How to Easily Increase Plot Size in Matplotlib

Authored by

stats writer

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One of the most frequent adjustments required when generating data visualizations is controlling the size of the output figure. Achieving clarity and impact in your graphs often necessitates careful dimensioning, ensuring that labels are readable and data points are not overly crowded. In the Matplotlib library, the standard approach to modify the dimensions of a plot involves utilizing the figure function, specifically through the use of the `figsize` parameter. This parameter accepts a two-element tuple representing the desired width and height, respectively, with measurements universally defined in inches.

While the primary method is setting the size upon figure initialization, advanced users also have the option to dynamically adjust the dimensions post-creation. This is accomplished using the `set_size_inches()` method, which is applied directly to the underlying Axes object or the Figure object itself. Both foundational methods provide the necessary flexibility to customize your visualizations, whether you need to adjust a single plot for publication or standardize the dimensions across an entire collection of generated graphics.

Understanding Figure Sizing in Matplotlib

In Matplotlib, a visualization is composed of two primary components: the **Figure** and the **Axes**. The Figure acts as the outermost container, serving as the entire canvas where the plot is drawn. The Axes is the region where the data is actually plotted, including the x and y axes, titles, and data markers. When we discuss resizing a plot, we are fundamentally referring to resizing the Figure object, which dictates the overall dimensions of the output image. By default, Matplotlib assigns a standard size to new figures, typically (6.4, 4.8) inches, but this is rarely suitable for all use cases, particularly when preparing charts for reports or academic papers where specific dimensions are often required.

The flexibility in sizing is essential for maintaining visual integrity. A figure that is too small might compress axis labels, making the visualization illegible, while a figure that is excessively large may consume unnecessary screen space or file size without adding value. Therefore, mastering the sizing parameters allows developers and data scientists to create visualizations that are optimized for their intended display medium, whether it be a small inline chart in a Jupyter Notebook or a high-resolution graphic destined for print.

Method 1: Setting Size for a Single Figure Instance

The most granular and common way to control dimensions is by passing the `figsize` argument directly into the `figure()` function within the `pyplot` module. This method ensures that only the currently created figure adheres to the specified dimensions, leaving subsequent figures to use either the default settings or any previously defined global parameters. The value provided to `figsize` is always interpreted as `(width, height)`, measured in inches. This unit convention is

critical to remember, as it directly impacts the physical printed size or the pixel dimensions when combined with the Dots Per Inch (DPI) setting.

To implement this for a specific visualization, you must call `plt.figure()` before initiating any plotting commands, such as `plt.plot()` or `plt.scatter()`. If you call `plt.figure()` multiple times, each instance will create a new figure object, and the `figsize` parameter will only apply to the figure object being instantiated at that exact moment. Understanding this sequence is vital for controlling individual plot sizes effectively within a script that generates multiple visualizations.

You can use the following syntax to increase the size of a single plot in Matplotlib:

```
import matplotlib.pyplot as plt

#define figure size in (width, height) for a single plot
plt.figure(figsize=(3,3))
```

Method 2: Configuring Global Plot Sizes Using rcParams

When working in an interactive environment like a Jupyter Notebook or when aiming for a consistent visual style across dozens of plots within a report, setting the figure size individually can become tedious and error-prone. Matplotlib offers a powerful customization system through the runtime configuration parameters, accessible via `plt.rcParams`. By modifying the `figure.figsize` entry in `rcParams`, you can define a new global default size that will apply to every figure created thereafter in the current session, unless explicitly overridden by a local `figsize` argument.

This method is highly recommended for standardization. For instance, if you know all your charts need to fit a 16:9 aspect ratio and be roughly 10 inches wide, setting this global parameter once at the beginning of your script guarantees consistency. This reduces the boilerplate code required for each individual visualization and ensures that the visual output remains coherent throughout your entire analysis or document.

And you can use the following syntax to increase the size of *all* Matplotlib plots in a notebook:

```
import matplotlib.pyplot as plt

#define figure size in (width, height) for all plots
plt.rcParams =
```

Note that when setting the dimensions using `rcParams`, you assign a Python list or tuple containing the width and height values (in inches) to the specific configuration key `'figure.figsize'`. This

change persists until the kernel is restarted or the parameter is reset manually.

The following examples show how to use this syntax in practice, highlighting the transformation from default settings to custom sizes, both locally and globally.

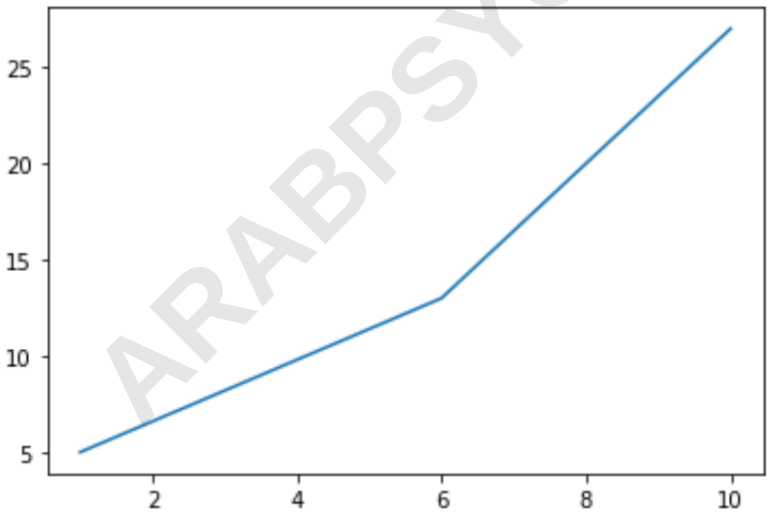
Example 1: Controlling the Size of a Single Matplotlib Plot

To appreciate the impact of the `figsize` parameter, we first examine a standard line plot generated without any explicit sizing instructions. By default, pyplot allocates dimensions that typically fit well on standard screens but often lack the necessary scale for detailed analysis or presentation. Suppose we create the following line plot in Matplotlib:

import matplotlib.pyplot as plt

#define x and y
x =
y =

#create plot of x and y
plt.plot(x, y)
plt.show()



As illustrated above, by default, the (width, height) of a Matplotlib plot is typically (6.4, 4.8). This aspect ratio (4:3) is a legacy standard. If our goal is to produce a visualization that is taller than it is wide--for example, to emphasize vertical trends or to fit a specific column layout--we must intervene using the `figsize` parameter.

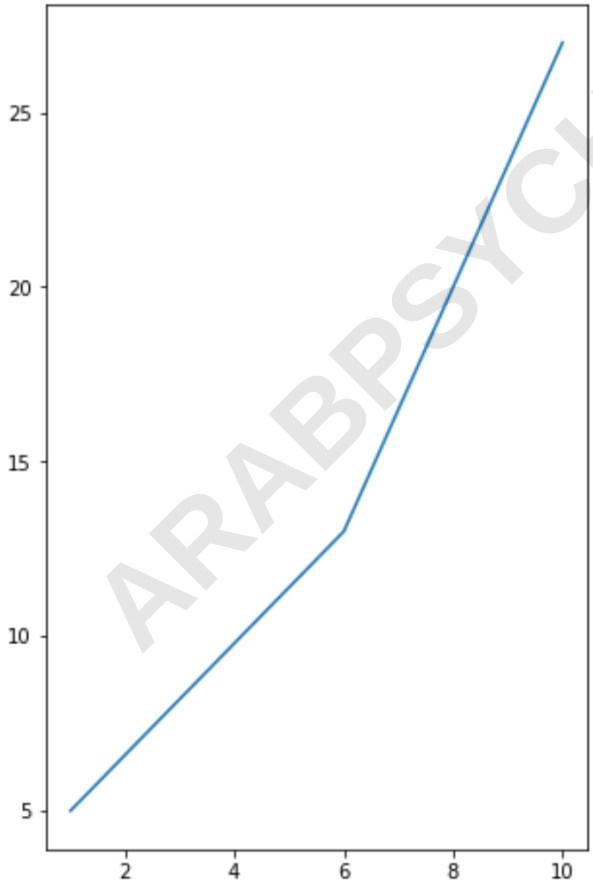
To significantly alter the appearance, perhaps making the plot much narrower and taller, we can use the following syntax. Here we define a width of 5 inches and a height of 8 inches, overriding the default settings for this specific figure instance:

```
import matplotlib.pyplot as plt

#define plot size
plt.figure(figsize=(5,8))

#define x and y
x =
y =

#create plot of x and y
plt.plot(x, y)
plt.show()
```



Notice how the plot retains its internal aspect ratio concerning the data, but the overall container

size (the Figure) has been dramatically adjusted, providing more vertical space. This is a crucial distinction: resizing the figure resizes the canvas, but it is the job of the Axes object to scale the actual plotted data to fit within that canvas.

Example 2: Setting Default Size for All Figures

When generating a series of plots, establishing a standard configuration ensures uniformity. This is particularly relevant in data analysis workflows where multiple visualizations are generated sequentially and must share a consistent look and feel. The subsequent code demonstrates how to set the plot size for *all* Matplotlib plots in a notebook session using `rcParams`. We define a wide, short plot size (10 inches wide, 4 inches high) to suit a landscape orientation commonly used in presentations.

After setting this configuration parameter, every subsequent call to `plt.figure()` (or any plotting command that implicitly creates a figure) will adopt these new dimensions. We demonstrate this by creating two distinct plots using separate datasets; both inherit the global setting.

import matplotlib.pyplot as plt

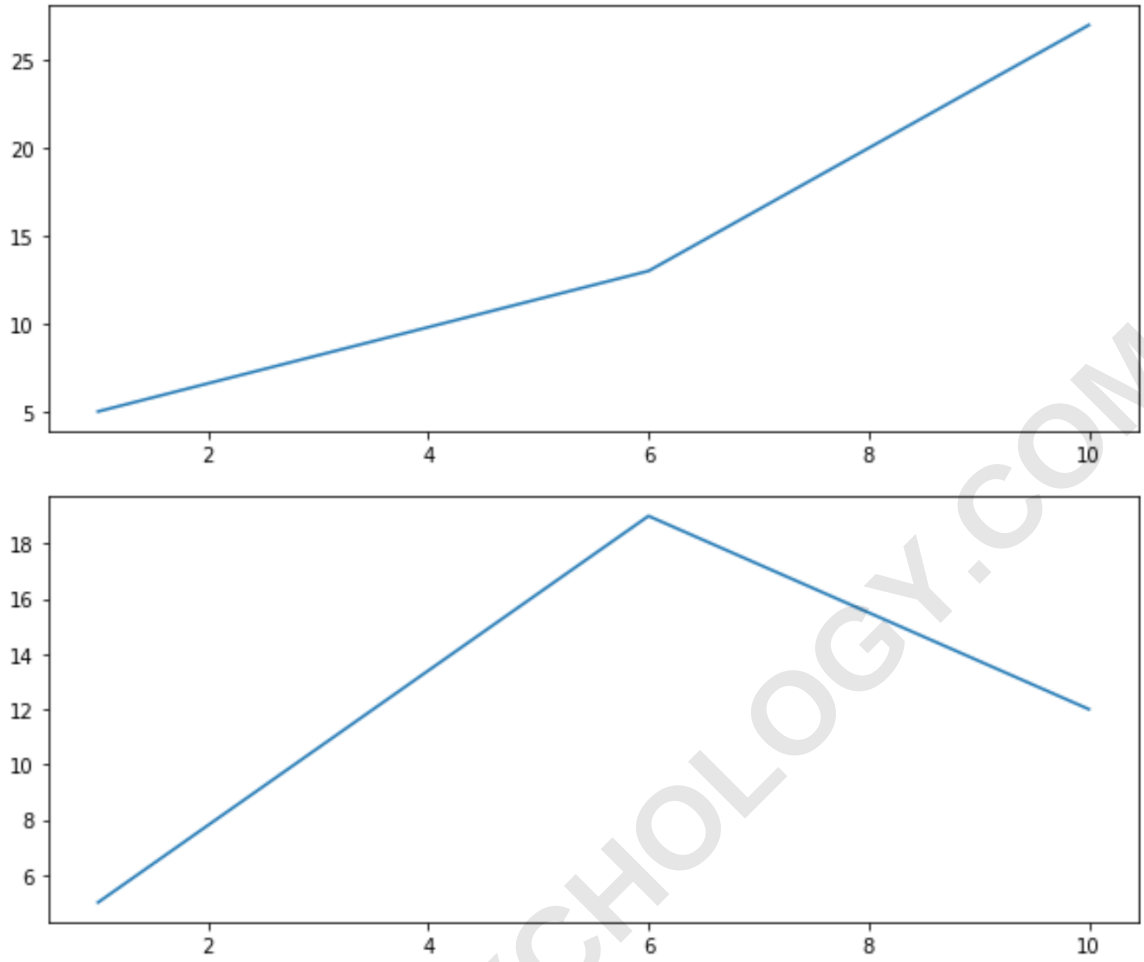
#define plot size for all plots
plt.rcParams =

#define first dataset
x =
y =

#create first plot
plt.plot(x, y)
plt.show()

#define second dataset
x2 =
y2 =

#create second plot
plt.plot(x2, y2)
plt.show()



Observe the resulting output. Both generated plots exhibit the wide, landscape orientation defined by the `rcParams` setting , successfully demonstrating the global configuration change. This approach is highly efficient for maintaining visual consistency across large projects.

Alternative: Dynamic Sizing with set_size_inches()

While `figsize` is suitable for initialization, there are scenarios where you might need to adjust the figure dimensions after the figure object has already been created and potentially populated with data. This is where the method `fig.set_size_inches(width, height)` becomes invaluable. This method is called directly on the Figure object itself, providing programmatic control over resizing based on conditional logic or user input during runtime.

To use this dynamic approach, you must first capture the Figure object, typically done using the Object-Oriented Interface (OOI) of Matplotlib, although it can also be accessed from the pyplot state machine. Here is the general workflow:

Use `fig = plt.figure()` or `fig, ax = plt.subplots()` to create and capture the Figure

object.
Perform your plotting operations (e.g., `ax.plot(...)`).
Use `fig.set_size_inches(new_width, new_height, forward=True)` to apply the new size. The `forward=True` argument is often used to ensure the backend is aware of the change.

This dynamic adjustment is particularly useful in complex scripts where the final required figure size might depend on the volume of data being plotted or constraints imposed by a subsequent layout manager.

Deep Dive into Units: Inches and DPI

A common source of confusion when resizing Matplotlib figures relates to the relationship between the size specified in inches (via `figsize`) and the final pixel dimensions of the saved image. The figure size in inches determines the physical dimensions if the figure were to be printed at a standard resolution. However, when rendering to a screen or saving to a raster format (like PNG or JPG), the actual pixel count is determined by multiplying the figure size (in inches) by the Dots Per Inch (DPI) setting.

The formula for calculating pixel dimensions is: `Pixel Width = Width (in inches) * DPI` and `Pixel Height = Height (in inches) * DPI`. Matplotlib uses a default DPI setting, often 100. Therefore, a figure with `figsize=(6, 4)` will render at 600x400 pixels by default. If you need a high-resolution image, you should increase the DPI setting, either when saving the figure (e.g., `plt.savefig('plot.png', dpi=300)`) or globally via `rcParams`. Understanding this relationship is crucial for generating publication-quality images.

Best Practices for Plot Sizing and Aspect Ratio

When deciding on appropriate figure dimensions, several best practices should be considered to ensure optimal visualization quality:

Aspect Ratio Integrity: Unless specifically required, try to maintain an aspect ratio that logically represents the data. For time series plots, a wider figure (e.g., 10x4) is generally preferred to allow the time axis sufficient space. For correlation plots or scatter plots where X and Y axes represent similar scales, a square figure (e.g., 6x6) is often ideal.
Text Scalability: Increasing the figure size without proportionally increasing font sizes can lead to tiny, unreadable text. If you dramatically increase the `figsize`, consider adjusting `rcParams` for fonts (e.g., `rcParams`) or dynamically calculating font size based on the new dimensions to maintain readability.
Subplot Management: When dealing with multiple plots within a single figure (using `plt.subplots()`), the figure size must accommodate all subplots, including sufficient padding for

titles, shared axes, and legends. If subplots appear too cramped, increase the `figure` size and potentially adjust the spacing using `plt.tight_layout()` or `fig.subplots_adjust()`.

By judiciously applying `figsize` locally for specific needs and leveraging `rcParams` for global consistency, you gain complete mastery over the presentation layer of your data analysis.

Troubleshooting Common Sizing Issues

Despite the simplicity of using `figsize`, users occasionally encounter issues where the plot size does not seem to update correctly. This is often due to context management or the order of operations.

Issue 1: Using plt.figure() after plotting: If you call plotting functions (like `plt.plot()`) before explicitly calling `plt.figure(figsize=...)`, pyplot will automatically create a figure using the default or global settings, and your subsequent `plt.figure()` call will create a new, empty figure with the correct size, leaving the original, plotted figure unchanged. Always define the figure size before the first plotting command.
Issue 2: Global vs. Local Overrides: If you set `rcParams` but then also use `figsize`, the local `figsize` parameter will always take precedence for that specific figure. Ensure you are not accidentally passing default or unwanted dimensions locally when you intend to use the global settings.
Issue 3: Subplot Layout Overlap: If the plot dimensions increase significantly, text elements (titles, tick labels) might overlap, especially if the figure border is close to the plotting area. Use `plt.tight_layout()` immediately before `plt.show()` to automatically adjust subplot parameters for a tight layout, minimizing clipping and overlap.

By following these guidelines and understanding the distinction between the Figure container and the Axes object, developers can confidently generate professional, perfectly sized visualizations tailored to any output requirement.