Module 1.3: Learn - Professional Development

Overview

This section includes:

1. How to search for coding solutions
2. How to use Slack to troubleshoot
3. How to read a scientific article

Research/Professional Development

Using Google to get ideas for coding solutions

Googling? Really? YES! As obvious as it is to just say "google it," receiving pertinent results from across the entire span of the internet takes some know-how. The programs we use are only as good as our ability to interact with them, so what happens when we inevitably get error codes we can't immediately figure out? Not to mention the abundance of software options, each with their own unique ability to frustrate you if not run exactly as specified (and sometimes even when run *exactly* as specified).

The first thing to remember when using internet searches to get ideas of coding solutions: figure out what you are trying to do. For many programming tasks, others folks have posted concise, tested code to accomplish those tasks, either as a post on a website, a video on platforms like YouTube, or on developer forums like Stack Exchange and Stack Overflow.

Let's walk through an example of how to look for a coding solution. Let's say you had two lists of genes and you wanted to figure out which genes are common to both lists. To compose a search, we should include:

- The programming language we are using—"R"

- Words to indicate what you want—"common to two lists"
- When we type "R common to two lists" (without the quotes), we are given about 3.2 billion results! (don't pani useful after the first few pages of results)
- **The first result we see is from Stack Overflow** ⤷ **(https://stackoverflow.com/questions/3695677/how-to-find-from-multiple-vectors)**
- The "People also ask" section may have alternative keywords and phrases from commonly asked questions t search
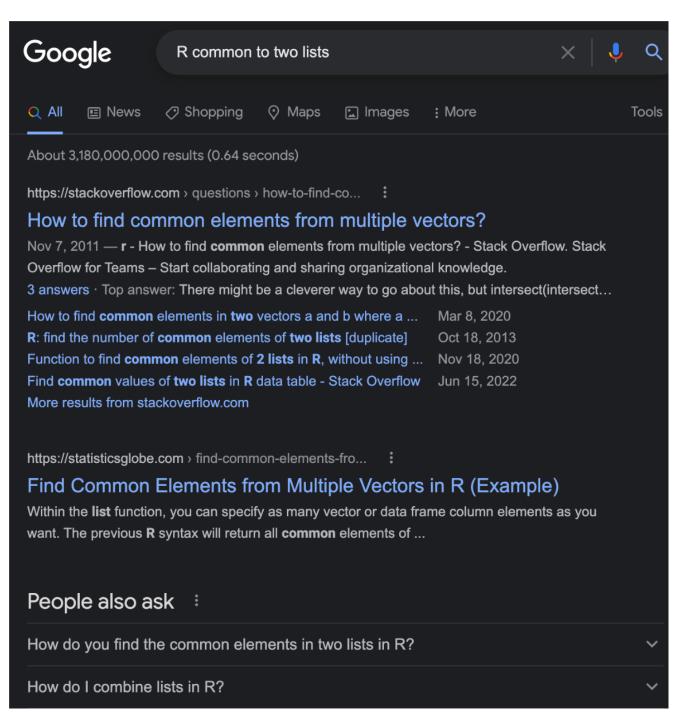
Figure. Google search results for 'R common to two lists'

Stack Overflow is a commonly used forum for programmers to ask coding questions. You will often find multiple s
questions asked by people that are new to coding or new to using specific applications, so coding solutions to yo
posted. If we look in the Stack Overflow comment chain, the first suggestion is to use the intersection function in
go and try out in your code. You will see that people rank up the answers they like the best, so the first answer is
it's a good idea to scroll through and read people's ideas in case there is something that works better with some
you have written so far.

Here are some other tips we have gathered from our lab and combined experiences:

- When searching for coding solutions, don't use quotes in your search so you can use the flexibility of the sear
  benefit
- Add quotes to make specific phrases if you are getting too many hits that aren't specific to your issue (for exa
  indicate that you want a data frame in R instead of any hits with "data" and "frame" separately)
- Search iteratively—if your first attempt at a search doesn't give you ideas, think about if there is a way to char
  include relevant concepts such as "intersection" in this example
- Your best results will usually be within the first two pages of hits. If you find yourself looking past page 2, rethi
- As you learn more about programming, pay attention to data structures and terminology used so that you can
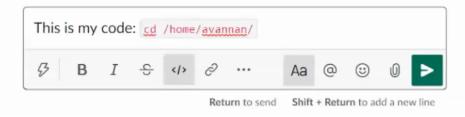 effective searches

How to use Slack to ask questions about code

If, after searching the internet using at least three different search terms you have not found the solution to your p
Slack. The course's Slack channel is where you can collaborate with your peers and instructors to find solutions t

Use Slack to Share Your Code

Sometimes the error in your code is something as small as an extra space. To make it easier for others to visualize your code, you should use code formatting in Slack.

Use the </> button at the b   essage to use code formatting. You can highlight the text yo   code format, then press </>

This is my code: cd /home/avannan/

B I S </> @ ... Aa @ ☺ 📎 ➤

Return to send   Shift + Return to add a new line

1:41

Video. Using Slack to Troubleshoot.
This video gives an overview of how to collaborate with your peers
and instructors to troubleshoot code.
View Transcript (https://canvas.asu.edu/courses/122165/files/54792272?wrap=1) ↓
(https://canvas.asu.edu/courses/122165/files/54792272/download?download_frd=1)

In this class we will be using Slack to communicate with each other; a channel is a shared page where multiple p
messages and respond with reactions, text, gifs, or file sharing. The professor of the class, the TAs, and your pee
respond to, and search the channel, so it is a great way to ask for help at any time and learn from reviewing othe

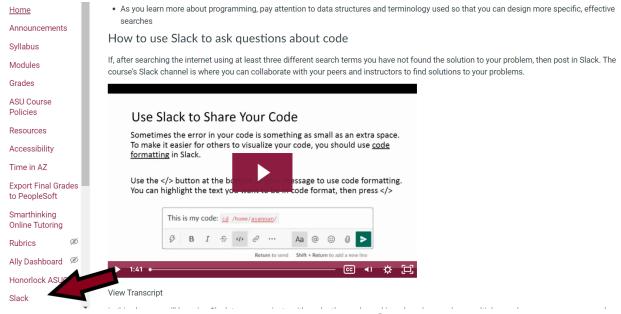The best way to access Slack is through the Canvas menu on the left.

- As you learn more about programming, pay attention to data structures and terminology used so that you can design more specific, effective searches

How to use Slack to ask questions about code

If, after searching the internet using at least three different search terms you have not found the solution to your problem, then post in Slack. The course's Slack channel is where you can collaborate with your peers and instructors to find solutions to your problems.

View Transcript

Figure. How to open Slack.

This figure shows the link for Slack in the left menu.

If you go to the Slack channel for this class, we will see a space where you can enter text.

You can go ahead and ask any general questions you have or make announcements by typing into the text box a hitting the green button with the paper airplane to the lower right-hand-corner. To demonstrate, let's enter a mess
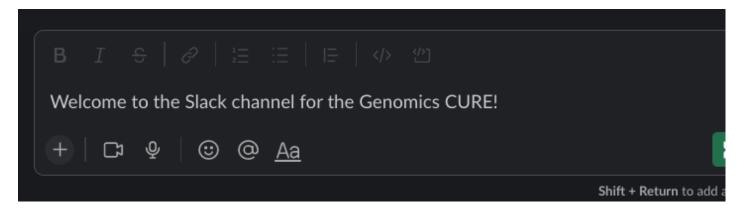

Figure. Entering a general message in Slack.

A few other icons you should know are:

- The plus sign (+), which allows you to attach files
- The happy face, because emojis are a MUST
- The at sign (@), to tag your TAs and peers
- **Check out this link for more formatting** ⬈ **(https://zapier.com/help/doc/tips-formatting-your-slack-messages)**

If you would like help debugging code that you wrote, it is very helpful to use Slack formatting features to post co help you find your problem.

How to format code in slack

There are two options for formatting text as code in Slack:

- The code icon ( ), for a single line of code
  - ProTip: you can also wrap your text in the backtick (`)
  - This will change the font, color, and background color of the code to bring attention to this being code
- The code block ( ), for a block (or several lines) of code
  - ProTip: you can start the text with three backticks (```)

Let's try a line of code. Let's copy and paste this normal text into Slack:

```
Please format code like this:
```

press 'shift + enter' to make a new line without yet sending the message, press code, and enter some code

```
`print ("Hello World!")`
```

Figure. Formatting a line of code in Slack

Note: If you are copying and pasting, you may have to delete the last backtick per line (`) and rekey it to close the

Alternatively, you can type (skipping the backtick), highlight the text, and then click the code button (</>).

Now let's try a code block. This has similar functionality as the code button, but it draws a box around the code. T another message.

If we were to type something with multiple lines and then use the code button, it would not be as readable. Let's when we have more than one code line:

```
Please format code like this:
`print ("Hello World!")`
`print ("Good morning starshine, the earth says hello")`
```
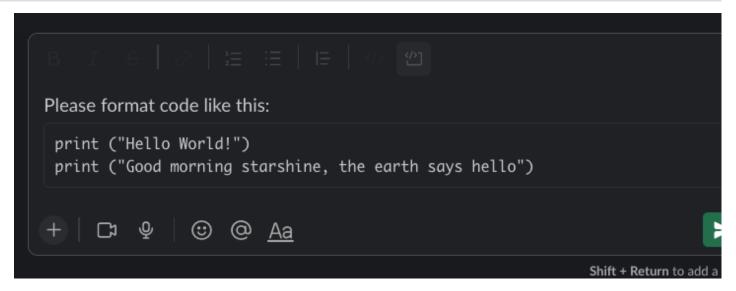
Figure. Formatting multiple lines of code in Slack.

This looks like code, but it is disjointed. The more lines of code you have, the more obnoxious this looks too; we readable and in one block. This time, let's use code block:

```
Please format code like this:
```
print ("Hello World!")
print ("Good morning starshine, the earth says hello")
```

**Figure. Formatting a code block in Slack.**

Note: If you are copying and pasting, you may have to delete the set of backticks (` ``` `) then copy and paste in th

Alternatively, you can type (skipping the backticks), highlight the text, and then click the code button ( ⟨/⟩ ).

Ah, much better. The code block makes it easier to communicate your code and for others to test out your code a questions about using Slack, please post in the #general channel to your TAs and peers. Remember your netique that this is a judgment-free zone where finding the answers to questions together helps the entire class.

# Recommended steps for quickly evaluating a scientific paper

Speaking of finding answers, there is one more important resource you need to know how to properly understand Being able to comprehend and critically evaluate scientific articles is foundational to any scientist's future. This is escape, so instead of avoiding the readings, find a method that works best for you. We will give you our best rec on our lab's experiences.

There is also this article from Cary et al. **PLOS Computational Biology** ⤷ **(https://journals.plos.org/ploscompbi id=10.1371/journal.pcbi.1008032#pcbi-1008032-t001)** that gives some good rules: **Ten simple rules for reading a PLOS Computational Biology** ⤷ **(https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1008032#**

This table briefly summarizes the main sections of a paper and recommends an order to evaluate if the paper is needs. It's worth mentioning that not every paper is set up the same way and recommendations can vary based but once you have a general idea of what is meant to be in a paper, you can more easily adapt to the different for

Steps to read a scientific paper and questions to ask

| Part(s) of paper and what order to read them | Questions to answ |
| --- | --- |
| **Start with the title and abstract.** <br> If there is one universal recommendation, it's start with the title and abstract. Here the author has intentionally summarized all of their key findings and methodological approaches in one short paragraph. | • What is the purpose of this pape <br> • Is it introducing new methods or problem? <br> • What topic does it help me unde |

| | |
|---|---|
| **Skim the introduction or background** to see if there are things you want to know more about. The introduction will present what is currently known about topics being discussed in the rest of the paper.  You can use this section to help you learn important specifics, which will be more important if you are new to a field. | • What is currently known about th<br>• What blanks were the authors h |
| **Critically evaluate the figures.**<br>The figures and their captions are integral to understanding the experimental design and the results. Figures are essentially the evidence for the claim(s). | • How was this figure generated?<br>• What results did they get based<br>  Does it make sense to me how t<br>• Is there anything that seems une<br>  confusing?<br>• What key findings does the pape |
| **Review the discussion.**<br>This will usually start with a summary of the paper and end by presenting what the authors were not able to figure out as future directions. This section sometimes notes important caveats that you might not have thought about and gives you ideas of what might come next. | • How did this work make an impa<br>• Am I doing anything they state a<br>  direction (if so I can use this pap<br>  introduction of my future papers)<br>• How did they interpret the results<br>  their interpretation?<br>• Is this what they said they would<br>• What are the next steps I would<br>  author? |
| **Check the methodology**<br>This section details all of the assays, techniques, and samples used to make the results discussed in the paper. For computational research, this section includes the software or packages used, mathematical models, and workflows used.  Think critically about the steps they took and if they make sense. Look for specific parameters and resources that might be relevant to your own research; you might need to email the corresponding | • What exactly did they do?<br>• Were the materials or model sys<br>  for what they were trying to stud<br>• Do the methods make sense for<br>  being asked? |

| | |
|---|---|
| author if you have specific questions while trying to implement things for your own work. | |
| **Reread the entire paper and take notes.** If you made it this far, you probably found the paper insightful or pertinent; time to go back in, take notes, and develop your understanding. | • Was there anything you missed<br>• Are there topics or sections that |
| **Check for supplementals.**<br>This section can include large tables of clinical and genomic data, analysis used to determine parameters and models used in the main results, and figures that are important but there wasn't enough room in the main text. It's typically worth that extra look to see if there is anything you can use to bolster your own work. | • Did this article have supplement<br>• What was the purpose of each?<br>• Is there data that I can use to rur approaches we developed? |
| **Check out the references.**<br>You can typically use this section to find more papers that are relevant to the specific aspect of the work that drew you to this paper in the first place. Papers cited can also give you an idea of other researchers in the field that you can check out. | • List two other references from th relevant based on title alone |

Papers we will be reading in depth

Read the paper **Ten simple rules for reading a scientific paper | PLOS Computational Biology** ⬈ **(https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1008032#pcbi-1008032-t001)** by Cary et al. Ar using the steps we outlined in the previous section – you will be asked about this on the quiz or assignment.

In the next modules, we will be reading these two papers (you can take a peek if you like head starts):

1. **Trimming of sequence reads alters RNA-Seq gene expression estimates | BMC Bioinformatics | Full T (https://link.springer.com/article/10.1186/s12859-016-0956-2)** by Williams et al.

2. **Sex differences in early and term placenta are conserved in adult tissues** ⬏ **(https://www.biorxiv.org/content/10.1101/2022.08.08.503197v1)** by Olney et al.

# **SNEAK PEEK**

As we mentioned throughout the module, the work you are doing in this course is real research that will be used
We encourage you to follow the manuscript we are writing based on our research question, "how does trimming
in gene expression in the human placenta?" Additionally, there are opportunities to continue working on this proje
your instructors if you are interested.

**Sex_Diff_Placenta_Parameters_Manuscript.docx** ⬏
**(https://urldefense.com/v3/__https://docs.google.com/document/d/1H7BgKNMtk0jH_9eblCeV4fX8WEQ4SkmqR4i2XK**
**dwAv5BmarQ!b9O3krbLfcz4hEzU06GQI2nWfrWgfpR7U2uzDYqvVfVHY59HlQSsT3swB-hasgfuVlHfR8CWF5T0jEk$)**

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# Module 1.3 Additional Resources

- Slack formatting tips
  - **Tips for Formatting Slack Messages** ⬏ **(https://zapier.com/help/doc/tips-formatting-your-slack-messages**
  - **Scientific Papers** ⬏ **(https://www.nature.com/scitable/topicpage/scientific-papers-13815490/)**
- Finding relevant details in published research papers

- Southern Cross University: How to Read a Journal Article

How to Read a Journal Article

- Robin Kay: How to Read a Research Article Quickly

How to Read a Research Article Quickly

- How to Read a Scientific Paper



How To Read a Scientific Article