A Subjective Guide to Creating a Research Project Poster

Peter Freeman

This guide assumes the use of Google Slides, which simplifies group poster construction. If you are constructing a poster by yourself, you may choose to use `Keynote` or `PowerPoint` instead, but that choice does not affect the advice given below. (It only affects instructions such as how to initialize a poster slide and customize its size.)

1 Initializing the Poster

Note: only one person in your group needs to do the following.

Assuming you have a Google account, the first step is to open up the Google Drive app. In that app, click on "New," then on "Google Slides," then, following the arrow to the right, "Blank Presentation." (Note: some templates are OK, but in general they add background color fields that tax the toner cartridges of a poster printer. Don't needlessly waste ink! In the "Untitled presentation" window that appears, eliminate the two boxes ("Click to add title" and "Click to add subtitle"). Click on a box once, then hit the delete key. Do this until you have a blank white field.

A conventional CMU Meeting of the Minds-compliant poster is 42 inches wide by 30 inches tall. To set this as the size of your slide, click on "File" and then scroll down to "Page setup." Click on the toggle button that appears and click on "Custom." Then put 42 and 30 into the two numerical fields, and change the units to "Inches" if necessary. Then click "Apply."

At this point, click the "Share" button at upper right and share the slide with your collaborators.

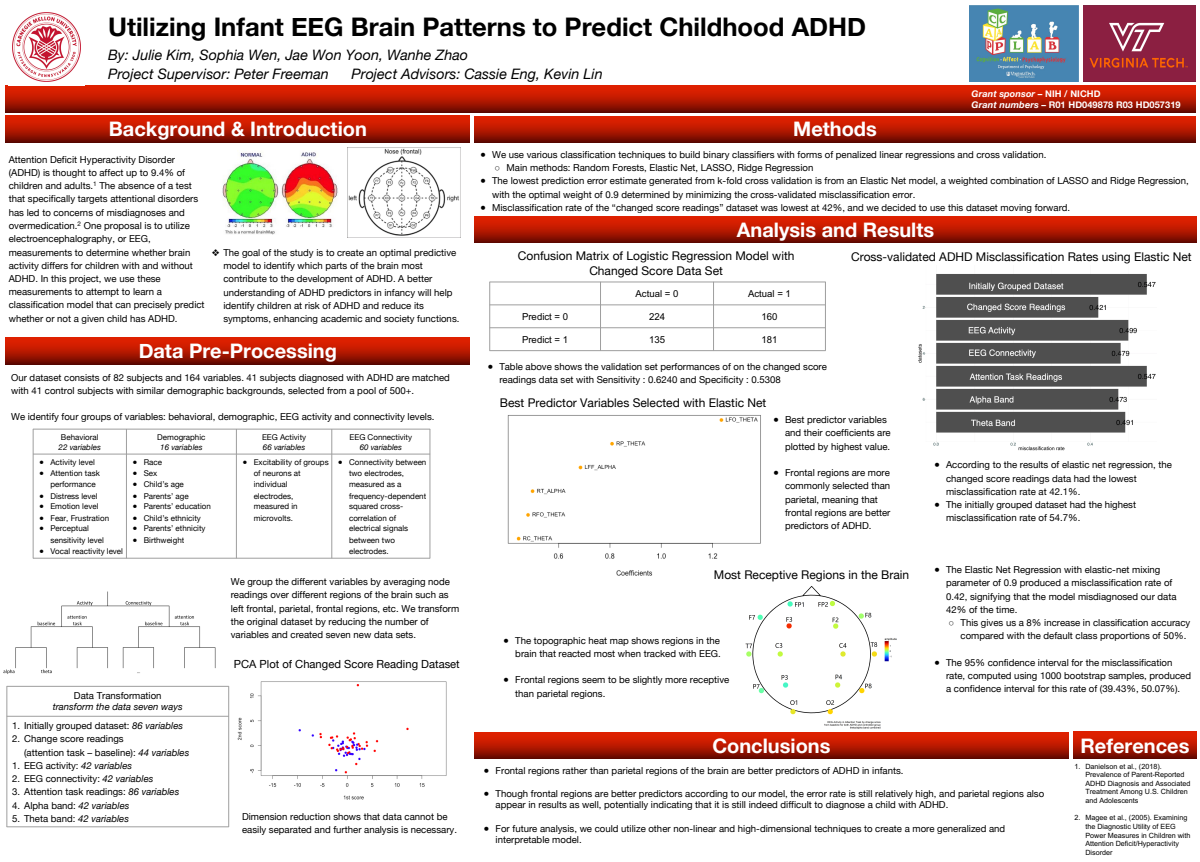
Now you and your collaborators are ready to go!

2 Elements of the Poster

See the poster example at the top of the next page. The basic elements in this poster that are useful for any poster are

- a title and an author list;
- two-four columns of text and figures; and
- introduction, data, analysis, and conclusions sections, as well as space for references.

Let's look at each element in turn.



Example of a poster from 36-490 (Spring 2019).

Before beginning, a very important note: a poster is **not** meant to be a record of *all* the research that you have done! Research is a messy enterprise that often leads you to explore dusty alleys and dead ends. Your job is *not* to tell the reader about all these places; your job is to tell a coherent story about some (might be larger, might be smaller) aspect of your research. Resist any temptation to try to write up everything. I know what you've done, and I'm the one ultimately giving you a grade!

Fonts. The font that you use should be a conventional one that gives the poster a professional appearance. As far as font sizes: my general rules are 120-point font for titles, 60-point font for author lists and for section headings (like Introduction), 30-point font for the text itself (which should be single-spaced), and 20-point font for figure captions and references. (The references header can be 30-point instead of 60-point, or even smaller, depending on the space you have left after all else is completely laid out.)

Title and Author List. The title should succintly represent the "story" you are going to tell in your poster. Don't say "Exploring Various Statistical Learning Methods Using Astronomical Data" when you can say "Detecting Interacting Galaxies in SDSS Data" or something specific like that. The statistical element to the research project is not necessarily the foremost element, i.e., there's usually no need to mention *how* analyses were done in the title.

You should of course include yourself as the author (use your full first and last name; middle initial is optional), and include me (or your TA) separately as your advisor. For instance, "Jane Doe (Advisor: Peter Freeman)". (As for your client, if there is one: there is no need to mention him or her at the top of the poster, but you should mention him or her in the Data section, for instance via the sentence "The data for this project were provided by Genghis Khan of CMU's Department of Mongol Studies.") There is no need to mention an affiliation (like "Department of Statistics & Data Science"). Try to include CMU- and/or department-specific logos; use Google to find them.

Introduction Section. At the upper left should be a section that introduces your reader to the problem you are trying to solve. As with the title, the Introduction is *not* about the statistics, but rather is general background about the *science*. The following is an example.

- Current sky surveys observe the majority of astronomical objects at just a few wavelengths.
- A particular problem is determining if a given object is a star or galaxy.

(This is not all of the Introduction; see below.) Strive for a concise, bullet-pointed summary, because the casual reader has only a limited attention span (particularly at Meeting of the Minds, where there are literally hundreds of posters). Since familiarity with domain science is not necessarily required in an undergraduate research context, I (or your advisor or even your client) will help you identify the relevant details to include in an Introduction...although it is up to you to attempt to form those details into a coherent set of points.

To actually write the Introduction, select "Insert" and then "Text box." Place the box, adjust the font size (so that you can actually see what you are typing), and begin typing. You'll note that in the upper control bar there are details about the font choice and the font size. By default, the alignment of text in the text box is left-justified; do not change this unless for some reason you need right-justified text. Center-justified text just does not appear professional. (To me.) Do not invoke any option which justifies text both to the left and right, because that will lead to an unnatural stretching-out of the spaces between words to make the margins line up. And that would just not appear professional. (To me.)

If there is an appropriate figure to accompany your Introduction, you'll generally want to place it below the introductory bullet points. (However, see my comments about figure placement in "Data Section," below...) If you include a figure, you should provide a short caption, and if you did not make the figure yourself, you should provide the URL for the figure source. Put the URL in very small but still readable font, and place it snug against the figure; you could even rotate the text box the URL is in and place that box along the left or right edge of the figure.

Your Statement of Purpose. At the end of the Introduction, it is a good idea to have one or two lines, in bold text, that state exactly the problem you are tackling or the question you are answering:

> **Can we construct a regression model that identifies those portions of brightness-space where the probability that an object is a star is substantially higher than the mean probability?**

(This could itself be bullet-pointed.) This statement should be placed after the introductory bullet(s), with perhaps some additional vertical spacing, so that the casual reader can easily see it. It is still in the Introduction section, though.

Data Section. The data section generally should consist of two parts: a bullet point(s) that describe(s) where the data came from (I'll generally provide those details, if not the client, although you need to craft the details into text), and a two-column table showing the predictor and response variables in your analysis, where the first column gives the variable name and the second column describes what the variable represents. (The exact details of the table may vary depending on what analysis you are actually carrying out.) If there is an appropriate figure that shows the data (perhaps a pairs plot showing the data projected down onto each two-dimensional plane in the predictor space, and/or a histogram of response variable values, and/or...), this should be placed below the table, if there is room. (However, this is where poster formatting can become more flexible: perhaps it looks best to put all your figures in the right column, or maybe all across the bottoms of the columns, or...)

To create the variables table, click on "Insert" and "Table" and choose the number of rows and columns. (Note that for non-numerical table entries, like variable names, I personally prefer a more "computery"-looking font, like Menlo; whatever you choose, the variable names should have a different font from the column in which the variable is defined.)

Analysis Section. The analysis section, which generally comprises (which associated figures) the second column of the poster, is the section in which you either describe in words (and maybe a tinge of math), or list, the analysis method(s) that you apply. For instance, you may want to describe a regression tree:

> • Regression trees are built by splitting the space of predictor variables X in two at a cutpoint s defined along one of the predictor axes, j. s and j are chosen so as to minimize the residual sum-of-squares relative to the mean of the response variables on either side of the cut.

In addition to such a description, you may want, if it is helpful, to add a table showing the tunable parameters of the method. (For regression trees, for instance, this includes `mindev`, `minsize`, and `mincut`, as found in the documentation for `tree.control()`.)

(Now, there are no precise rules that dictate whether you want to simply list methods or describe them, or to what extent you want to describe them. What works best will come out over the course

of drafting the poster. However, a useful heuristic is that if you are utilizing a single model, as in the poster above, then more detail about that model is appropriate, whereas if you are simply trying to find the best model out of a suite of models, a list is probably more appropriate.)

Once you've laid out methods, you lay out the results of applying them. These results should be in the form of tables and figures with captions. There is no general rule to apply here (the details really depend on your particular project), *except* that if you are comparing the efficacy of multiple methods (say, logistic regression vs. linear discriminant analysis vs. ...), you should have a table that shows a metric of the quality of fit for each method, so that you can conclude with method worked "best." It should be clear from the details of the project what the metric should be (e.g., misclassification error, etc.).

Try to develop figures that will provide concise support for the story you are trying to tell; do not simply create a myriad of figures just to create a myriad of figures. Create a figure that you can point to when describing your poster for a judge and say something along the lines of, "as you can see in this plot, we found [plug in major result of analysis here]..."

Conclusions Section. This section (usually placed in the middle to the bottom of the rightmost column) need not be large, nor need it be philosophically deep. All you want to do here is simply state what you found. If you are unsure what to conclude, look back to the part of the Introduction section where you stated, in bold, your statement of purpose. Your conclusion should follow from the statement of purpose ("Using regression trees, we found that we were able to identify portions of the predictor space in which the proportion of stars is significantly larger than the global mean proportion. Our work can be used to inform astronomers whether high-resolution follow-up observations are warranted for objects whose predictor variable values fall in these predictor space regions.") It may also be appropriate to state future analysis goals, even though it is almost certainly the case that you will not be the one to perform the future analysis.

References Section. Situated below the Conclusions, this is the bibliography.

3 Printing the Poster

Regardless of whether you are preparing your poster for Meeting of the Minds or for another purpose, you should await further instructions from me. Two important notes, however:

DO NOT PRINT OUT YOUR POSTER AT KINKO'S, OR ANY PLACE WHERE YOU'D HAVE TO PAY FOR IT! The Department of Statistics takes care of the cost.

and

DO NOT PRINT YOUR POSTER MORE THAN ONCE! If you find a typo after the poster is printed, you have to live with it. Closely examine your PDF file prior to sending it to the printer. (Remember: you will download your slide in PDF format prior to printing!)