```python
In [1]:  import pandas as pd
         import numpy as np
         from sklearn.svm import SVR
         from sklearn.metrics import mean_squared_error, mean_absolute_error
         from sklearn.model_selection import KFold
         from sklearn.preprocessing import StandardScaler
         from sklearn.pipeline import Pipeline
```

```python
In [2]:  # Load the dataset
         data = pd.read_csv('1M_ahead_dataset.csv')
```

```python
In [3]:  # Separate predictors and target; 'Yt.1M' is our target.
         X = data.drop(['Yt.1M'], axis=1)
         y = data['Yt.1M']
```

```python
In [4]:  # Set up 5-fold cross-validation
         kf = KFold(n_splits=5, shuffle=True, random_state=42)
         fold_metrics = []
         fold_counter = 1
```

```python
In [5]:  # Loop through each fold
         for train_index, test_index in kf.split(X):
             # Split into training and test sets
             X_train, X_test = X.iloc[train_index], X.iloc[test_index]
             y_train, y_test = y.iloc[train_index], y.iloc[test_index]

             # Build a pipeline: Standardize features and apply SVR
             model = Pipeline([
                 ('scaler', StandardScaler()),
                 ('svr', SVR(kernel='rbf', C=1.0, epsilon=0.1))  # For linear kernel use: SVR(kernel='linear')
             ])

             # Fit the model
             model.fit(X_train, y_train)

             # Predict on test set
             y_pred = model.predict(X_test)

             # Calculate evaluation metrics
             mse = mean_squared_error(y_test, y_pred)
             mae = mean_absolute_error(y_test, y_pred)
             rmse = np.sqrt(mse)

             # Print out the metrics for the current fold
             print(f"Fold {fold_counter} -- MSE: {mse:.4f}, RMSE: {rmse:.4f}, MAE: {mae:.4f}")
             fold_metrics.append({'Fold': fold_counter, 'MSE': mse, 'RMSE': rmse, 'MAE': mae})
             fold_counter += 1
```

```
Fold 1 -- MSE: 0.0168, RMSE: 0.1295, MAE: 0.0826
Fold 2 -- MSE: 0.0187, RMSE: 0.1369, MAE: 0.0824
Fold 3 -- MSE: 0.0161, RMSE: 0.1268, MAE: 0.0861
Fold 4 -- MSE: 0.0138, RMSE: 0.1176, MAE: 0.0840
Fold 5 -- MSE: 0.0186, RMSE: 0.1365, MAE: 0.0830
```

```python
In [6]:  # Summarize the cross-validation results in a DataFrame
         results_df = pd.DataFrame(fold_metrics)
         print("\nOverall Cross-Validation Results:")
         print(results_df)
```

```
Overall Cross-Validation Results:
   Fold       MSE      RMSE       MAE
0     1  0.016770  0.129497  0.082612
1     2  0.018740  0.136894  0.082448
2     3  0.016084  0.126822  0.086108
3     4  0.013832  0.117607  0.084019
4     5  0.018631  0.136496  0.082951
```

Loading [MathJax]/jax/output/CommonHTML/fonts/TeX/fontdata.js