

Good figures can make or break an engineering paper/presentation. The goal of a figure is to display data in a clear and concise manner that is not misleading. Clear, meaning your figure makes it easier for non-experts to understand. Concise, meaning the minimum set of data that emphasizes the story you are trying to communicate. Misleading, meaning that your figures don't over-emphasize differences or distract from data that doesn't support your point.

Figures should be used as aides to the main body of text (or talk). Thus, each figure should be referenced in the main body of the paper at least once. If you don't need to reference it, then you probably don't need it! It is acceptable to mention apparent conclusions in the caption of the figure, but they must be mentioned in the main body as well. Additionally, your figures should never be pictures of a screen/paper taken by your phone.

Reminders for high-quality figures

1. Title - The reader's first impression of the figure. What am I looking at?
2. Axis labels - What units am I looking at here? Units help build intuition for scale. If I am measuring the speed of a car, it would be better to use km/hour or miles/hour (depending on your audience) than a crazy unit like micrometers per week.
3. Legend - I see a ton of squiggly lines! Which one is which? If possible, legends should overlap blank space in the graph, not take up additional space. Utilize dotted/dashed/symbols for line differentiation.
4. Captions - A short description of the figure is required. In some cases, you can even mention briefly if the data points to an obvious conclusion (this conclusion should also be talked about in the main body of the text). Keep in mind that it is likely that no one else has spent as much time thinking about this data as you have.¹
5. Appropriate scale - Use >80% of the area. If your data is bunched up, zoom or use a logarithmic scale to make features apparent. Make fonts (main text, captions, labels, etc.) in your report a similar size.

For basic plotting instructions for creating titles, labels, legends, and captions, see:

MATLAB: [Quick Lesson - 01 Basic plotting using MATLAB](#)

Python: [Python Quick Lesson - 01 Basic Plotting](#)

¹ Note some journals and publications explicitly limit or ban conclusions in captions.

Inadequate Example Figure

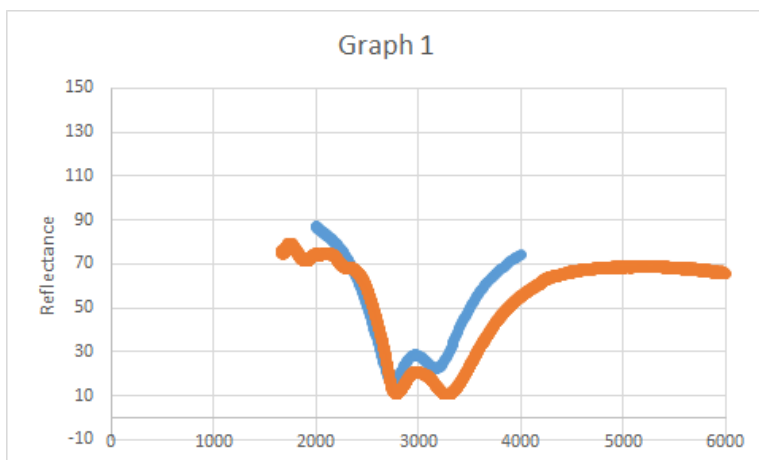


Figure1: This graph shows the reflectance of our sample versus wave number of incoming light.

Comments

1. Title - While present, it is not descriptive
2. Axis labels - The horizontal axis has no units. Reflectance is a percentage so it has no units, but it might be helpful to note that it is a percent.
3. Legend - No legend present
4. Captions - The description is short, but not very informative
5. Appropriate scale - The scale is unnecessarily big. The text is a good deal smaller than the text in this document.

Good Example Figure

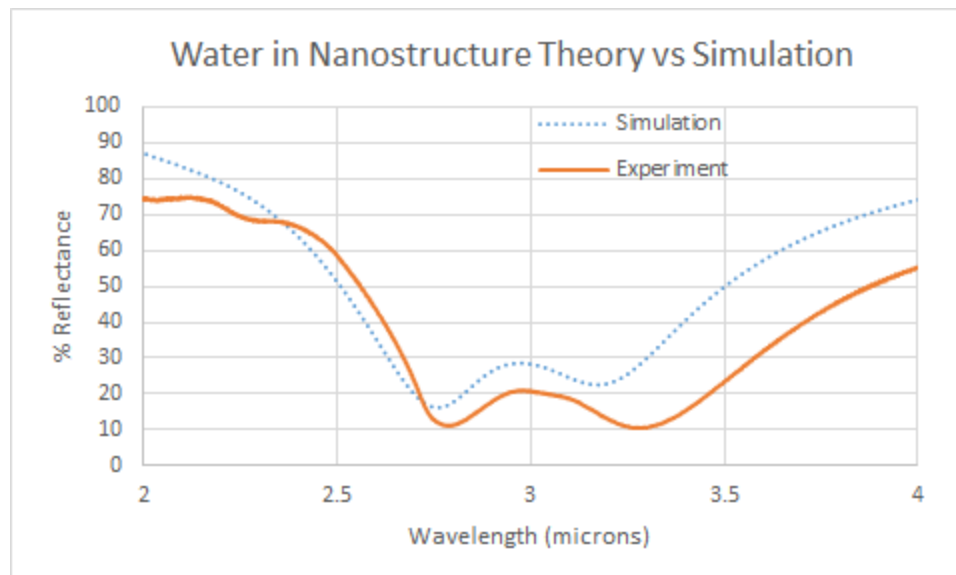


Figure1: Simulation versus experiment of the percent of incoming light reflected from a nanostructure filled with water as a function of incident light wavelength. Note that the characteristic water peak around 3um is clearly visible in both simulation and experiment.

Comments

1. Title - Concise and descriptive
2. Axis labels - units are present and appropriate
3. Legend - Present, note the use of dashes in case readers are not viewing in color.
4. Captions - The description is short and informative. Includes a conclusion.
5. Appropriate scale - Scale fits the data ~%80 of the view