Rotman

INTRO TO DATA VISUALIZATION

Part II Intro to Matplotlib – From Default to Publication-Ready

August 28, 2025 Prepared by Jay Cao / MDAL

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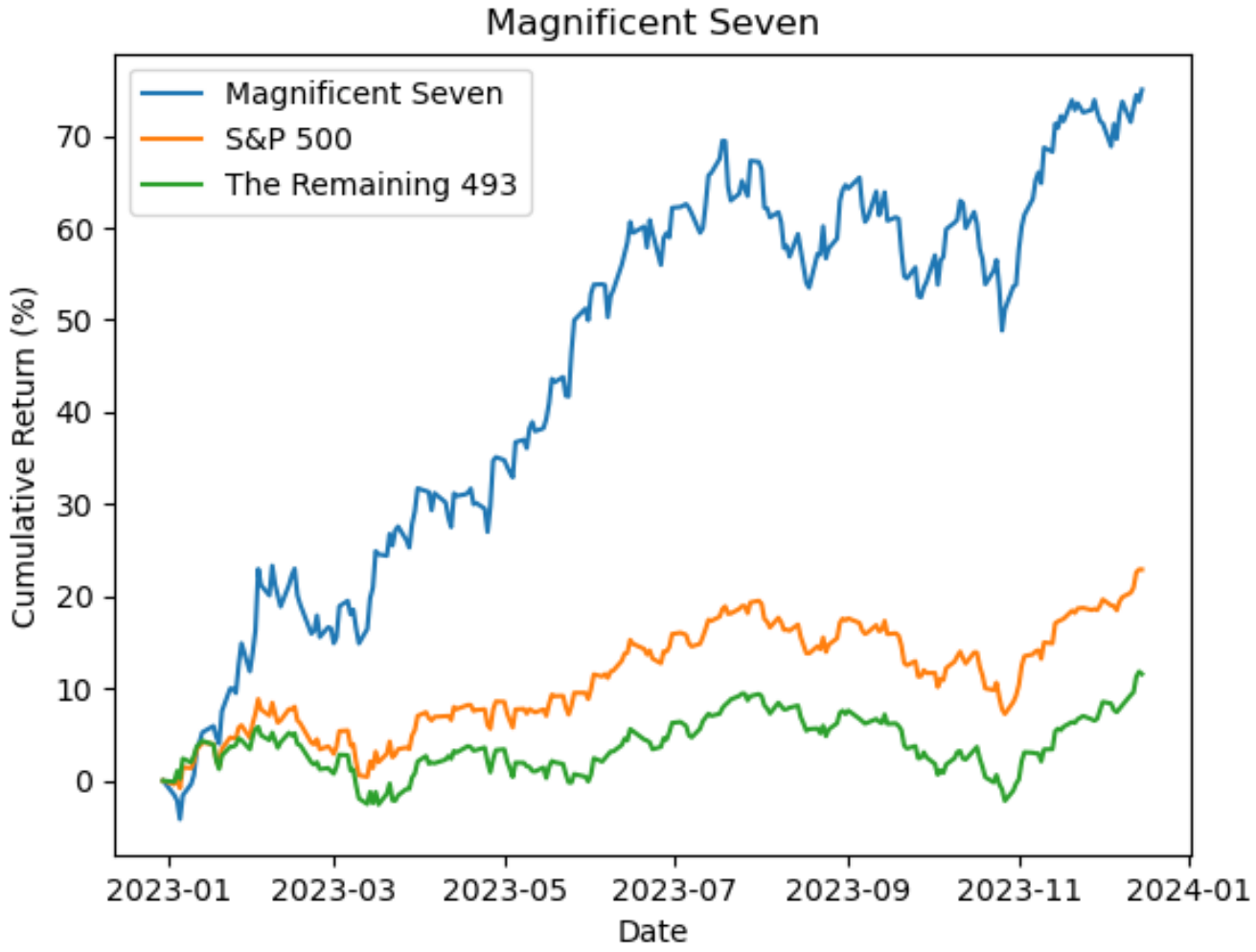
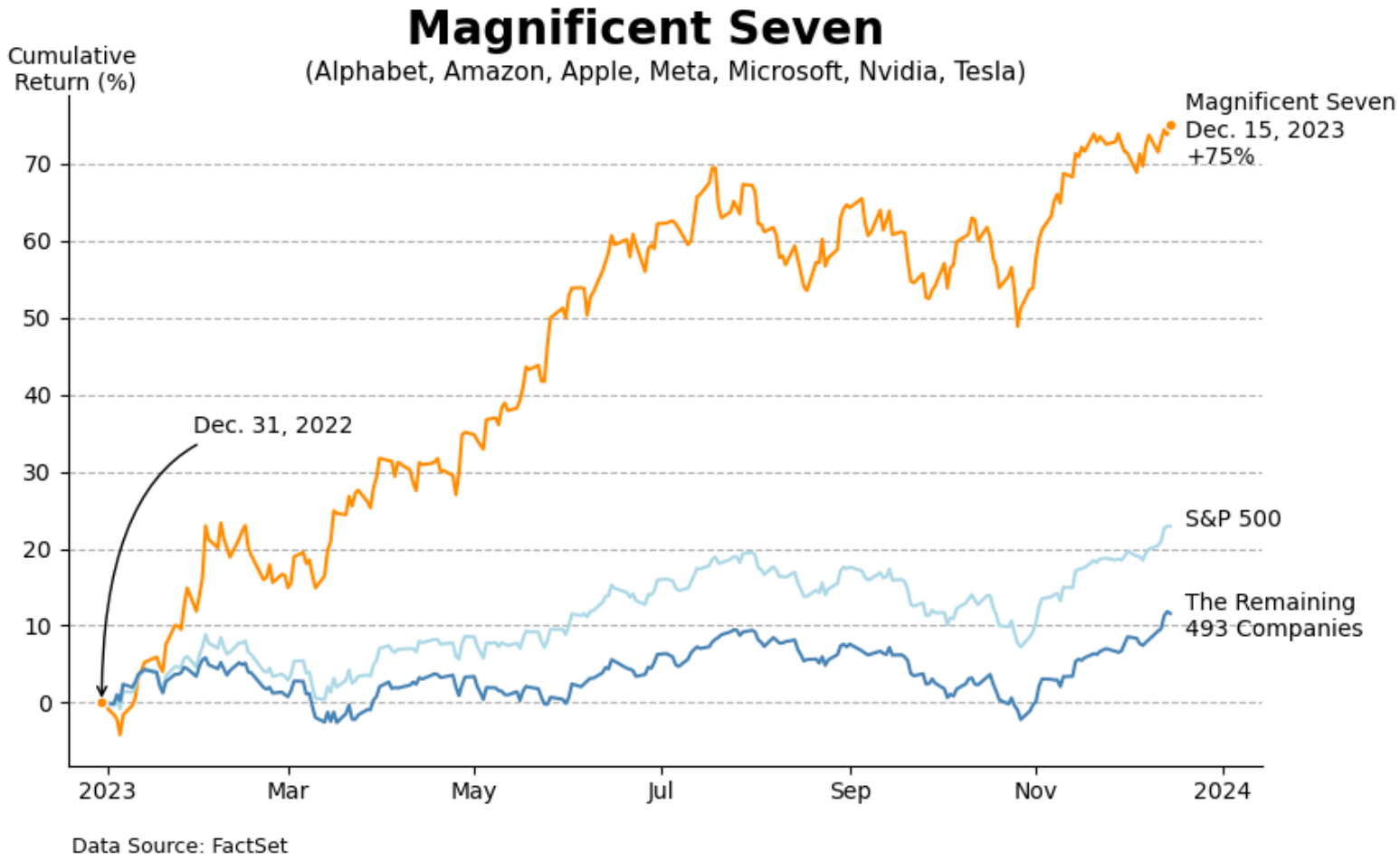
Hands-on: From Matplotlib Default

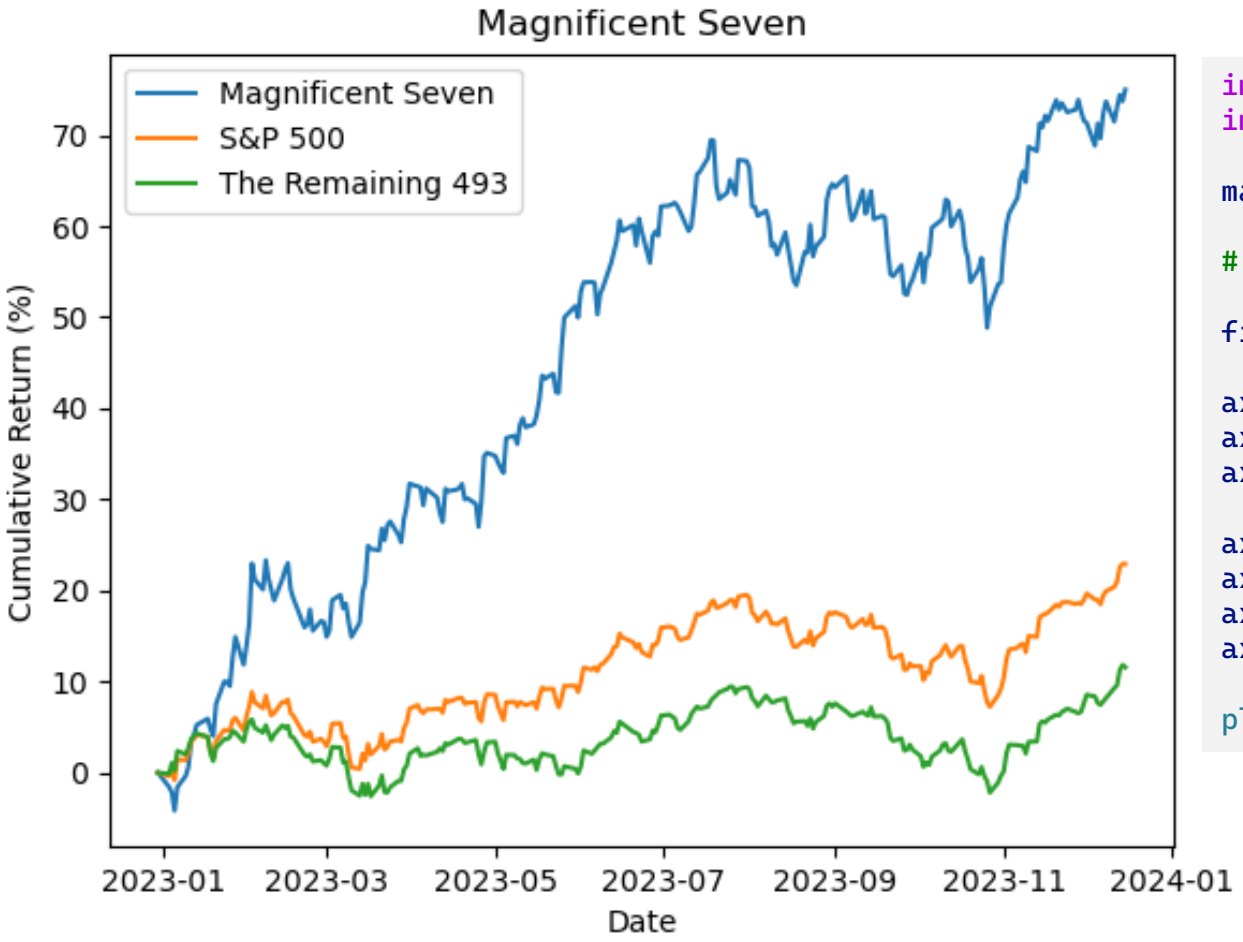


Hands-on: To Publication-Quality



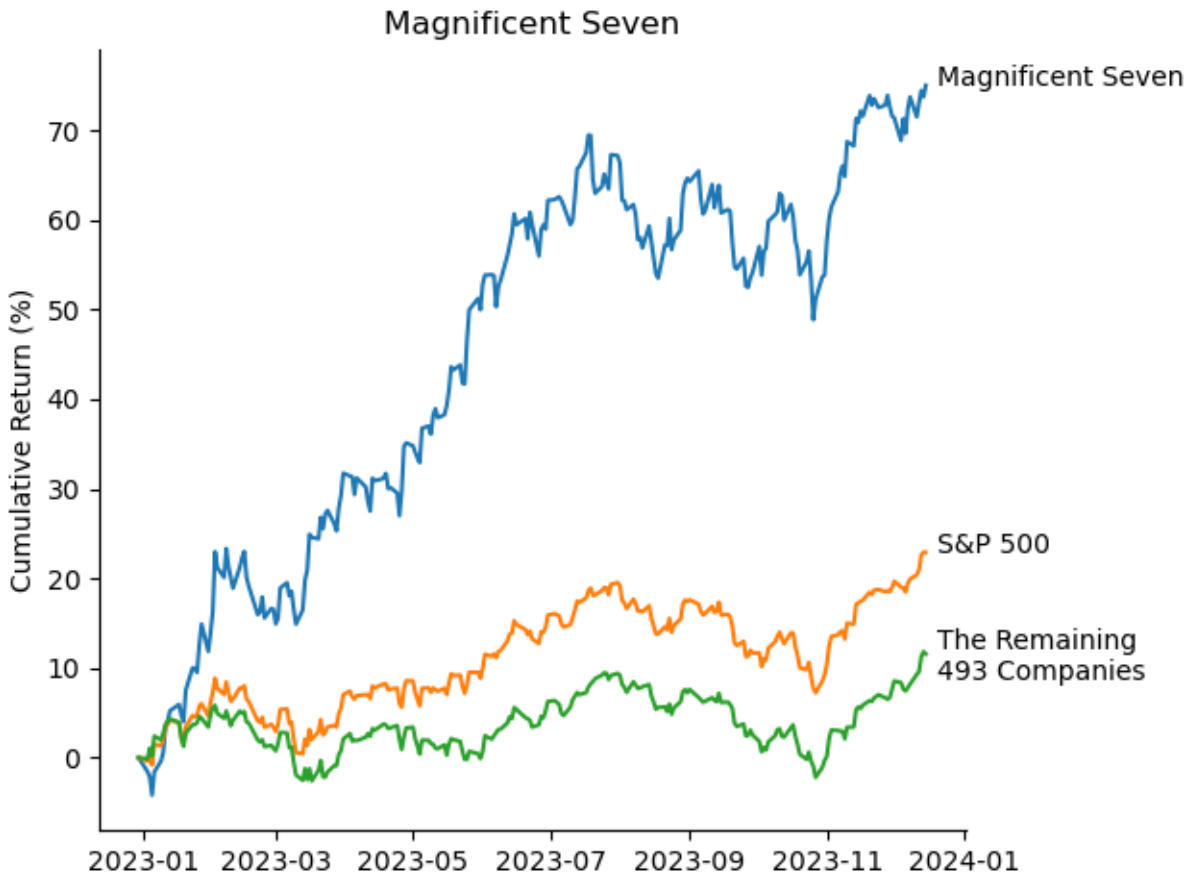
Inspiration Source 1: https://www.nytimes.com/interactive/2024/01/22/business/magnificent-seven-stocks-tech.html
Inspiration Source 2: https://www.wsj.com/finance/stocks/its-the-magnificent-sevens-market-the-other-stocks-are-just-living-in-it-5d212f95

Round 1 - Matplotlib Default




```python
import pandas as pd
import matplotlib.pyplot as plt

mag7_df = pd.read_csv("mag7.csv", parse_dates=["date"])

# Round 1

fig, ax = plt.subplots()

ax.plot(mag7_df["date"], mag7_df["mag7"])
ax.plot(mag7_df["date"], mag7_df["sp"])
ax.plot(mag7_df["date"], mag7_df["rest"])

ax.set_xlabel("Date")
ax.set_ylabel("Cumulative Return (%)")
ax.set_title("Magnificent Seven")
ax.legend(["Magnificent Seven", "S&P 500", "The Remaining 493"])

plt.show()
```

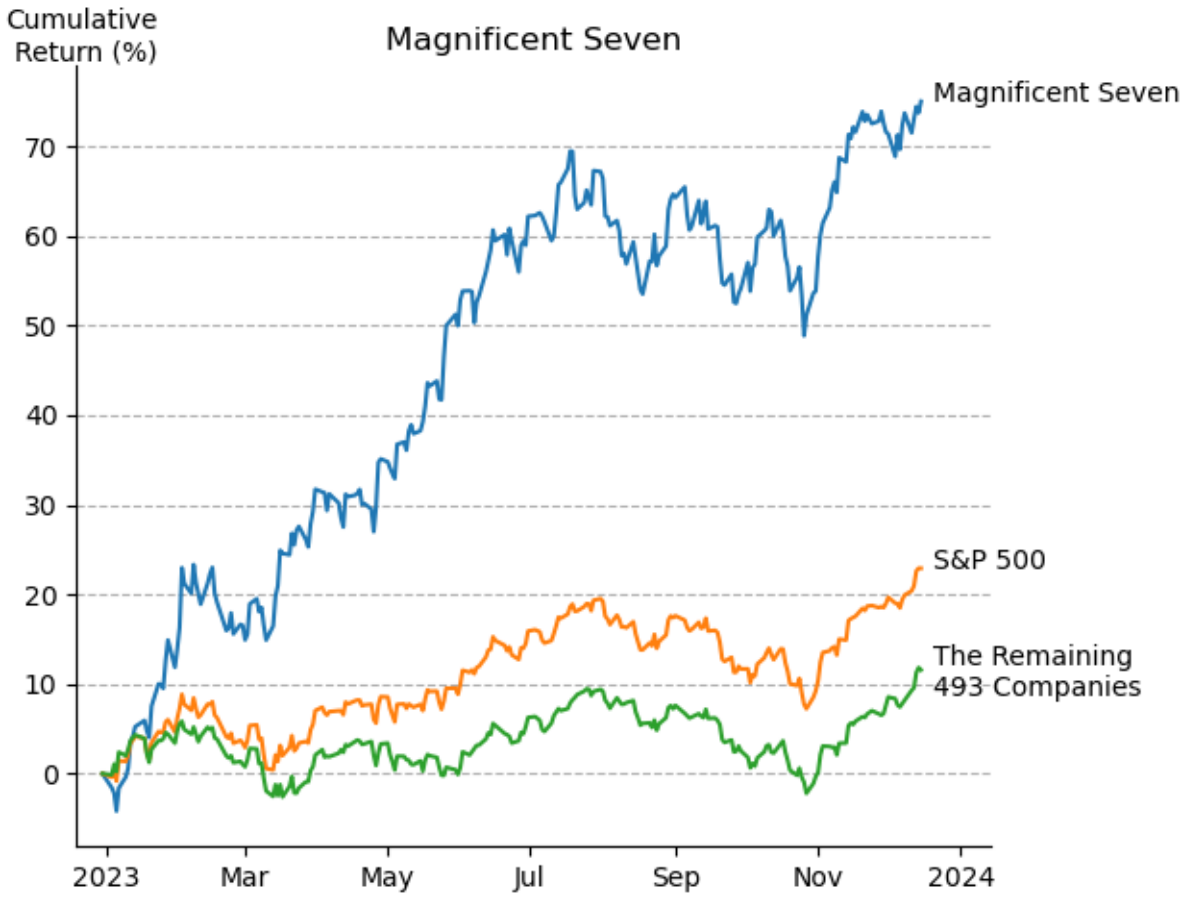
Round 2




```
…

# Round 2

# remove x-axis label
# remove legend
# annotate at the end of each line
# hide top and right spines

# add annotations
ax.annotate(
   text="Magnificent Seven",
   xy=(mag7_df["date"].iloc[-1], mag7_df["mag7"].iloc[-1]),
   xytext=(
      mag7_df["date"].iloc[-1] + pd.Timedelta("5 day"),
      mag7_df["mag7"].iloc[-1],
   ),
)

…

# hide top and right spines
ax.spines["top"].set_visible(False)

…

# use tight_layout() to automatically adjusts subplot
plt.tight_layout()

…
```

Ref 1. https://matplotlib.org/stable/users/explain/text/annotations.html
Ref 2. https://matplotlib.org/stable/api/_as_gen/matplotlib.axes.Axes.annotate.html

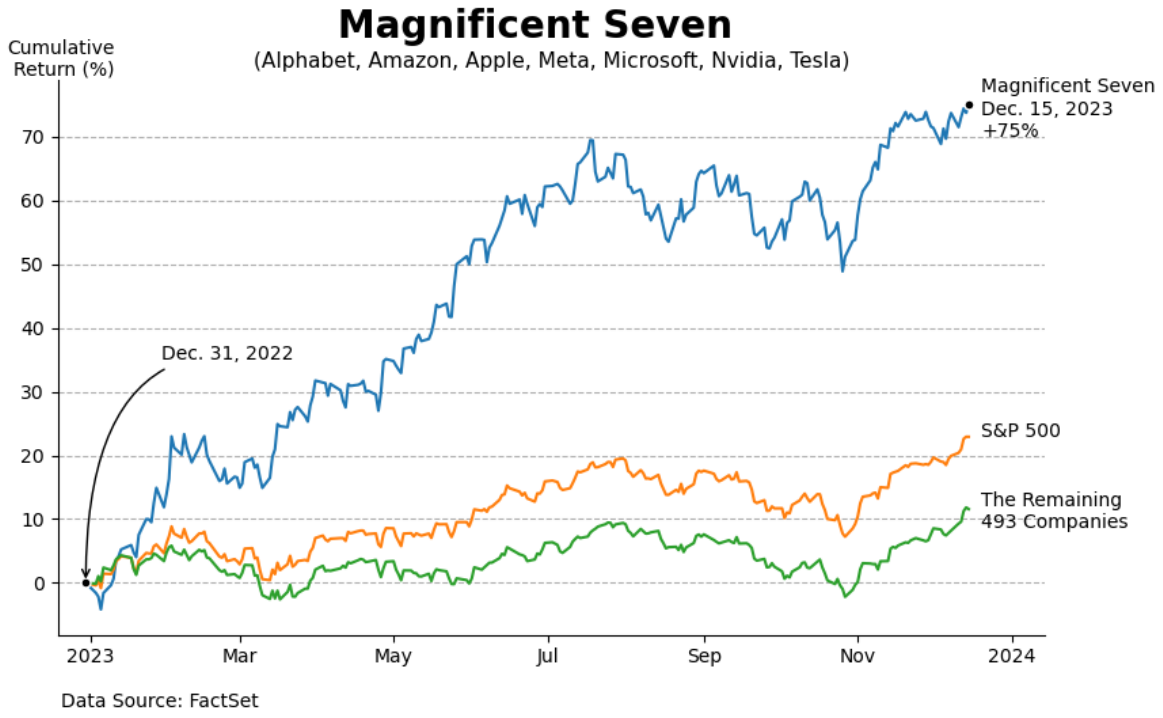
Round 3




```python
import matplotlib.dates as mdates

…

# Round 3
# improve the x-axis tick labels
# improve the y-axis labels (move it to the top)
# add y grid

…

# set x-axis view limits
ax.set_xlim(mag7_df["date"].iloc[1] - pd.Timedelta("15 days"),
            mag7_df["date"].iloc[-1] + pd.Timedelta("30 days"))

# set x-axis tick labels
locator = mdates.AutoDateLocator()
formatter = mdates.ConciseDateFormatter(locator)
ax.xaxis.set_major_locator(locator)
ax.xaxis.set_major_formatter(formatter)

# set the y-axis label
ax.set_ylabel("Cumulative\nReturn (%)", loc="top",
              rotation=0, labelpad=-50)

…

# add y grid
ax.grid(visible=True, axis='y', linestyle="--")

…
```

Ref 1. https://matplotlib.org/stable/api/dates_api.html
Ref 2. https://matplotlib.org/stable/api/_as_gen/matplotlib.pyplot.grid.html

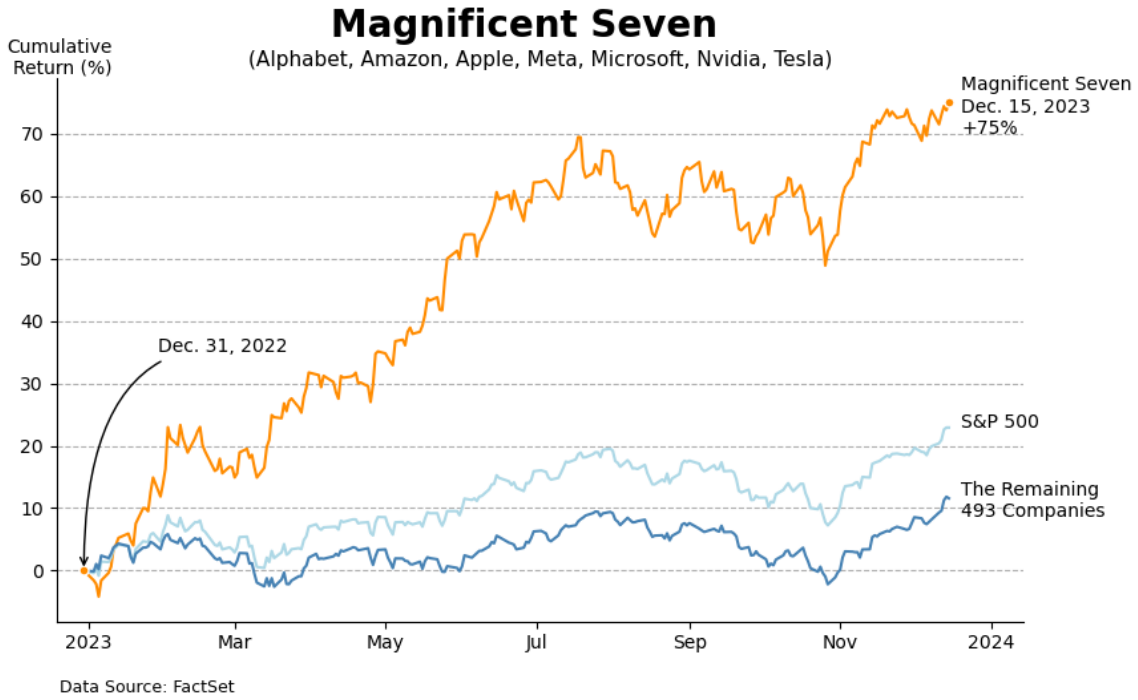
Round 4




```
...

# Round 4
# add the first data point as a dot and annotate it
# add the last data point of the mag7 as a dot and annotate it
# improve title
# add caption
# adjust axes aspect ratio
# add the figure size
# remove tight_layout()

# set ax aspect ratio and figure size
ax.set_box_aspect(aspect=9/16)
fig_width = 9*1.05
fig_height = fig_width/16*9
fig.set_figwidth(fig_width)
fig.set_figheight(fig_height)

# set title and subtitle
fig.suptitle("Magnificent Seven", fontsize=20, fontweight='bold')
ax.set_title("(Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia, Tesla)",
             fontdict={'fontsize': 11})

# plot the first data point as a dot and annotate it
ax.plot(mag7_df["date"].iloc[0], mag7_df["mag7"].iloc[0],
        color="black", marker="o", markersize=5, markeredgecolor="white")
ax.annotate(
   text="Dec. 31, 2022",
   xy=(mag7_df["date"].iloc[0], mag7_df["mag7"].iloc[0]),
   xytext=(
      mag7_df["date"].iloc[0] + pd.Timedelta("30 day"),
      mag7_df["mag7"].iloc[0] + 35,
   ),
   arrowprops=dict(arrowstyle="->", connectionstyle="angle3, angleA=0, angleB=90"),
)
...

# add caption
# https://matplotlib.org/stable/api/_as_gen/matplotlib.figure.Figure.text.html
fig.text(0.13, 0.01, "Data Source: FactSet")
# plt.tight_layout()
```

Ref 1. https://matplotlib.org/stable/users/explain/text/annotations.html#customizing-annotation-arrows
Ref 2. https://matplotlib.org/stable/gallery/subplots_axes_and_figures/figure_title.html

Round 5




```
...

# Round 5
# adjust colors and fonts

...

# plot the data
ax.plot(mag7_df["date"], mag7_df["mag7"], color="darkorange")
ax.plot(mag7_df["date"], mag7_df["sp"], color="lightblue")
ax.plot(mag7_df["date"], mag7_df["rest"], color="steelblue")

# set title and subtitle
fig.suptitle("Magnificent Seven", fontsize=20, fontweight='bold')
ax.set_title("(Alphabet, Amazon, Apple, Meta, Microsoft, Nvidia, Tesla)",
             fontdict={'fontsize': 11})

...

# plot the first data point as a dot and annotate it
ax.plot(mag7_df["date"].iloc[0], mag7_df["mag7"].iloc[0],
        color="darkorange", marker="o", markersize=5, markeredgecolor="white")
...

# plot the last data point of magnificent seven as a dot
ax.plot(mag7_df["date"].iloc[-1], mag7_df["mag7"].iloc[-1],
        color="darkorange", marker="o", markersize=5, markeredgecolor="white")
...

# add caption
fig.text(0.13, 0.01, "Data Source: FactSet",
         fontdict={'fontsize': 9, 'fontweight': 'light'})

...
```

Ref 1. https://matplotlib.org/stable/gallery/color/named_colors.html
Ref 2. https://matplotlib.org/stable/users/explain/text/text_intro.html