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In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
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In [4]: df = pd.read_csv("C:\\Users\\HP\\Documents\\Climate_dataset.csv")

df.info
df.head()
```

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Out[4]:
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	dt	AverageTemperature	AverageTemperatureUncertainty	City	Country	Latitude	Longitude
0	1743-11-01	6.068	1.737	Århus	Denmark	57.05N	10.33E
1	1743-12-01	NaN	NaN	Århus	Denmark	57.05N	10.33E
2	1744-01-01	NaN	NaN	Århus	Denmark	57.05N	10.33E
3	1744-02-01	NaN	NaN	Århus	Denmark	57.05N	10.33E
4	1744-03-01	NaN	NaN	Århus	Denmark	57.05N	10.33E

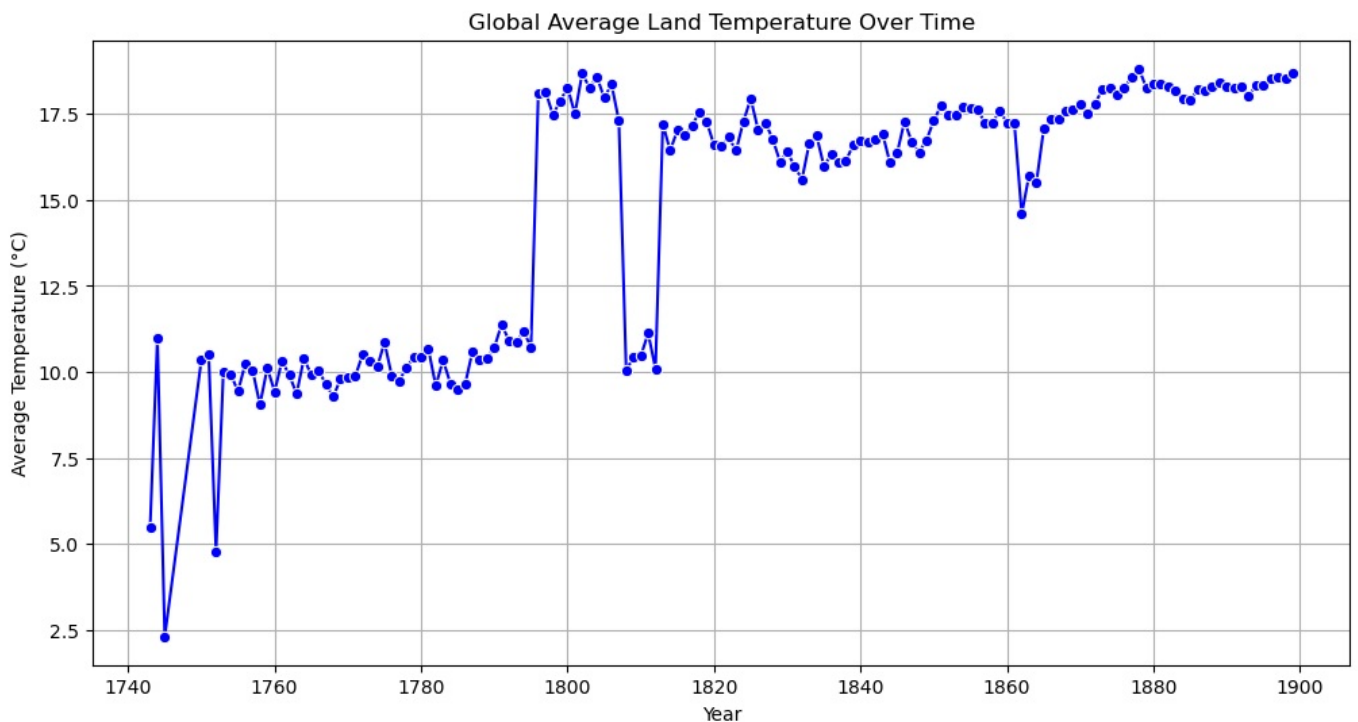
```
In [10]: # Convert date column to datetime format
df['dt'] = pd.to_datetime(df['dt'], dayfirst=True, errors='coerce')
df = df.dropna(subset=['dt'])

# Extract year for analysis
df['Year'] = df['dt'].dt.year

# Handling missing values
df = df.dropna(subset=['AverageTemperature'])

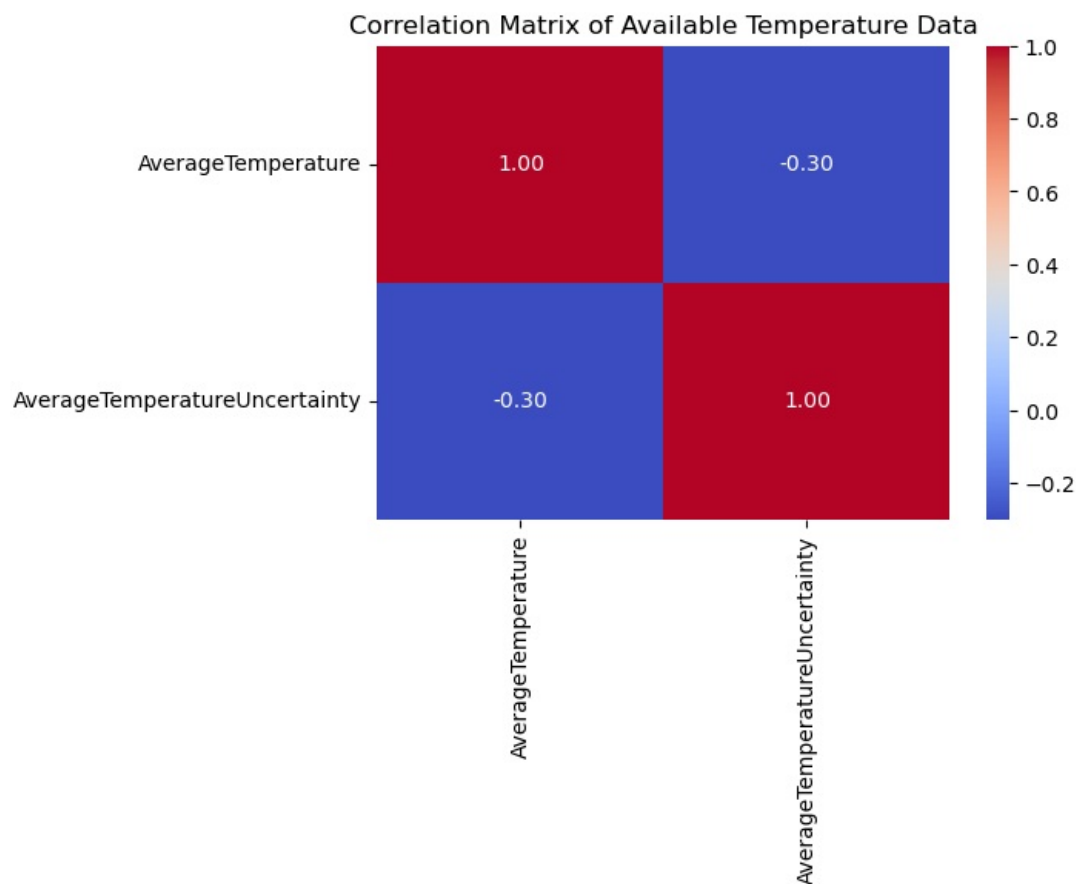
# Aggregate average global temperature per year
yearly_avg_temp = df.groupby('Year')['AverageTemperature'].mean().reset_index()
```

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In [12]: # Line plot global temperature trend over time
plt.figure(figsize=(12, 6))
sns.lineplot(data=yearly_avg_temp, x='Year', y='AverageTemperature', marker='o', color='b')
plt.title('Global Average Land Temperature Over Time')
plt.xlabel('Year')
plt.ylabel('Average Temperature (°C)')
plt.grid(True)
plt.show()
```



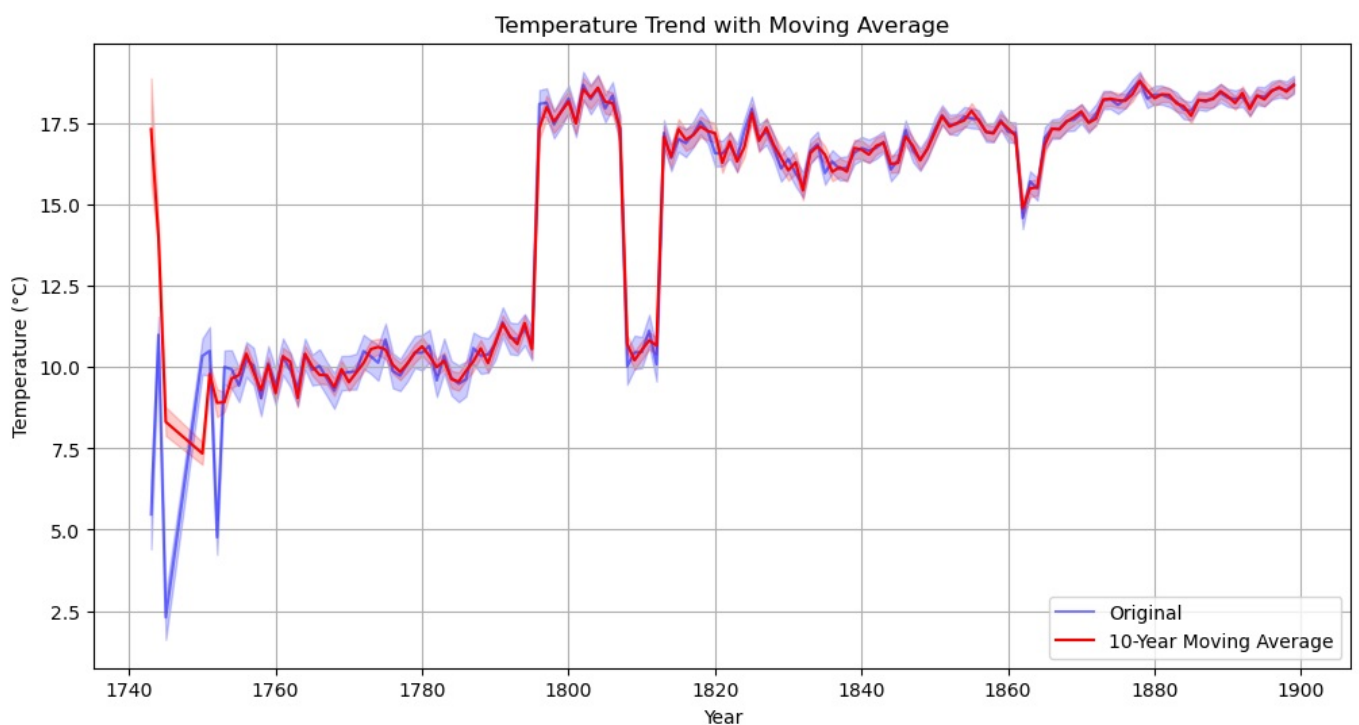
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In [17]: # Heatmap to show correlations between different temperature measures.
correlation_matrix = df[['AverageTemperature', 'AverageTemperatureUncertainty']].corr()

plt.figure(figsize=(6, 4))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', fmt=".2f")
plt.title("Correlation Matrix of Available Temperature Data")
plt.show()
```



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In [19]: # Moving Average Analysis for trend smoothing
df['Temp_MA_10'] = df['AverageTemperature'].rolling(window=10).mean()

# Plot moving average trend
plt.figure(figsize=(12, 6))
sns.lineplot(data=df, x='Year', y='AverageTemperature', label='Original', color='blue', alpha=0.5)
sns.lineplot(data=df, x='Year', y='Temp_MA_10', label='10-Year Moving Average', color='red')
plt.title('Temperature Trend with Moving Average')
plt.xlabel('Year')
plt.ylabel('Temperature (°C)')
plt.legend()
plt.grid(True)
plt.show()
```



In []:

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