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import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

# 1. Import the iris dataset
df = pd.read_csv('Iris.csv')
print("Dataset loaded successfully!")
print(f"Dataset shape: {df.shape}")
print(df.head())

Dataset loaded successfully!
Dataset shape: (150, 6)
   Id SepalLengthCm SepalWidthCm PetalLengthCm PetalWidthCm Species
0  1          5.1         3.5          1.4         0.2  Iris-setosa
1  2          4.9         3.0          1.4         0.2  Iris-setosa
2  3          4.7         3.2          1.3         0.2  Iris-setosa
3  4          4.6         3.1          1.5         0.2  Iris-setosa
4  5          5.0         3.6          1.4         0.2  Iris-setosa

# 2. Separate the numeric columns in a dataframe
numeric_cols = ['SepalLengthCm', 'SepalWidthCm', 'PetalLengthCm',
                 'PetalWidthCm']
df_numeric = df[numeric_cols]

# 3. Create a correlation matrix
correlation_matrix = df_numeric.corr()
print("Correlation Matrix:")
print(correlation_matrix)

Correlation Matrix:
              SepalLengthCm SepalWidthCm PetalLengthCm
PetalWidthCm      1.000000    -0.109369     0.871754
SepalLengthCm      0.817954     1.000000    -0.420516
SepalWidthCm       0.356544    -0.109369     1.000000
PetalLengthCm      0.962757     0.871754    -0.420516
PetalWidthCm       1.000000     0.817954     0.962757

# 4. Plot a heatmap
plt.figure(figsize=(10, 8))
sns.heatmap(correlation_matrix,

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        annot=True, # Show correlation values
        cmap='coolwarm', # Color scheme
        center=0, # Center colormap at 0
        square=True, # Make cells square-shaped
        linewidths=1, # Add gridlines
        cbar_kws={"shrink": 0.8}, # Adjust colorbar size
        fmt=".2f") # Format numbers to 2 decimal places
plt.title('Correlation Heatmap of Iris Dataset Features', fontsize=16,
fontweight='bold')
plt.tight_layout()
plt.show()

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# 5. Write inference
print("INFERENCE:")
print"""

```

Looking at the correlation heatmap, we can see some interesting patterns:

- Petal length and petal width are very strongly related (0.96). When one increases, the other almost always increases too. They're basically telling us the same story.
- Sepal length also correlates well with petal measurements (0.87 and 0.82), suggesting that larger flowers generally have bigger petals.
- Sepal width is the odd one out - it actually has negative correlations with petal features. This makes it unique and potentially useful for identifying different iris species.

In simple terms: petal measurements move together, while sepal width behaves independently.

This means sepal width captures different information about the flowers compared to the other features.

""")

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