

431 Lab 01

Deadline: Tuesday 2023-09-12 at Noon

431 Staff

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Lab 01 has 4 questions, all of which you need to complete by the deadline specified in the [Course Calendar](#). Note that we have provided a Quarto template for Lab 1 on our [431-data](#) web site. Visit [our 431-Labs page](#) for more information, including:

- how to get help with the Lab,
- our late policy,
- details on answer sketches and grading rubrics
- how your lab will be graded, and
- how we handle requests to regrade a Lab.

0.1 Learning Objectives

1. Be comfortable interacting with R to gain additional information about a data set.
2. Describe a provided visualization, including commenting on its shape and the relationship observed.
3. Contextualize the information presented in the figure, by using additional information about the data and building upon your description.
4. Critically consider, and apply, the PPDAC approach as laid out by David Spiegelhalter in the Introduction of *The Art of Statistics: Learning from Data*.
5. Build an elementary Quarto document, using the template we have provided.

0.2 Getting Started with Lab 01

To start, create a directory on your computer for `lab01`. We suggest this be a directory you control, called something like `lab01`, and we recommend you create it as a subdirectory of a `2023-431` directory on your machine.

- Into that `lab01` directory, you will download the Quarto Template for Lab 01, which is called `431-lab01-template.qmd`, as described below. After you download the template file to your directory, you will want to rename it to substitute in your actual name in the file name, perhaps calling it `yourname-lab01.qmd`.

After you've downloaded the relevant template, open RStudio, and use the **File ... New Project ... Existing Directory** menu to create an R Project in your `lab01` directory in which you will do all of your work for Lab 01.

We encourage you in the strongest possible terms to **ask questions**, using any of the approaches described on our [Contact Us](#) page.

0.3 The Quarto Template for Lab 01

In this Lab, you will prepare a report in the form of an HTML file, using Quarto. We have provided you with a very useful Quarto document template for this assignment called `431-lab01-template.qmd` that you should use to complete your work.

- The template is part of the [Data and Code repository](#) for the course. Follow the instructions posted there to download all of the files you'll need in a ZIP file, including the template to an easy place to find them on your computer (we suggest a `431-data` subdirectory in your `2023-431` directory.) Then copy the template into your directory for Lab 01, specifically, that you created earlier.

You will build your response to Questions 2-4 as a Quarto file using the template provided. Use the Render button in RStudio to compile your work and create the HTML output. You'll want to do this multiple times as you go, to identify potential problems quickly.

0.4 Submitting the Lab

Eventually, you will:

- create an `.mp4` video file for Question 1
- use Quarto (and the [template for Lab 1](#)) to build a single HTML document containing your responses to Questions 2-4.

Be sure to remove all of the instructions included in the original template before submitting your work, hit F7 to spell-check your Quarto file before rendering, review the HTML result to ensure that it looks clean and clear, and that it doesn't retain any unnecessary warning messages or other material that distracts from your work. Be sure also that your name is listed as the author of the work.

Your Quarto file (`.qmd`), your HTML file (`.html`) and the (`mp4`) video file should then be submitted (the system will let you upload each file individually) to the Lab 01 section in the [Assignments folder in Canvas](#) before the deadline on the [Course Calendar](#). We will need to see all three files (Quarto, HTML and video) submitted before we can grade your work.

0.5 Loading Packages

```
library(patchwork); library(tidyverse)
```

Note that we used these packages to create the instructions for Lab 01, but you may or may not need them in your response.

1 Question 1.

Make a 30-second video to help us pronounce your name and learn something interesting about you.

In this question, you will create and submit a short (30 seconds or less, please) video of yourself (recording yourself using Zoom is a solid approach.) In this film, we should be able to see your face clearly and also hear you clearly, so make sure that is the case. The resulting video should ideally be sent to us as an **.mp4** file.

1.1 You will be doing two things in the video:

1. First, say hello, and then state your name, loudly and clearly, so that the viewer can learn to pronounce it correctly. Please use both your given name and your family name. If you prefer to be called by a nickname, please specify that, too.
2. Then, tell us something about you that we don't know, and might be interested to learn. It can be anything at all. We're hoping to get to know you a little better, and this can be something about your professional or private life, or whatever you feel you would like to share with us. We're hoping to facilitate connections here.

1.2 Some tips for the video...

- Your fellow students (as well as the Teaching Assistants and Dr. Love) will see your video before the semester is over, so keep that in mind as you decide what to tell us.
- Do not worry about the quality of the video, or adding elaborate theatricality, props or scenery. If you'd like to do so, that's fine, but just make sure that we can see you and hear what you are saying clearly.
- We're not kidding about the 30-second time limit. Do not exceed 30 seconds.

2 Question 2.

2.1 Interpret Visualizations Built using R

We used R and the **tidyverse** (specifically the **ggplot2** part of the **tidyverse**) to build two plots using the **DNase** data set from the **datasets** package automatically loaded by R. Below, you'll find the two plots we built (labeled Plot A and Plot B) and the code we used to build the plots and then display them in a single Figure with an appropriate title (for which we used the **patchwork** package.)

Use the Help window in R to learn about the `DNase` data set, and in particular, about the two variables displayed in the plots below, and their scientific context. Then write a paragraph (100-150 words is the appropriate length) which explains what the Figure's two plots indicate about the relationship between the two variables, and (more generally) what you have learned about the data (or science) from the Figure. Be sure to discuss how the two plots work together specifically addressing the question of what you can learn from Plot A that you can't learn from Plot B and vice versa.

Your response to this question should be written using clear and complete English sentences and minimizing jargon, as is the case with all “essays” you will write for this course.

2.2 Code for Plot A

```
plotA <- ggplot(DNase, aes(x = conc, y = density)) +  
  geom_point() +  
  geom_smooth(method = "loess", formula = y ~ x) +  
  theme_bw() +  
  labs(title = "Plot A")
```

2.3 Code for Plot B

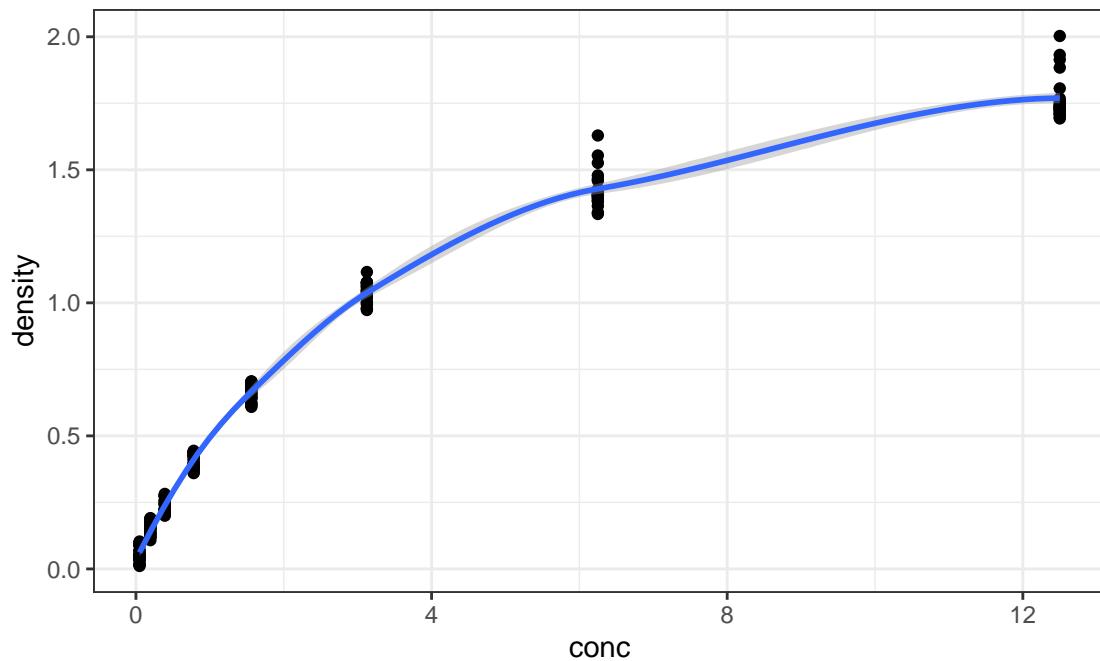
```
plotB <- ggplot(DNase, aes(x = factor(conc), y = density)) +  
  geom_boxplot() +  
  theme_bw() +  
  labs(title = "Plot B")
```

2.4 Code to combine Plots A and B into one Figure and display the result

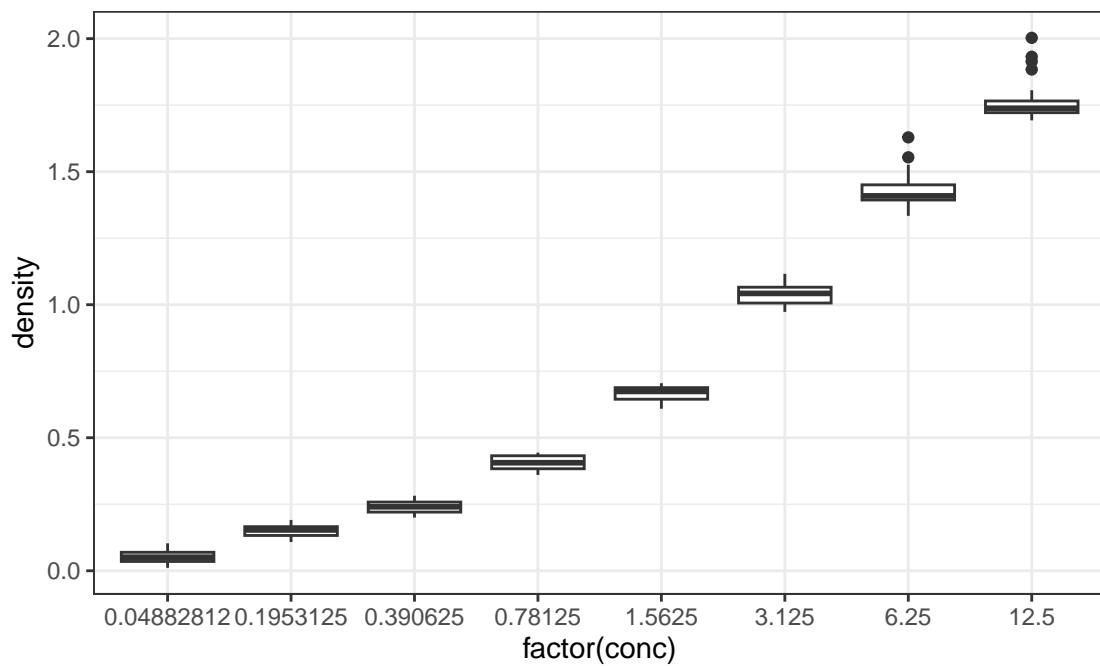
```
plotA / plotB +  
  plot_annotation(  
    title = "Question 2. Association of `density` and `conc` in the `DNase` data")
```

Question 2. Association of `density` and `conc` in the `DNase` data

Plot A



Plot B



3 Question 3.

3.1 React to the Introduction of *The Art of Statistics*

Read the introduction to David Spiegelhalter's book *The Art of Statistics*. Then write a short essay (of 100-150 words, please) describing how the PPDAC problem solving cycle might be helpful to you in the context of some "problem" you are interested in solving. Please feel free to draw on your own experience solving problems in a systematic way, and don't feel obliged to write about a "problem" that is related to biology or medicine or health or science. Anything you can explain briefly and that you are interested in could work well here.

Again, your response to this question (and to the other Questions) should be written using clear and complete English sentences and minimizing jargon.

4 Question 4.

4.1 Connecting Spiegelhalter to Question 2

In Question 2 above, you've been given data (D) and a very rough analysis (A), and from your own write-up have drawn some conclusions (C). The PPDAC approach is notably a cycle, and so after we create a conclusion we return to another problem. Given what you've learned about the data, what you've seen in the analysis, and the conclusions you've drawn in Question 2, briefly (again, in 100-150 words) describe your thoughts as to what the next cycle of the PPDAC approach for a study of these data could be.

In your response, clearly specify what you see as the Problem, Plan, Data, Analysis, and Conclusion while also highlighting how this builds upon the results already presented.

5 Session Information

Use the code below to include your session information.

```
sessioninfo::session_info()
```

This will produce considerable output, which we want to see, although I've hidden it in these instructions. Providing the session information helps with reproducibility. It lets us see what packages you have loaded on your machine, and some other information about your R session that can be helpful in understanding any problems you run into.

What Happens After Submission?

We will summarize some of the more interesting responses to Questions 2-4 after the Lab has been graded, and we will share the Question 1 videos with the rest of the class.

- This Lab will be graded on a scale from 0-50, and students will receive 14 points for successful completion of Question 1, and 12 points each for Questions 2-4.
- Note that the teaching assistants will review your responses to Questions 2-4 carefully to assess clarity of writing, attention to detail, and adherence to grammatical and syntax requirements, but we will not grade Lab 01 with those elements in mind. (Spelling, grammar, syntax and the rest will matter for grading purposes in all other assignments this term.)
- A complete answer sketch for the assignment will be posted 48 hours after the deadline, and grades will be available one week after the deadline.
- See the [431-Labs page](#) for more information.