```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.ensemble import RandomForestRegressor, GradientBoostingRegressor, StackingRe
from sklearn.linear_model import LinearRegression
from google.colab import files
from sklearn.metrics import mean_absolute_error, mean_squared_error, r2_score
import os
```

```
print()
files.upload()
```

Choose Files No file chosen Upload widget is only available when the cell has been executed in the current browser session. Please rerun this cell to enable.

```
Saving forestfires.csv to forestfires (1).csv
{'forestfires (1).csv':
b'X,Y,month,day,FFMC,DMC,DC,ISI,temp,RH,wind,rain,area\n7,5,mar,fri,86.2,26.2,94.3,5.
```

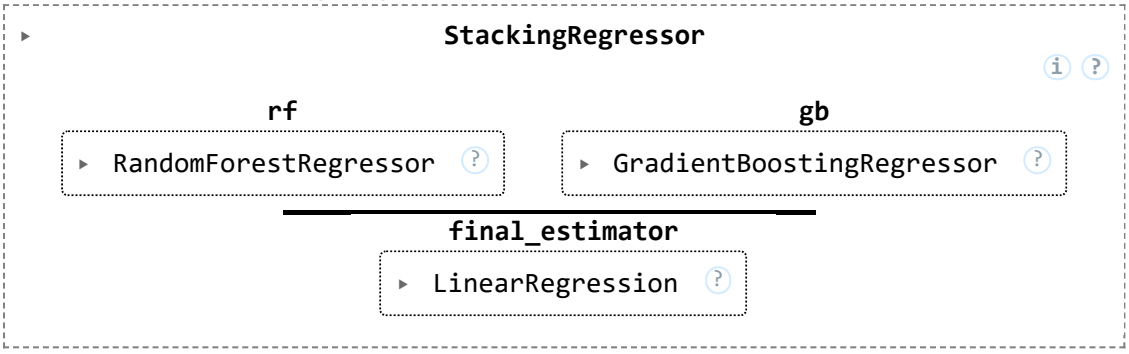
```
print("Dataset berhasil dimuat. 5 baris pertama:")
print(df.head())
print("\n")
```

```
Dataset berhasil dimuat. 5 baris pertama:
   X  Y month  day  FFMC   DMC     DC  ISI  temp  RH  wind  rain  area  \
0  7  5   mar  fri  86.2  26.2   94.3  5.1   8.2  51   6.7   0.0   0.0
1  7  4   oct  tue  90.6  35.4  669.1  6.7  18.0  33   0.9   0.0   0.0
2  7  4   oct  sat  90.6  43.7  686.9  6.7  14.6  33   1.3   0.0   0.0
3  8  6   mar  fri  91.7  33.3   77.5  9.0   8.3  97   4.0   0.2   0.0
4  8  6   mar  sun  89.3  51.3  102.2  9.6  11.4  99   1.8   0.0   0.0

   area_log
0       0.0
1       0.0
2       0.0
3       0.0
4       0.0
```

```
df = pd.read_csv('forestfires.csv')
df['area_log'] = np.log1p(df['area'])
X = df.drop(['area', 'area_log'], axis=1)
y = df['area_log']
X = pd.get_dummies(X, columns=['month', 'day'], drop_first=True)
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)
```

```
estimators = [
    ('rf', RandomForestRegressor(n_estimators=100, random_state=42)),
    ('gb', GradientBoostingRegressor(n_estimators=100, random_state=42))
]

stacking_regressor = StackingRegressor(estimators=estimators, final_estimator=LinearRegre
print("\nMelatih model Stacking Regressor...")
stacking_regressor.fit(X_train, y_train)
```

```
Melatih model Stacking Regressor...
```

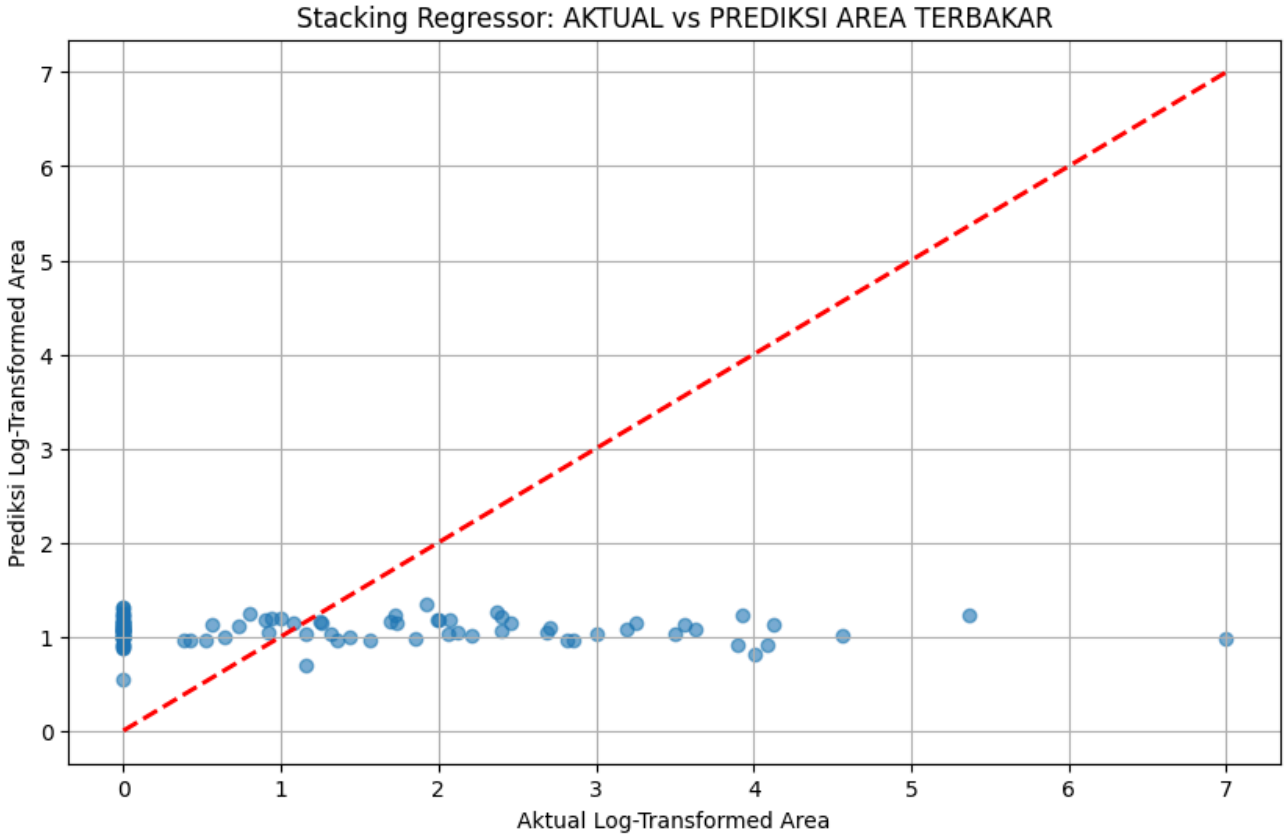



```
y_pred_stacking = stacking_regressor.predict(X_test)
mae_stacking = mean_absolute_error(y_test, y_pred_stacking)
mse_stacking = mean_squared_error(y_test, y_pred_stacking)
r2_stacking = r2_score(y_test, y_pred_stacking)

print("\n--- Hasil Evaluasi Stacking Regressor ---")
print(f"Mean Absolute Error (MAE): {mae_stacking:.4f}")
print(f"Mean Squared Error (MSE): {mse_stacking:.4f}")
print(f"R-squared ($R^2$): {r2_stacking:.4f}")
```

```
--- Hasil Evaluasi Stacking Regressor ---
Mean Absolute Error (MAE): 1.1976
Mean Squared Error (MSE): 2.2228
R-squared ($R^2$): -0.0114
```

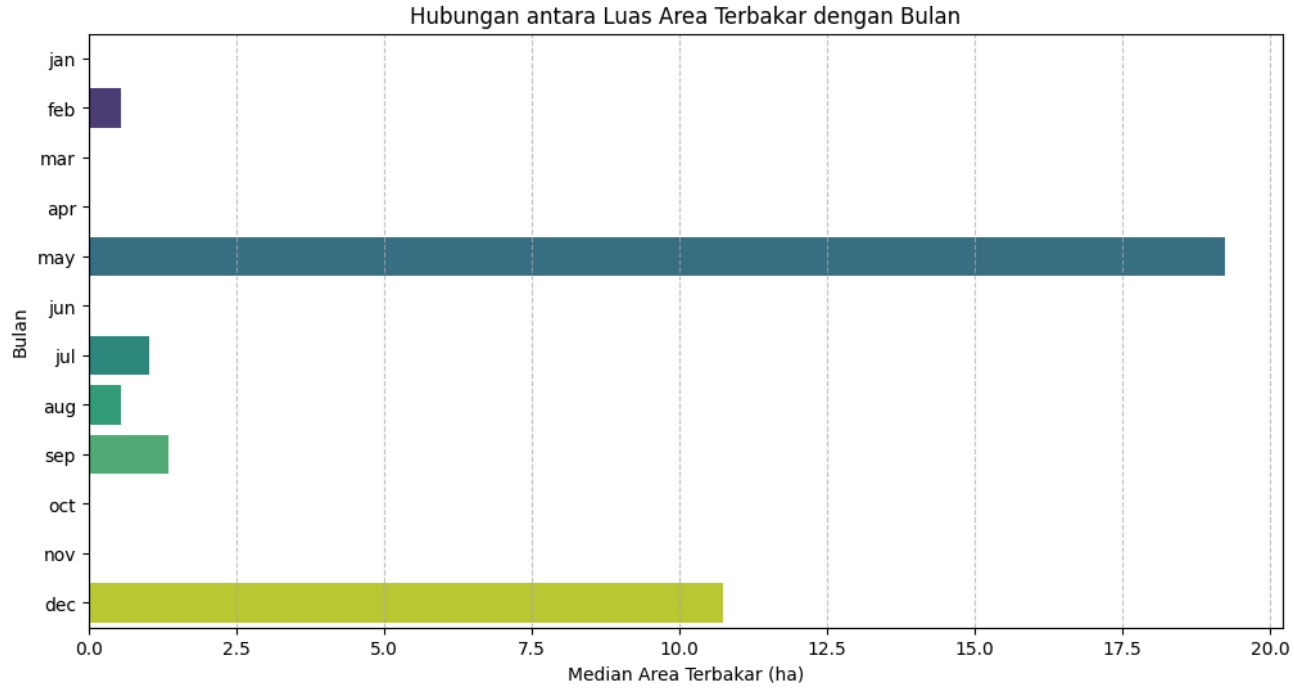
```
# Membuat scatter plot perbandingan nilai aktual dan prediksi
plt.figure(figsize=(10, 6))
plt.scatter(y_test, y_pred_stacking, alpha=0.6)
plt.plot([y_test.min(), y_test.max()], [y_test.min(), y_test.max()], 'r--', lw=2)
plt.title('Stacking Regressor: AKTUAL vs PREDIKSI AREA TERBAKAR')
plt.xlabel('Aktual Log-Transformed Area')
plt.ylabel('Prediksi Log-Transformed Area')
plt.grid(True)
plt.savefig('stacking_actual_vs_predicted.png')
print("Plot perbandingan aktual vs prediksi telah disimpan sebagai 'stacking_actual_vs_pr
```

```
Plot perbandingan aktual vs prediksi telah disimpan sebagai 'stacking_actual_vs_predi
```

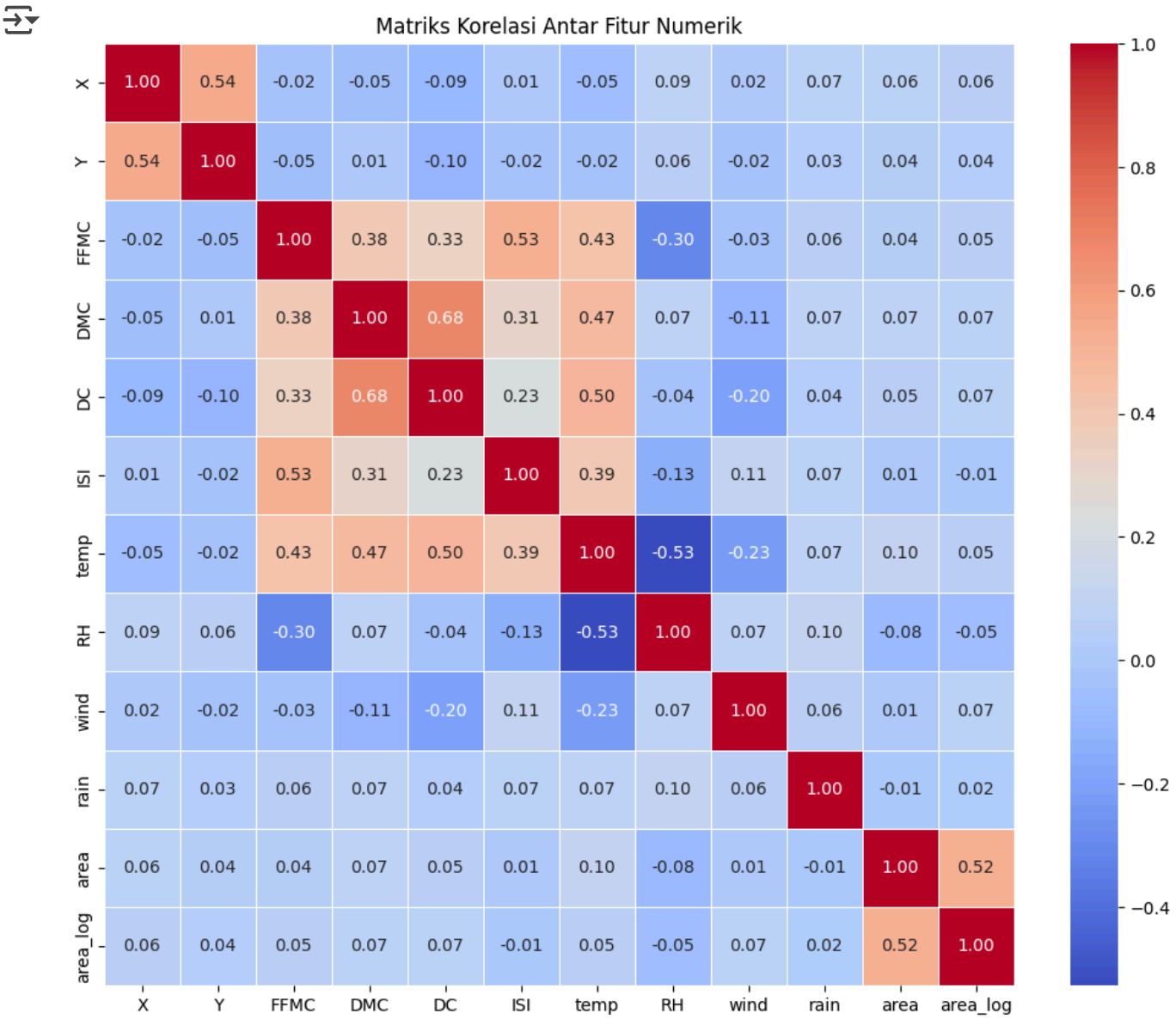



```
month_order = ['jan', 'feb', 'mar', 'apr', 'may', 'jun', 'jul', 'aug', 'sep', 'oct', 'nov
monthly_area_median = df.groupby('month')['area'].median().reindex(month_order)

plt.figure(figsize=(12, 6))
sns.barplot(x=monthly_area_median.values, y=monthly_area_median.index, orient='h', palett
plt.title('Hubungan antara Luas Area Terbakar dengan Bulan')
plt.xlabel('Median Area Terbakar (ha)')
plt.ylabel('Bulan')
plt.grid(axis='x', linestyle='--', alpha=0.7)
plt.show()
```

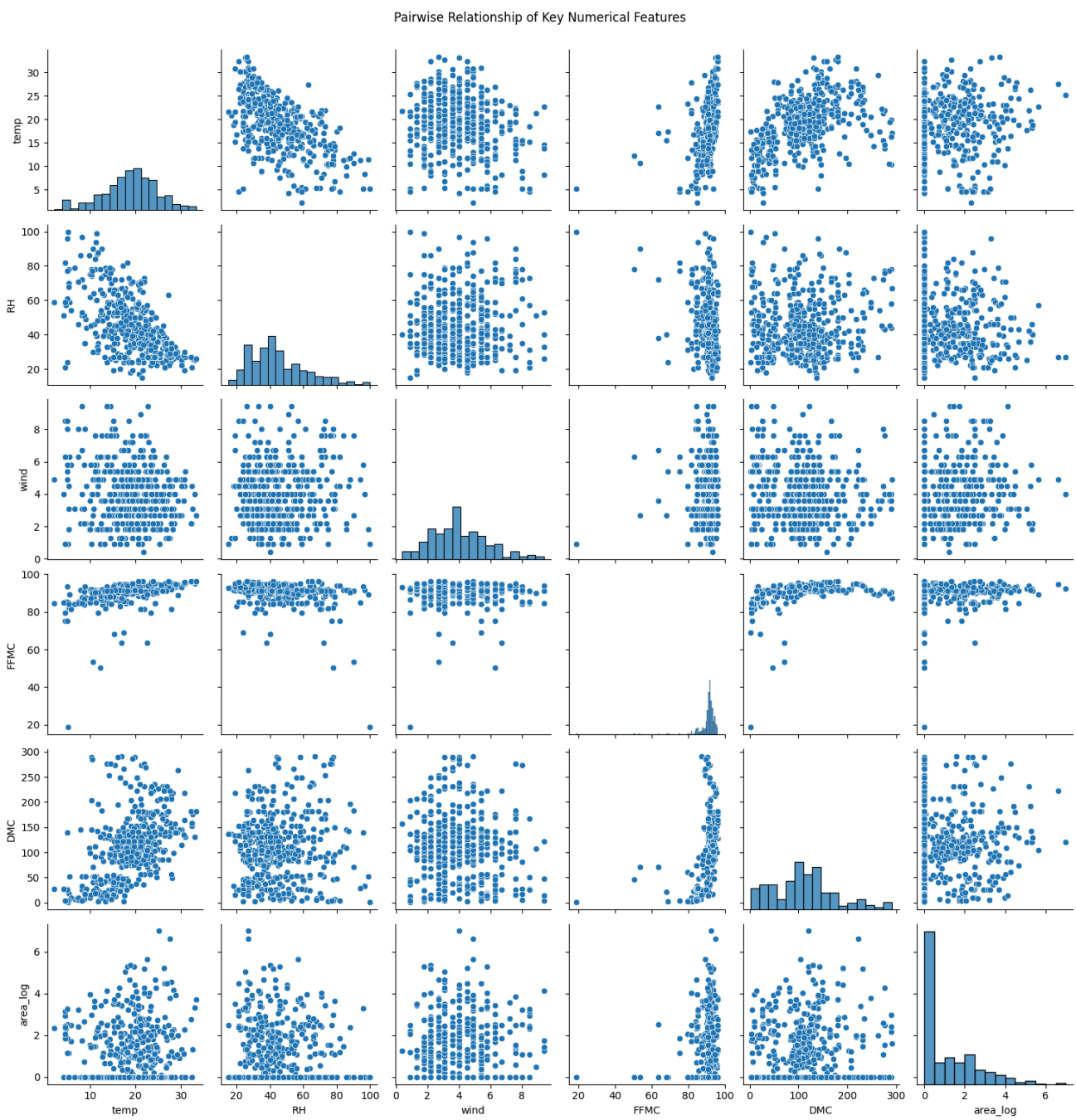
```
/tmp/ipython-input-3409079605.py:5: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.

  sns.barplot(x=monthly_area_median.values, y=monthly_area_median.index, orient='h',
```




```
df_numeric = df.select_dtypes(include=[np.number])
correlation_matrix = df_numeric.corr()
plt.figure(figsize=(12, 10))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', fmt=".2f", linewidths=.5)
plt.title('Matriks Korelasi Antar Fitur Numerik')
plt.show()
```




```
df['area_log'] = np.log1p(df['area'])
features_for_pairplot = ['temp', 'RH', 'wind', 'FFMC', 'DMC', 'area_log']
sns.pairplot(df[features_for_pairplot])
plt.suptitle('Pairwise Relationship of Key Numerical Features', y=1.02)
plt.show()
```


Pairwise Relationship of Key Numerical Features
temp
RH
wind
FFMC
DMC
area_log