บทที่ 8 การแสดงผลข้อมูลเชิงเวลาและอื่นๆ

- แนวคิดและการสร้างแผนภูมิอธิบายข้อมูลเชิงเวลา เช่น Timeline Chart, Candlestick Chart, Cross spectral density (CSD) เป็นต้น

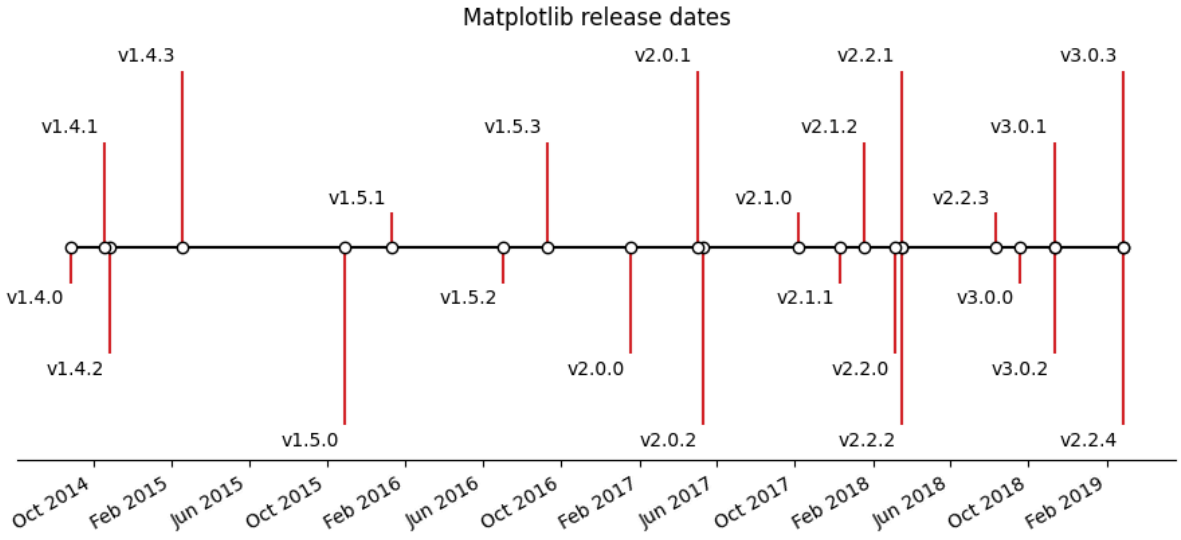
Timeline Chart

In [ ]:
```
#import
from datetime import datetime

import matplotlib.pyplot as plt
import numpy as np

import matplotlib.dates as mdates
```

In [ ]:
```
# กำหนดข้อมูลใน list เก็บไว้ในตัวแปร
names = ['v2.2.4', 'v3.0.3', 'v3.0.2', 'v3.0.1', 'v3.0.0', 'v2.2.3',
         'v2.2.2', 'v2.2.1', 'v2.2.0', 'v2.1.2', 'v2.1.1', 'v2.1.0',
         'v2.0.2', 'v2.0.1', 'v2.0.0', 'v1.5.3', 'v1.5.2', 'v1.5.1',
         'v1.5.0', 'v1.4.3', 'v1.4.2', 'v1.4.1', 'v1.4.0']

dates = ['2019-02-26', '2019-02-26', '2018-11-10', '2018-11-10',
         '2018-09-18', '2018-08-10', '2018-03-17', '2018-03-16',
         '2018-03-06', '2018-01-18', '2017-12-10', '2017-10-07',
         '2017-05-10', '2017-05-02', '2017-01-17', '2016-09-09',
         '2016-07-03', '2016-01-10', '2015-10-29', '2015-02-16',
         '2014-10-26', '2014-10-18', '2014-08-26']

# Convert date strings (e.g. 2014-10-18) to datetime
dates = [datetime.strptime(d, "%Y-%m-%d") for d in dates]
```

In [ ]:
```
# Choose some nice levels
levels = np.tile([-5, 5, -3, 3, -1, 1],
                 int(np.ceil(len(dates)/6)))[:len(dates)]

# Create figure and plot a stem plot with the date
fig, ax = plt.subplots(figsize=(8.8, 4), layout="constrained")
ax.set(title="Matplotlib release dates")

ax.vlines(dates, 0, levels, color="tab:red")  # The vertical stems.
ax.plot(dates, np.zeros_like(dates), "-o",
        color="k", markerfacecolor="w")  # Baseline and markers on it.

# annotate lines
for d, l, r in zip(dates, levels, names):
    ax.annotate(r, xy=(d, l),
                xytext=(-3, np.sign(l)*3), textcoords="offset points",
                horizontalalignment="right",
                verticalalignment="bottom" if l > 0 else "top")

# format x-axis with 4-month intervals
ax.xaxis.set_major_locator(mdates.MonthLocator(interval=4))
ax.xaxis.set_major_formatter(mdates.DateFormatter("%b %Y"))
plt.setp(ax.get_xticklabels(), rotation=30, ha="right")

# remove y-axis and spines
ax.yaxis.set_visible(False)
```

```
ax.spines[["left", "top", "right"]].set_visible(False)

ax.margins(y=0.1)
plt.show()
```



Candlestick Chart

In [ ]:
```
#import
import plotly.graph_objects as go

import pandas as pd
from datetime import datetime
```

In [ ]:
```
df = pd.read_csv('https://raw.githubusercontent.com/plotly/datasets/master/finance-
```

In [ ]:
```
df
```

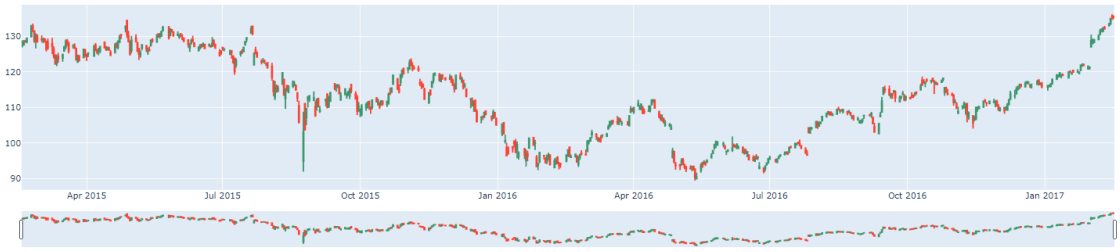
Out[ ]:

	Date	AAPL.Open	AAPL.High	AAPL.Low	AAPL.Close	AAPL.Volume	AAPL.Adjusted	
0	2015-02-17	127.489998	128.880005	126.919998	127.830002	63152400	122.905254	106.74
1	2015-02-18	127.629997	128.779999	127.449997	128.720001	44891700	123.760965	107.84
2	2015-02-19	128.479996	129.029999	128.330002	128.449997	37362400	123.501363	108.89
3	2015-02-20	128.619995	129.500000	128.050003	129.500000	48948400	124.510914	109.78
4	2015-02-23	130.020004	133.000000	129.660004	133.000000	70974100	127.876074	110.37
...	...	...	...	...	...	...	...	
501	2017-02-10	132.460007	132.940002	132.050003	132.119995	20065500	132.119995	114.49
502	2017-02-13	133.080002	133.820007	132.750000	133.289993	23035400	133.289993	114.82
503	2017-02-14	133.470001	135.089996	133.250000	135.020004	32815500	135.020004	115.17
504	2017-02-15	135.520004	136.270004	134.619995	135.509995	35501600	135.509995	115.54
505	2017-02-16	135.669998	135.899994	134.839996	135.350006	22118000	135.350006	116.20

506 rows × 11 columns

In [ ]:
```
fig = go.Figure(data=[go.Candlestick(x=df['Date'],
                open=df['AAPL.Open'],
                high=df['AAPL.High'],
                low=df['AAPL.Low'],
                close=df['AAPL.Close'])])
```

In [ ]:
```
fig.show()
```



Candlestick without Rangeslider

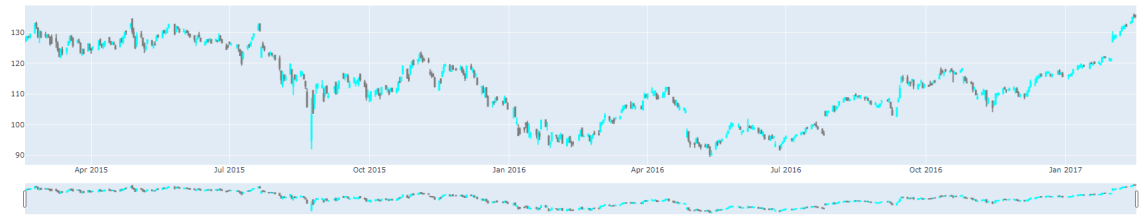
In [ ]:
```
fig = go.Figure(data=[go.Candlestick(x=df['Date'],
                open=df['AAPL.Open'], high=df['AAPL.High'],
                low=df['AAPL.Low'], close=df['AAPL.Close'])
                     ])
```

In [ ]:
```
fig.update_layout(xaxis_rangeslider_visible=False)
fig.show()
```

Custom Candlestick Colors

In [ ]:
```
fig = go.Figure(data=[go.Candlestick(
    x=df['Date'],
    open=df['AAPL.Open'], high=df['AAPL.High'],
    low=df['AAPL.Low'], close=df['AAPL.Close'],
    increasing_line_color= 'cyan', decreasing_line_color= 'gray'
)])
```

In [ ]:
```
fig.show()
```

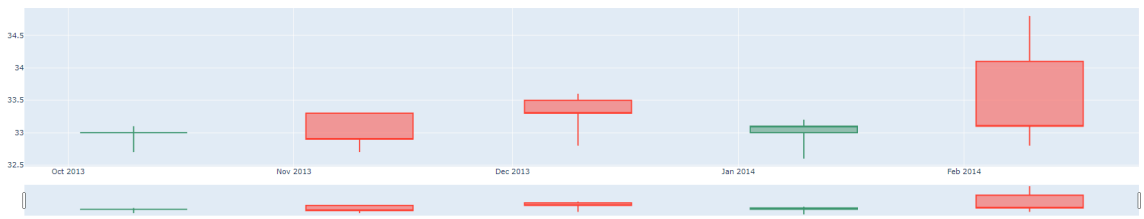


Simple Example with datetime Objects

In [ ]:
```
open_data = [33.0, 33.3, 33.5, 33.0, 34.1]
high_data = [33.1, 33.3, 33.6, 33.2, 34.8]
low_data = [32.7, 32.7, 32.8, 32.6, 32.8]
close_data = [33.0, 32.9, 33.3, 33.1, 33.1]
dates = [datetime(year=2013, month=10, day=10),
         datetime(year=2013, month=11, day=10),
         datetime(year=2013, month=12, day=10),
         datetime(year=2014, month=1, day=10),
         datetime(year=2014, month=2, day=10)]
```

In [ ]:
```
fig = go.Figure(data=[go.Candlestick(x=dates,
                      open=open_data, high=high_data,
                      low=low_data, close=close_data)])
```

In [ ]:
```
fig.show()
```

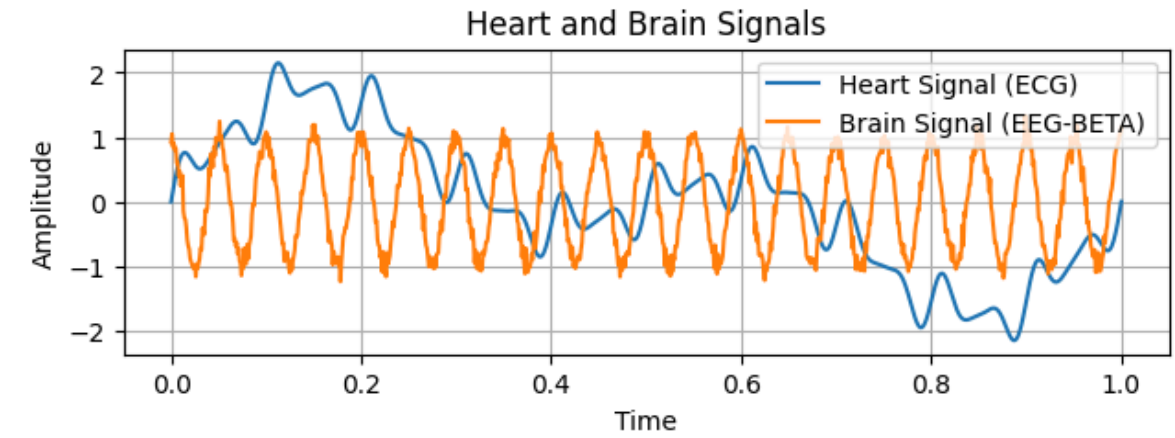


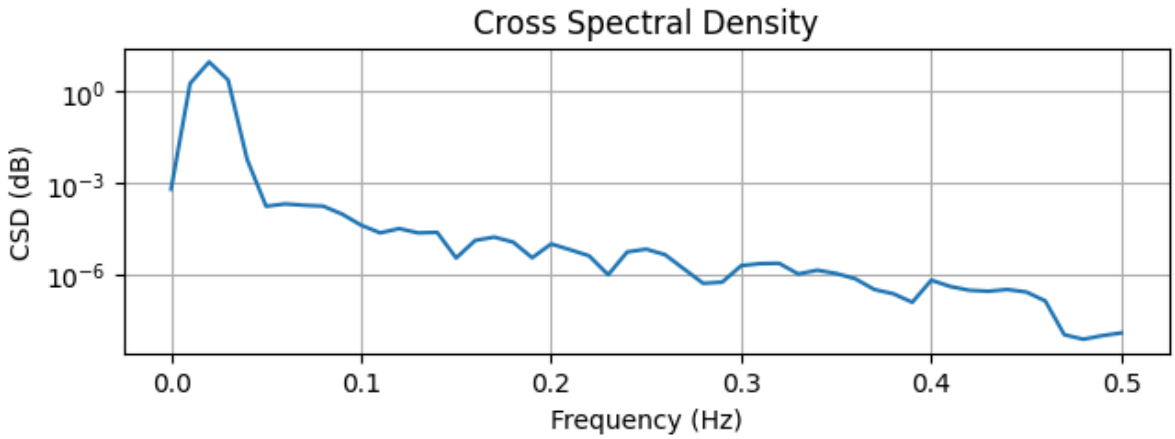
Cross spectral density (CSD)

In [ ]:
```
#import
import numpy as np
from scipy import signal
import matplotlib.pyplot as plt
```

In [ ]:
```
# Number of samples and time array creation
num_samples = 1000
time = np.linspace(0, 1, num_samples)

# Generating P wave, QRS complex, and T wave for ECG signal
p_wave = np.sin(2 * np.pi * 2 * time)
qrs_complex = (
    + 0.2 * np.sin(2 * np.pi * 10 * time)
    + 0.3 * np.sin(2 * np.pi * 20 * time)
    + 0.1 * np.sin(2 * np.pi * 30 * time)
)
t_wave = np.sin(2 * np.pi * 1 * time)
ecg_signal = p_wave + qrs_complex + t_wave

# Generating brain signal (EEG-BETA) and adding random movement
brain_signal = np.cos(2 * np.pi * 20 * time)
random_movement = np.random.normal(loc=0, scale=0.1, size=num_samples)
brain_signal += random_movement

# Calculating Cross Spectral Density (CSD) between ECG and EEG signals
frequencies, csd = signal.csd(ecg_signal, brain_signal, fs=1.0, nperseg=100)
```

In [ ]:
```
# Plotting ECG, EEG-BETA signal and Cross Spectral Density (CSD)
fig, (ax1, ax2) = plt.subplots(2, 1, layout='constrained')

# Plotting ECG, EEG-BETA signal
ax1.plot(time, ecg_signal, label='Heart Signal (ECG)')
ax1.plot(time, brain_signal, label='Brain Signal (EEG-BETA)')
ax1.set_xlabel('Time')
ax1.set_ylabel('Amplitude')
ax1.set_title('Heart and Brain Signals')
ax1.legend()
ax1.grid(True)

# Plotting Cross Spectral Density (CSD)
ax2.semilogy(frequencies, np.abs(csd))
ax2.set_xlabel('Frequency (Hz)')
ax2.set_ylabel('CSD (dB)')
ax2.set_title('Cross Spectral Density')
ax2.grid(True)

plt.show()
```


Heart and Brain Signals
Heart Signal (ECG)
Brain Signal (EEG-BETA)
Amplitude
Time
2
1
0
−1
−2
0.0
0.2
0.4
0.6
0.8
1.0


Cross Spectral Density
CSD (dB)
Frequency (Hz)
10^{0}
10^{-3}
10^{-6}
0.0
0.1
0.2
0.3
0.4
0.5

In [ ]: