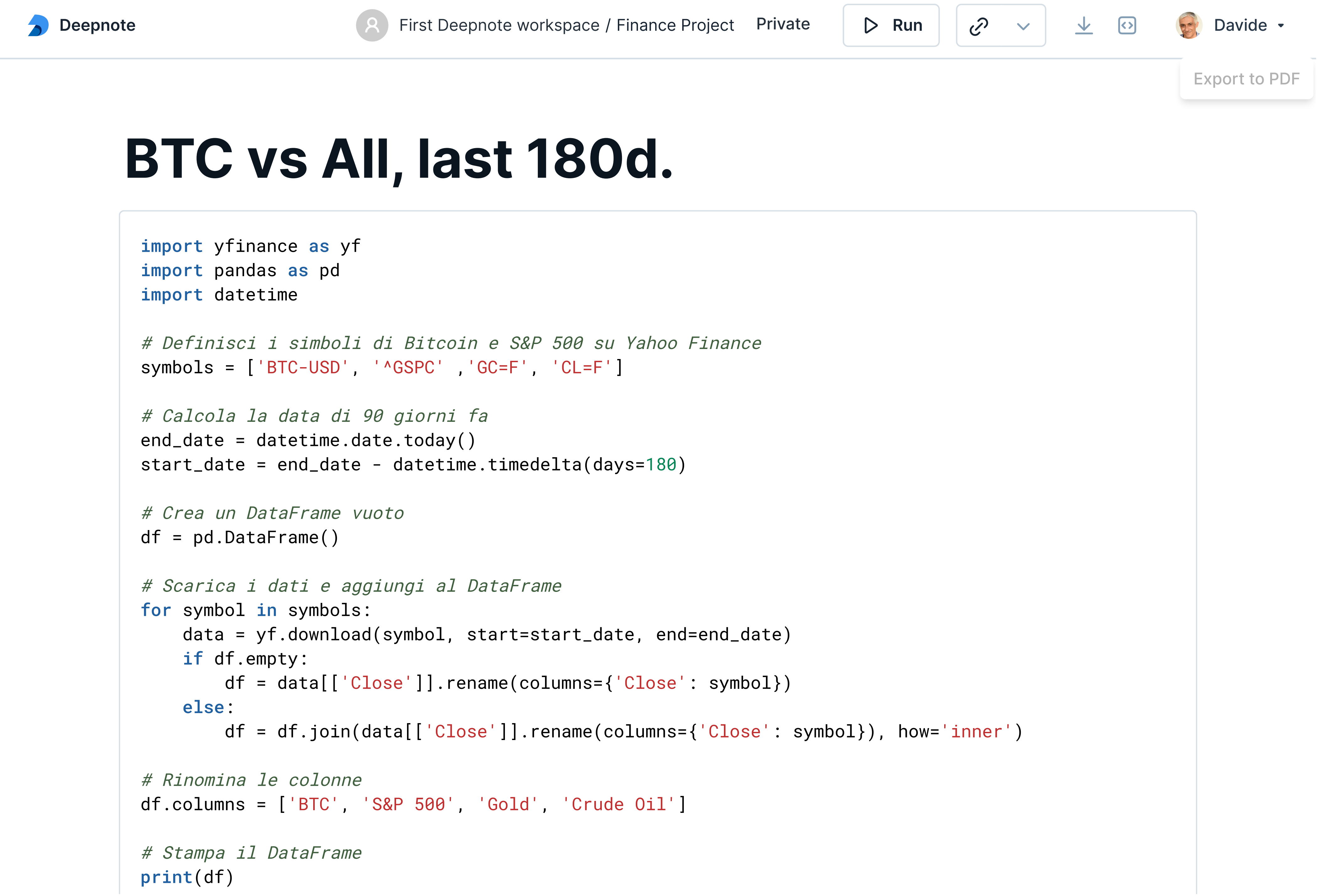


BTC vs All, last 180d.

```
import yfinance as yf
import pandas as pd
import datetime

# Definisci i simboli di Bitcoin e S&P 500 su Yahoo Finance
symbols = ['BTC-USD', '^GSPC' ,'GC=F', 'CL=F']

# Calcola la data di 90 giorni fa
end_date = datetime.date.today()
start_date = end_date - datetime.timedelta(days=180)

# Crea un DataFrame vuoto
df = pd.DataFrame()

# Scarica i dati e aggiungi al DataFrame
for symbol in symbols:
    data = yf.download(symbol, start=start_date, end=end_date)
    if df.empty:
        df = data[['Close']].rename(columns={'Close': symbol})
    else:
        df = df.join(data[['Close']].rename(columns={'Close': symbol}), how='inner')

# Rinomina le colonne
df.columns = ['BTC', 'S&P 500', 'Gold', 'Crude Oil']

# Stampa il DataFrame
print(df)
```

```
[*********************100%%**********************]  1 of 1 completed
[*********************100%%**********************]  1 of 1 completed
[*********************100%%**********************]  1 of 1 completed
[*********************100%%**********************]  1 of 1 completed
                     BTC      S&P 500         Gold  Crude Oil
Date
2023-05-08  27694.273438  4138.120117  2026.300049  73.160004
2023-05-09  27658.775391  4119.169922  2036.199951  73.709999
2023-05-10  27621.755859  4137.640137  2030.500000  72.559998
2023-05-11  27000.789062  4130.620117  2014.699951  70.870003
2023-05-12  26804.990234  4124.080078  2014.500000  70.040001
...                  ...          ...          ...        ...
2023-10-30  34502.363281  4166.819824  1996.199951  82.309998
2023-10-31  34667.781250  4193.799805  1985.199951  81.019997
2023-11-01  35437.253906  4237.859863  1978.800049  80.440002
2023-11-02  34938.242188  4317.779785  1985.599976  82.459999
2023-11-03  34732.324219  4358.339844  1991.500000  80.510002

[126 rows x 4 columns]
```

```python
# Ordina df2 in ordine cronologico
df2 = df.sort_index(ascending=True)

# Normalizza i valori rispetto al primo valore di ogni colonna
df2 = df2 / df2.iloc[0]
```

```
# Visualizza il DataFrame normalizzato
print(df2)
```

```
                 BTC   S&P 500      Gold  Crude Oil
Date
2023-05-08  1.000000  1.000000  1.000000   1.000000
2023-05-09  0.998718  0.995421  1.004886   1.007518
2023-05-10  0.997381  0.999884  1.002073   0.991799
2023-05-11  0.974959  0.998188  0.994275   0.968699
2023-05-12  0.967889  0.996607  0.994177   0.957354
...              ...       ...       ...        ...
2023-10-30  1.245830  1.006935  0.985145   1.125068
2023-10-31  1.251803  1.013455  0.979717   1.107436
2023-11-01  1.279588  1.024103  0.976558   1.099508
2023-11-02  1.261569  1.043416  0.979914   1.127119
2023-11-03  1.254134  1.053217  0.982826   1.100465

[126 rows x 4 columns]
```

```
import matplotlib.pyplot as plt

# Creare un grafico
plt.figure(figsize=(10,6))

# Plottare la colonna 'btc' in blu
plt.plot(df2['BTC'], color='blue', label='BTC')

# Plottare la colonna 'sp500' in verde
plt.plot(df2['S&P 500'], color='green', label='S&P 500')

# Plottare la colonna 'gold' in rosso
plt.plot(df2['Gold'], color='red', label='Gold')

# Plottare la colonna 'oil' in nero
plt.plot(df2['Crude Oil'], color='black', label='Crude Oil')
```

```
# Aggiungere titoli e etichette
plt.title('Normalized to start date closing price, last 180d')
plt.xlabel('Date')
plt.ylabel('Normalized price (closing)')
plt.legend()

# Mostrare il grafico
plt.show()
```

```
ret = df2.pct_change().dropna()
print(ret)
```

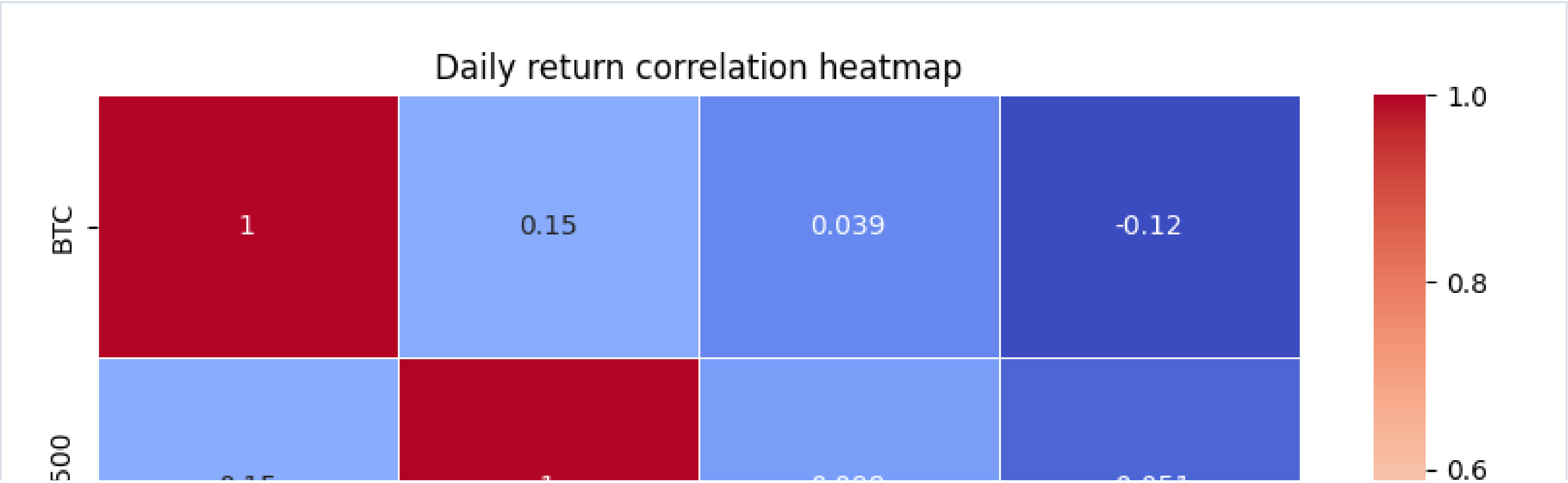
```
                 BTC   S&P 500      Gold  Crude Oil
Date
2023-05-09 -0.001282 -0.004579  0.004886   0.007518
2023-05-10 -0.001338  0.004484 -0.002799  -0.015602
2023-05-11 -0.022481 -0.001697 -0.007781  -0.023291
2023-05-12 -0.007252 -0.001583 -0.000099  -0.011712
2023-05-15  0.014464  0.002958  0.001737   0.015277
...              ...       ...       ...        ...
2023-10-30  0.017475  0.012010  0.003822  -0.037760
2023-10-31  0.004794  0.006475 -0.005510  -0.015672
2023-11-01  0.022196  0.010506 -0.003224  -0.007159
2023-11-02 -0.014082  0.018859  0.003436   0.025112
2023-11-03 -0.005894  0.009394  0.002971  -0.023648

[125 rows x 4 columns]
```

```
# Calcola la matrice di correlazione
correlation_matrix = ret.corr()

# Stampa la matrice di correlazione
print(correlation_matrix)
```

```
                BTC   S&P 500      Gold  Crude Oil
BTC        1.000000  0.150308  0.038880  -0.120946
```

```
S&P 500     0.150308  1.000000  0.099293  -0.051337
Gold        0.038880  0.099293  1.000000   0.213201
Crude Oil -0.120946 -0.051337  0.213201   1.000000
```

```python
import seaborn as sns

# Crea un heatmap della matrice di correlazione
plt.figure(figsize=(10, 7))
sns.heatmap(correlation_matrix, annot=True, cmap='coolwarm', linewidths=0.5)
plt.title("Daily return correlation heatmap")
plt.show()
```


Daily return correlation heatmap
BTC
1
0.15
0.039
-0.12
500
1.0
0.8
0.6