error):** Similar to RMSE, a lower MSE is better. It measures the average squared difference between predicted and actual values. It is used when you want to emphasize the importance of larger errors in your evaluation.

**R-squared (R²) Score:** A higher R-squared value indicates a better model. R-squared measures the proportion of variance in the target variable explained by the model. An R-squared value closer to 1 indicates that the model explains a large portion of the variance, which is often desirable.

**Adjusted R-squared:** This is a modification of R-squared that adjusts for the number of predictors in the model. A higher adjusted R-squared indicates a better model, especially when comparing models with different numbers of features.

**Mean Absolute Error (MAE):** A lower MAE indicates a better model. MAE measures the average absolute difference between predicted and actual values.

**Mean Percentage Error (MPE)** or Mean Absolute Percentage Error (MAPE): These metrics are used when you want to measure the percentage difference between predicted and actual values. Lower values are better.

1. **statistic and p-value:** These metrics are used in the context of overall model significance. A lower p-value for the F-statistic suggests that the model as a whole is significant and better at explaining the variance in the data.

**Mean Absolute Error (MAE):**

The Mean Absolute Error (MAE) is another common metric used to measure the accuracy of a predictive model. It calculates the average of the absolute differences between predicted and actual values.

Ultimately, the choice of which metric to prioritize depends on your specific goals. For example, if your primary concern is prediction accuracy, you might focus on RMSE or MAE. If you're interested in understanding how much variance your model explains, R-squared or adjusted R-squared may be more relevant. Additionally, it's often a good practice to use a combination of these metrics and consider the context of your problem when determining what constitutes a "better" model.

**Proposed System Results.**

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| --- | --- | --- | --- | --- |
| **MODEL** | **MAE** | **MSE** | **RMSE** | **R-squared (R²) Score** |
| Decision Tree Regressor | 0.5243564379960359 | 2.6402377695390324 | 1.6248808477974723 | 0.8132733063759845 |
| Random Forest | 0.528 | 3.008 | 1.734358671094304 | 0.7872638968727792 |
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# Mean Squared Error (MSE)

mse = mean\_squared\_error(y\_test, y\_pred)

print("Mean Squared Error:", mse)

# Root Mean Squared Error (RMSE)

rmse = mean\_squared\_error(y\_test, y\_pred, squared=False)

print("Root Mean Squared Error:", rmse)

# Mean Absolute Error (MAE)

mae = mean\_absolute\_error(y\_test, y\_pred)

print("Mean Absolute Error:", mae)

# R-squared (R2)

r2 = r2\_score(y\_test, y\_pred)

print("R-squared:", r2)

# Mean Absolute Percentage Error (MAPE)

mape = mean\_absolute\_percentage\_error(y\_test, y\_pred)

print("Mean Absolute Percentage Error:", mape)

# Explained Variance Score

explained\_variance = explained\_variance\_score(y\_test, y\_pred)

print("Explained Variance Score:", explained\_variance)

# Median Absolute Error (MedAE)

medae = median\_absolute\_error(y\_test, y\_pred)

print("Median Absolute Error:", medae)

**Decision Tree Result**

Mean Squared Error: 2.6402377695390324

Root Mean Squared Error: 1.6248808477974723

Mean Absolute Error: 0.5243564379960359

R-squared: 0.8132733063759845

Mean Absolute Percentage Error: 0.017859589690949612

Explained Variance Score: 0.8135893622949752

Median Absolute Error: 0.0

Mean Squared Error (MSE): 2.6402

MSE measures the average squared difference between the predicted values and the actual (true) values.

In this case, an MSE of 2.6402 means that, on average, the squared difference between the model's predictions and the true values is approximately 2.64. Lower MSE values are better, indicating that the model's predictions are closer to the true values.

Root Mean Squared Error (RMSE): 1.6249

RMSE is the square root of the MSE and provides a measure of the average absolute error in the same units as the target variable.

In this case, an RMSE of 1.6249 means that, on average, the model's predictions are off by approximately 1.625 units. Again, lower RMSE values indicate better predictive performance.

Mean Absolute Error (MAE): 0.5244

MAE measures the average absolute difference between the predicted values and the actual values.

An MAE of 0.5244 means that, on average, the model's predictions are off by approximately 0.5244 units. MAE is also a measure of prediction accuracy, and lower values are preferred.

R-squared (R²): 0.8133

R-squared is a measure of how well the model explains the variance in the data. It ranges from 0 to 1, with higher values indicating a better fit.

In this case, an R² of 0.8133 means that the model explains approximately 81.33% of the variance in the data. It suggests that the model captures a significant portion of the variability in the target variable.

Mean Absolute Percentage Error (MAPE): 0.0179

MAPE measures the average percentage difference between the predicted values and the actual values.

An MAPE of 0.0179 means that, on average, the model's predictions deviate by approximately 1.79% from the true values as a percentage of the true values.

Explained Variance Score: 0.8136

The explained variance score is similar to R-squared and represents the proportion of the variance in the target variable that is explained by the model.

An explained variance score of 0.8136 suggests that approximately 81.36% of the variance in the target variable can be attributed to the model's predictions.

Median Absolute Error: 0.0

The median absolute error is the median of the absolute differences between predicted and true values.

A median absolute error of 0.0 indicates that, for at least half of the data points, the model's predictions are exactly equal to the true values, indicating a very accurate model for these data points.

In a nutshell, these metrics collectively provide insights into how well the model performs in terms of accuracy, precision, and the proportion of variance it can explain. In this case, the model appears to perform relatively well, as indicated by the low MSE, RMSE, MAE, MAPE, and the relatively high R-squared and explained variance score.

**Result for Random Forest**

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Mean Squared Error for Random Forest Algorithm: 3.008

Root Mean Squared Error for Random Forest Algorithm: 1.734358671094304

Mean Absolute Error for Random Forest Algorithm: 0.528

R-squared for Random Forest Algorithm: 0.7872638968727792

Mean Absolute Percentage Error for Random Forest Algorithm: 0.01719472155961226

Explained Variance Score for Random Forest Algorithm: 0.789259995202122

Median Absolute Error for Random Forest Algorithm: 0.0

**Result for Linear Regression**

Mean Squared Error for Linear Regression: 2.294108764277203

Root Mean Squared Error for Linear Regression: 1.5146315605708218

Mean Absolute Error for Linear Regression: 0.6469544781787253

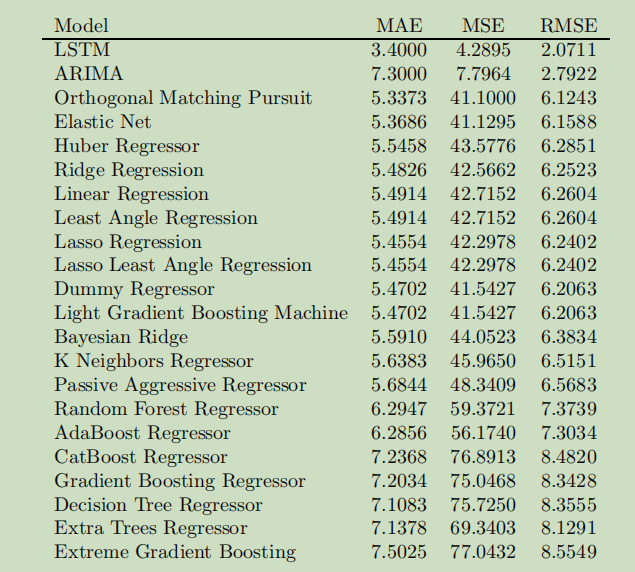
R-squared for Linear Regression: 0.8377527398064043

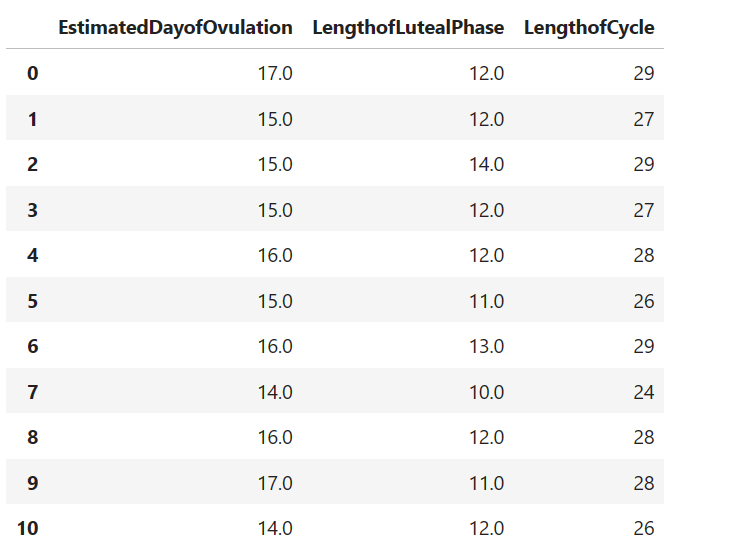
Mean Absolute Percentage Error for Linear Regression: 0.02288643767416694

Explained Variance Score for Linear Regression: 0.8397249986717931

Median Absolute Error for Linear Regression: 0.36568428315927193

**Existing System**





Based on the above menstrual cycle information, the decision tree is giving accurate prediction

