

# Presentations & Visualization of Data - Part Two

An important part of any good poster, but also any good paper, are good and clear figures. So, what makes a good figure?

- First of all, as always when it comes to good communication, you have to know your audience. Are you talking to a scientific community versus a general audience?
- Identify the message that you are trying to convey. It should help to tell a story and help you to pick the most suitable plot type of your figure. Depending on whether you're planning to use it in a presentation, publication, or in a poster, the figure should be slightly different and optimized for the purpose.
- Always include a caption.
- Use easily readable font sizes.
- Use color effectively.
- And make your figures easy to interpret with good design and understandable visualization of your data.
- And finally, use the right tools.

## Which program to use?

You have a choice of many programs to create your figures. You can use: Microsoft Excel, PowerPoint, Matlab, Matplotlib, Illustrator, Inkscape, ImageMagick, Cytoscape, and Circos, to name a few. Look at the different software options and find the one that suits you and your purpose most.

There are **different figure layouts** depending on what you want to visualize. For instance, if you want to show a relationship, you have two plots and are a line. You can draw comparison easily using a bar graph or column graphs. If you have different compositions, you can use a scatter plot. You can also visualize different distributions with arrow bars.

## Here's some examples of what good figures look like.

This is a column figure and a line graph. You see that you have different colors to visualize different compositions. A little cartoon to visualize how the experiment was conducted. There are arrows, legends, and texts to clearly visualize what is going on and make the information easily accessible.

These are good figure because they're easy to understand. There is very efficient use of the white space. Color is used effectively with different compositions of samples that are color coded, making it very easy to compare them. They have a concise figure caption as well, explaining the message thoroughly.

This is another example of a good figure. There's a lot going on with the subplots smaller graphs, bar graphs, cartoons, and illustrations, all in the same figure. So, why is this busy looking content still considered a good figure? That is because it is still not overwhelming and the groupings help to organize the different data types. There's clarity in the information represented in the figure with a clear x and y axis in each of the figures, demonstrating what is

being measured. And, the choice of colors makes a very good contrast for the entire figure, but also between the different techniques and measurements.

This figure is used to visualize and summarize your findings. There are illustrations of different systems, subplots, numbers, values, and arrows. It's starting with a system and adding a molecule to get something else. And then, it is easy to see what happens. This type of figure is visualizing and summarizing the most important findings. It is considered a good figure because it helps to tell a story. It is easy to understand and it's clear, clean, and visually pleasing. It's not too busy but still has important information.

## Figures for different purposes

It is important that you tailor your figure for a specific purpose.

This is a figure that you would put in a paper in a publication. There's the skeleton plot line. And then, you have a zoomed in perspective of an area that visualizes what people are supposed to see. This is a good figure for a paper, but it would not work well in a presentation. But you could make a few changes and it would work for this purpose.

First, you would show the data plots. Second, use an animation to zoom in and start talking about and visualizing the signal that you want your audience to see by shading or using colors. Then in your explanation, add a cartoon or illustration to show what you want people to see in the data or how you interpret the data.

## What makes a bad figure?

This figure has some issues. The various graphic lines are covering each other up and the different colors are not very helpful to distinguish them. What is even more confusing is the legend box that overlaps the corner of the graph. The x labels are also overlapping each other. And the 3-digit high precision that is shown does not seem to be significant. To make this figure more appealing, it could use another layout that favors the results. Split the figure into two different plots, highlighting one at a time. Avoid the use of color that is not helpful in this case. And reduce the number of x ticks.

Here's an example of splitting up each series and showing it independently, which makes the information much more easy to access.

Here's another example of a bad figure. The lines are overlapping and the wire range is way too large. And there's too much white space at the top and bottom. To improve this figure, you would, focus the wire range to the important areas only and then avoid any overlap of the lines.

The concept that is meant to be displayed in this figure is if something has the ratio of more than one or less than one. However, if you convert this figure into a different style, instead of plotting the ratio, you can plot the logarithm of the ratio, and it is easy to see which of your compositions fall below or above the ratio of one. Information is much more easily accessible if you present your data this way.

## Data visualization process.

Here's the process of how to visualize your data:

- First, collect your raw data.
- Process and filter it.
- Clean the data set.

- And you may want to go back once you've seen your data set and conduct an exploratory analysis of what you want your audience to see and what you want to visualize.
- Then, you come to your conclusion.
- You will then want to determine what your message is and start drafting the figure through illustrative visualizations or drawing it by hand.
- Come up with a design that you think works well with the figure and that is well-suited to visualize your conclusion.
- Discuss this design with your peers.
- Try and produce a raw figure using software like Excel.
- Edit and refine your design details in a program like Inkscape.
- And finally, export your image as a journal-ready figure.

When you look at this figure, there's a lot going on. Too much information, ratios, and images with observation superimposed. It is too busy, not well structured or organized. And an audience would have difficulties discerning which direction to read it in and how to access the information.

### **Can you think of five ways to improve this figure?**

1. This figure needs more white space to clearly organize the content.
2. The composition could be rearranged to create better visual balance.
3. The gray colors could be changed to assign meaning and be consistent throughout. Right now, it is unclear what these different shades mean.
4. It could use bold words to structure the information and draw attention.
5. Duplicated labels should be removed for clarity and only shown once.

Panel A of this figure could be improved by spreading out the different pieces and adding titles to better organize and structure the information. You could also add some white space and align the different plots together in the figure.

Panel B could be optimized with better organization and by changing the orientation from portrait to landscape style. You will gain a lot more space and the pieces can be aligned for better structure.

Panel C works better in a vertically stacked composition with the plots split up and aligned. By using consistent color coding, alignment, and titles between panels A, B, and C, the information is much more accessible in this visualization.

As you begin to create figures that visualize data and information that you'll utilize in your work, review this checklist to find out if your figures are effective.

- The figure is self contained: understandable without additional information.
- Every element is labeled or explained in the caption including x and y units. x and y axis: scales show appropriate variation of the data or are comparable.
- Readability and contrast are appropriate.
- Every use of color has a reason.
- The figure works in gray scale, except for very complex figures.
- If there are groupings, they help understand the message without manipulating.
- There are no channel inconsistencies within the figure.
- It is as simple as possible, i.e. no decorations, every piece that could be eliminated without losing information has been eliminated.
- And has been validated by other people.