Learning to Code in R with Generative AI - Survey Results

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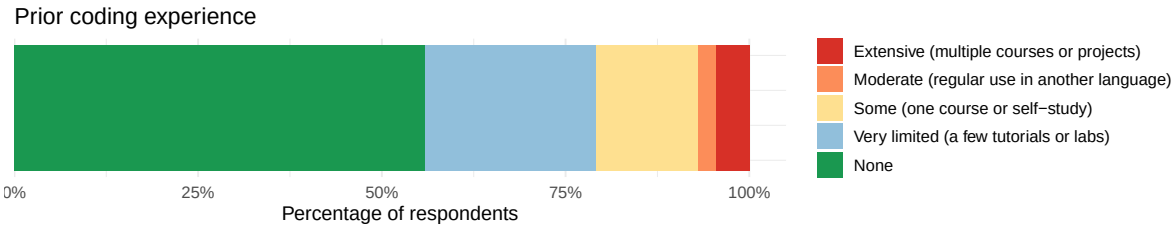
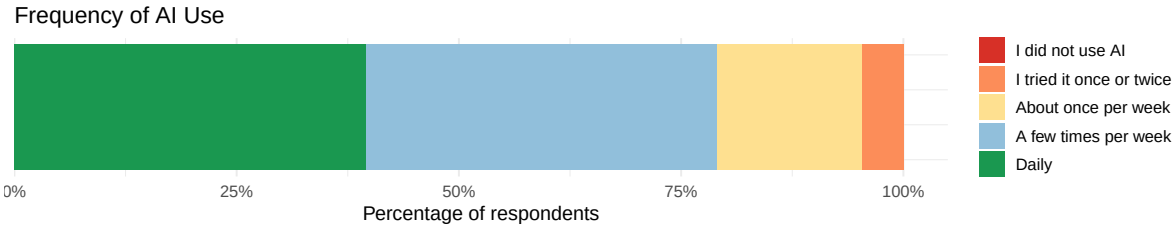
0.1 Overview

These graphs, tables and open responses are from an anonymous Google forms survey that was designed to solicit students' personal experience on the effectiveness of using generative AI in this course. The resulting csv file with the survey results is in the course GitHub repository (https://github.com/jeffreyblanchard/PathoGen2025/tree/main/survey/bio478_survey_responses.csv). These results are generated from this csv file and the underlying R code can also be found in the above GitHub repo.

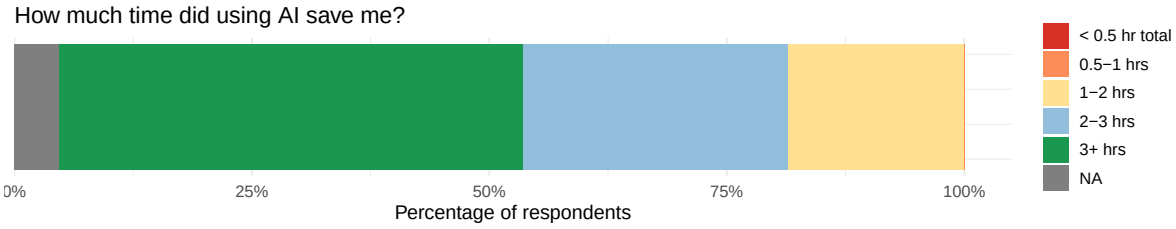
0.2 Prior Coding Experience



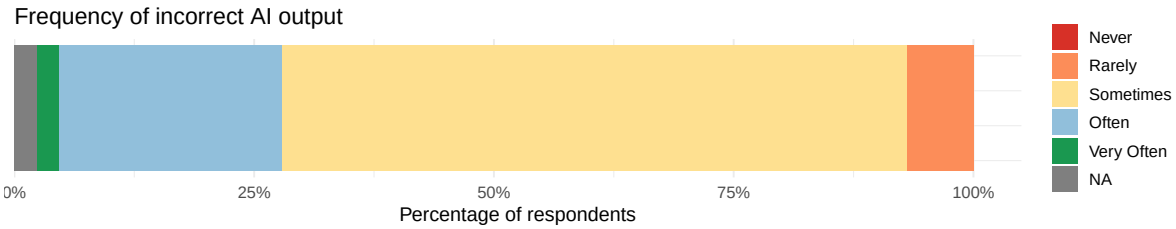
0.3 Frequency of AI Use



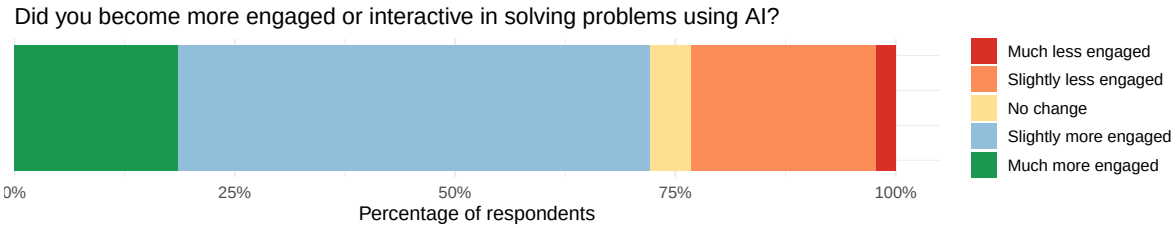
0.4 How much time did using AI save me?



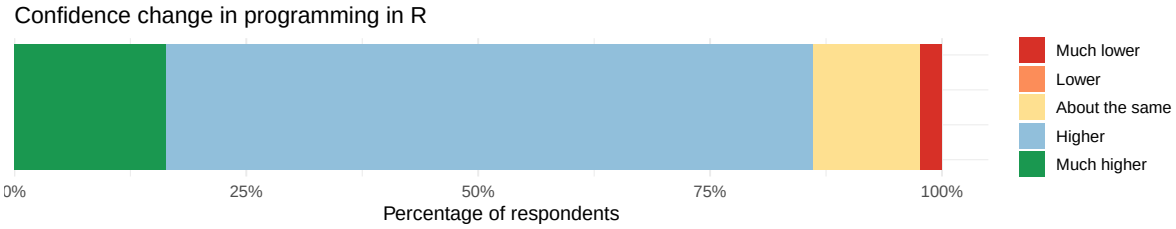
0.5 Frequency of incorrect AI output



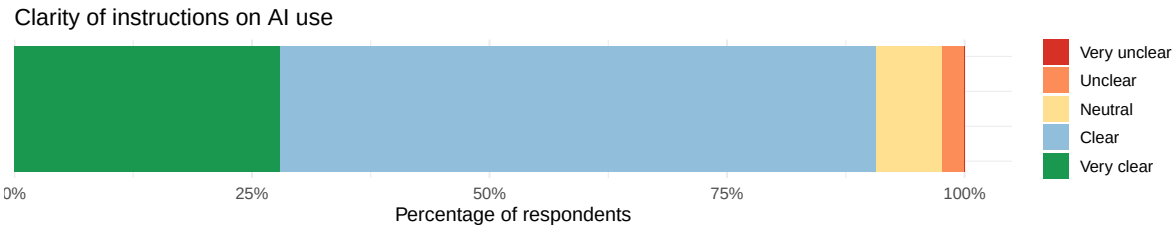
0.6 Did you become more engaged or interactive in solving problems using AI?



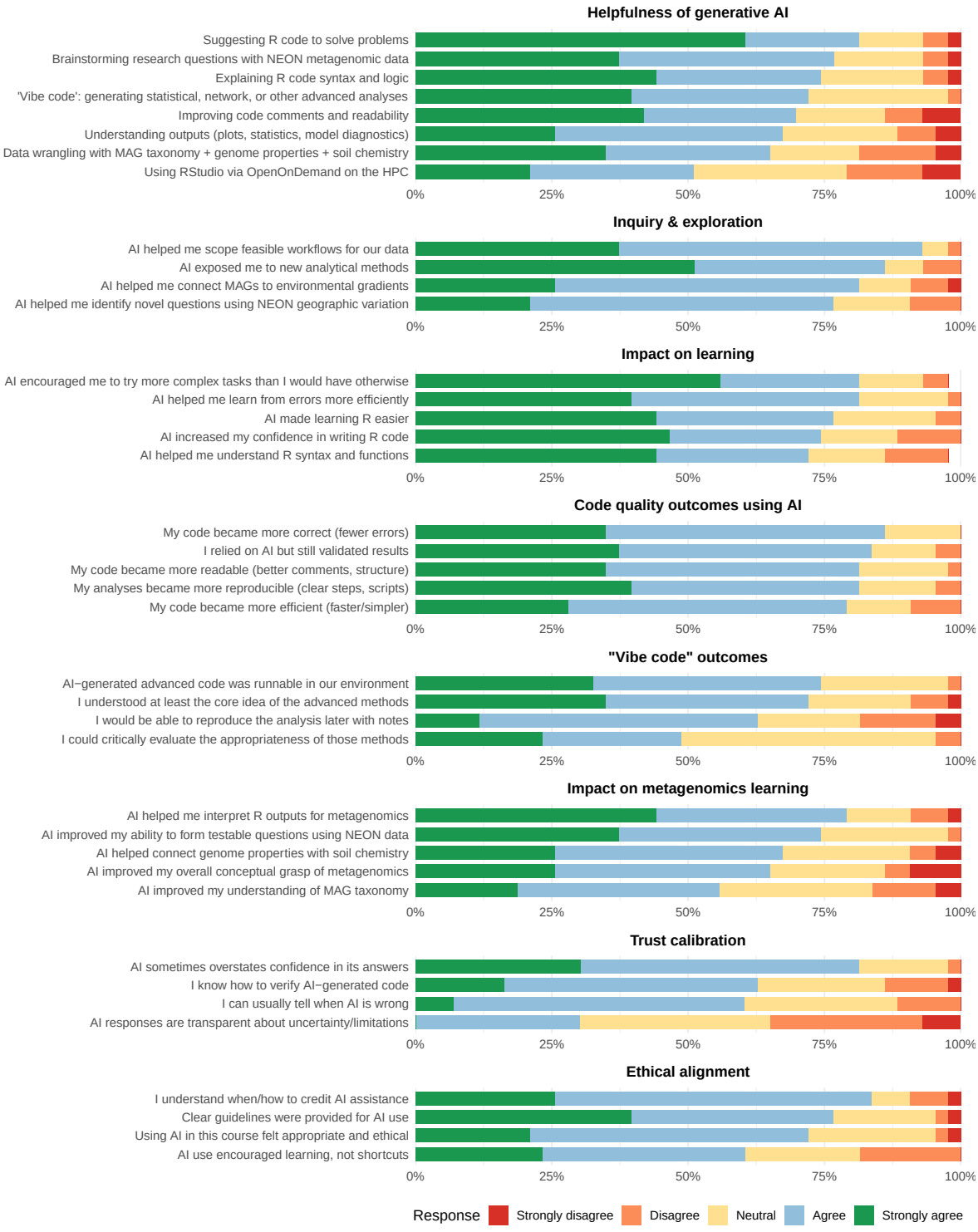
0.7 Confidence change in programming in R



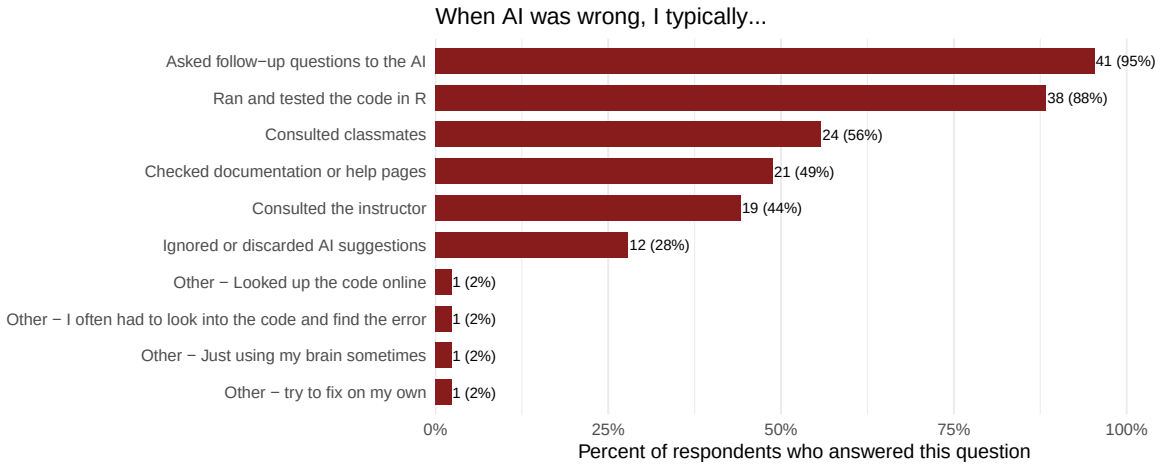
0.8 Clarity of instructions on AI use



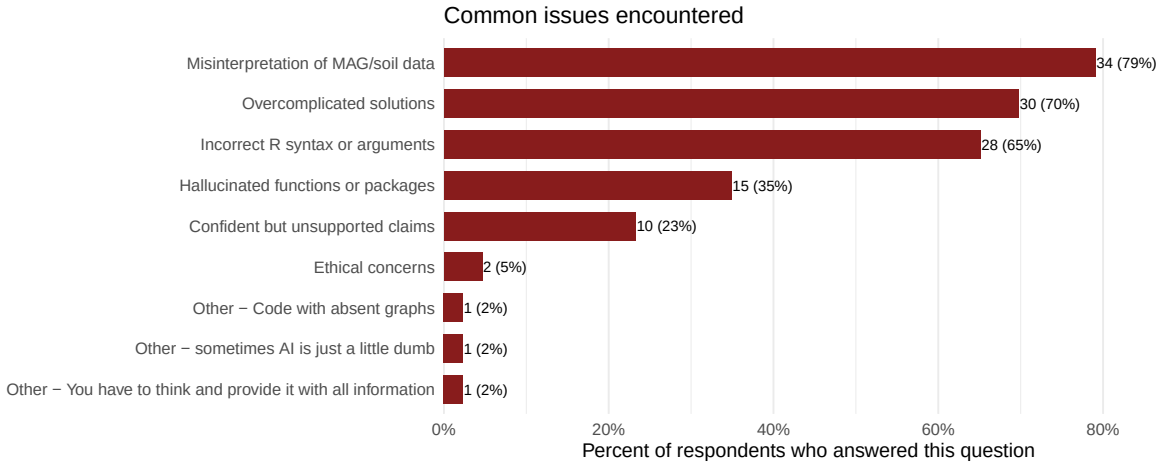
0.9 Combined likert graph of multiple choice grids



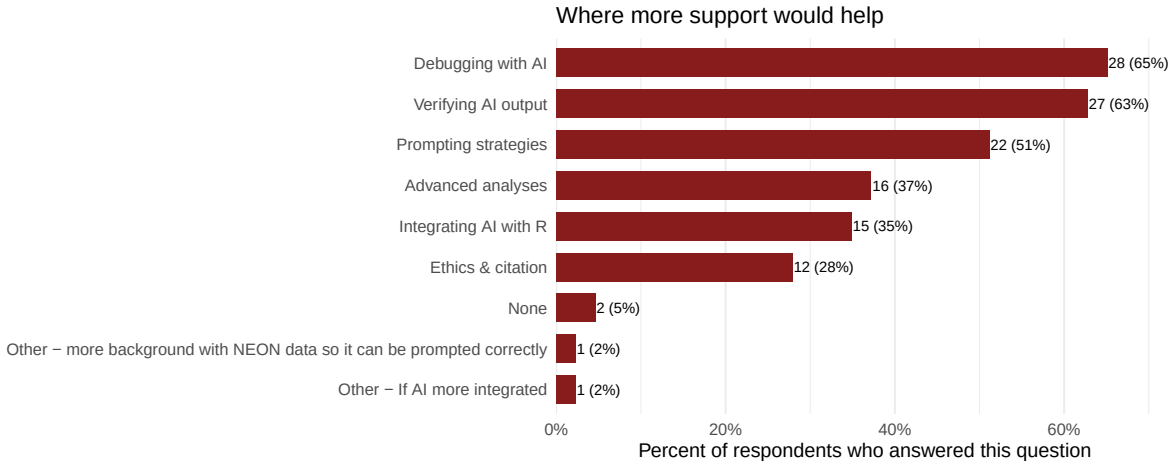
0.10 When AI was wrong, I typically... - multiple response



0.11 Common issues encountered - multiple response



0.12 Where more support would help - multiple response



0.13 Examples of helpful AI responses - Open response

It telling me how to create statistical analysis formulas to compare data points, and how to map graphs

Sometime when I didn't know how to attack a problem it would take me through the steps I needed to do before I wrote a code to answer the question like cleaning up or merging data

Before we learned the definitions of regex patterns and I tried to ask AI to create patterns for effective character finding, I used AI to give an explanation of the reasoning and meaning of the regex patterns it generated Even before we formally learned the skill, AI helped me think of advanced regex patterns

Writing code blocks utilizing functions/libraries I hadn't used before

clarity on homework / studying

Giving me different types of analysis I could do to see spatial autocorrelation for the MAG and metadata dataset

Making sense of the outputs generated by the code Or clarifying what table categories that have slightly different names from the instructions are most likely to be what the instructions are trying to direct you to

It really helped a lot during the lab exercises and it also explains it too

When working with the NEON Mags dataset, the AI gave very good suggestions on how to go about formatting my data and what errors were preventing my code from running

NA

A lot of the time I asked AI to help explain certain coding functions or I would ask them why I am getting the error message I am getting when rendering my lab and that's helped me learn from why I can't write the code in certain ways So AI has definitely helped me improve my coding syntax so that less errors come up when I render my labs

AI was very good at telling me what an error message meant, provided that I gave them the exact error message R was giving me AI would often explain what the error message meant and then provide multiple common ways to solve this problem

When an error occurs it will explain my error to me and give me code to correct it

-producing helpful explanations when codes do not run, providing simple code fixes

AI was able to come up analyses and graphs for the data that I never would have thought of It also provided the code for each analysis which was very helpful when trying to reproduce the graph in RStudio

I frequently would give copilot what I said and the error code and it would then bold what it changes and why

Once I was supposed to run a code to make graphs in a certain way but I wasn't really sure on how to do that AI helped me brainstorm ways to make my code run the way I needed it to

I asked it how to create a pie chart and it described it for me Another thing was to make a graph that was interactive so when your mouse hovers over a point you see what it is

One that integrated the suggested code in its response, and followed that with an explanation of why the code worked Another common one was when I reached an issue with one of my code chunks it would correct the issue and explain why my

code wasn't working

Giving an example of the code and then explainging what each part does, making it easy to know what use/add to get the product i needed

AI has been helpful in providing responses to fix my coding errors For example, I would tell CoPilot the code I was trying to run, and say it was not working and enter the specific "Error:" I was getting Copilot would then send back the correct code (most of the time), and explain where I went wrong which was really helpful so that I would not make the same mistake again

I was having trouble finding code to help me build a PCA plot for the MAG data set I upload the code that I already had as well as the MAG csv file and AI was able to give me a better code that also gave me instructions on what to change That was very helpful and allowed me to see what I was doing wrong

I usually used AI to correct errors within the code I created, so a helpful response would be something along the lines of "I see the problem is _____ which can be solved by _____"

it would give options on how to improve or fix the code and when taking a screenshot of my code & the errors, it was almost always helpful with helping me fix the issues

When I'd get an error, I'd give it to AI and often, it could tell me what I did wrong and how to fix it

Often times I will just input my error messages into AI (specifically ChatGPT) and even without seeing my original code, it generates a successful fix for my code Chat has been very successful in providing code fixes and formats on how to code certain things

I thought the most helpful Ai responses were the ones that gave me step by step instructions for the type of code to generate depending on the prompt By breaking it down, I could understand the point of each chunk

Putting in error code from R would 85% of the time be resolvable through AI directly Otherwise I could ask for alternative methods to alter my code

I would ask it to help me with something, and then it would output the code and the reasoning behind the code and how it works

It helped me be able to make graphs and complete exercises It helped me

understand what was going on in general And it always showed different ways to write the code

Having an idea on how you want data to be analyzed but not being sure of what kind of graphic would be best suited for that AI can suggest a few different methods and write the bulk of the code required to set the graphic up in RStudio

Troubleshooting issues was when I found AI most effective, rendering problems and trying to understand coding terms

All of the assignments like Making a graph for neon image data

When I have difficulty running a code due to an error in it and I could not find a way to make the code work so I will put the code and the feedback that R gave me on copilot and ask the AI to help me understand how to fix the code

Anything I don’t know ai can help

Not an exact example but the answers that included step by step explanations of the code were helpful

AI can help clean out a code chunk by replacing verbose patterns with simpler, more readable alternatives - for example, instead of writing filter(!isna(site_id), !isna(phylum)) %>% count(site_id, phylum), AI might suggest drop_na(site_id, phylum) %>% count(site_id, phylum), which is shorter and easier to understand

Here’s a specific example: my question to AI was: "what's the difference between your solution and what I wrote?" AI gave me a step by step explanation of (1) what my code does and (2) problems my code causes (failing to address the problem) The specific problem I was working on was How to display a table that counts the number of MAGs by phylum at each site AI was very helpful in all circumstances, especially in *Suggesting R code to solve problems* and *Explaining R code syntax and logic* Those were my two top uses of AI Of course, AI helped with all the other categories too, but for the most part, the two I just mentioned were the categories that I most often consulted AI for I feel like the category *Data wrangling with MAG taxonomy + genome properties + soil chemistry* can be included underneath either of these two, because it was related to problem-solving The reason I put *Extremely helpful* for all categories because of the ability to consult AI for really almost everything For the two categories I mentioned above, these are the prompts I would ask "Here’s my code It seems to me that it works fine, but can you verify that it really does?" Or, "What does this function do? What’s the difference between

this one and this one?" Or, "Here's the problem I'm trying to solve, and here's my code so far Can you help me with my code (either troubleshoot this error I'm getting or show me whether this is the best way to approach the problem)" I took advantage of making the most out of AI by asking it to explain functions it used that I wasn't familiar with I also always tried to understand AI logic by walking myself through each line, one by one The next two categories that I used AI for mostly in this course was *Brainstorming research questions with NEON metagenomic data* *'Vibe code': generating statistical, network, or other advanced analyses* kind of follows or falls under this This is especially helpful because I don't have a research background and while I can ask simple questions like "What phyla are enriched in these soil pH ranges?", I still would need to expand on this question My problem is that I'm not creative (maybe not curious enough?) with my questions This is why using AI to jumpstart brainstorming is especially helpful, especially because it can quickly provide background information that might spark my curiosity

What's wrong here? - "You are getting this error because joinID does not exist in the right table Check colnames() and rename before left_join()"

AI fixing errors in my code

Providing multiple approaches

Most useful with chunks of code for statistical analysis and plots readibility

NA

0.14 Examples of unhelpful or incorrect AI responses - Open response

When it would tell me to use formulas that needed only numerical values but I had N/A in my values It would tell me to use random names or column types that didn't exist

Sometimes if I had an error it would keep giving me incorrect codes to the point where nothing worked and I did'nt know how to tell fix this issue

When reading the soil mags + soil chem csv file to create Vibe code, AI would either reveal that the file is too big to be read or it would pretend to read it Either way, it would generate code that assumed variables and column names, which were often incorrect

Many AI responses generate code that contain errors

using AI for therapy

The codes it would give me would have a lot of errors, but this was fine because you learn a lot by seeing where those mistakes are and how to fix them yourself

When you're trying to fix a path directory error or use code it's giving you and you don't realize the proper names of the files are wrong and thats the secret reason why nothing is working

It takes a couple of tries for copilot to understand what is being asked which can be frustrating

When it came to working with GitHub or other external R coding, AI was not able to give very helpful tips and was just reiterating the same response in different wording

NA

Sometimes when prompting AI with my questions, I've learned that you have to craft the question very specifically in order for them to give generally what you're looking for The times that I have found AI giving unhelpful responses is when I don't prompt it correctly and sometimes it will give me an answer/code that uses a library or code function that we have not learned or not part of the lesson we are working on

When combining data frames I found that using AI wasn't as helpful as just referring back to the module AI would overcomplicate things and sometimes I would lose some of my data

AI isnt the best at helping with MAG data or anything in terms of troubleshooting for working directory

AI responses that don't provide a code or give super complicated unrunnable codes

AI is very prompt-specific, so if a prompt does not reflect exactly what the person wants, it takes a lot of back and forth between the AI and the person to get a good result

sometimes it gives wrong names for column

Sometimes when I would get an error in my code I was ask AI what I did wrong and

how I can fix It and most of the time it did help me but sometimes it would act up and not really give me proper guidance in what needed to be done

AI telling me to install and load new libraries when I don't even need them

It would occasionally give me a code that wouldn't run or it wouldn't explain why a certain code wasn't working

giving just example code with no explanation

There have been times where Copilot was wrong I would have to work with it back and forth, and say things like "No, that is not correct The error: is coming up", etc However, after I explained more, it would show me the correct code (most of the time)

In the beginning of the class, using AI was a challenge because I did not know the proper formatting or syntax I would as AI to give me code to transform a data set but not really understand what was being done An example of this was me using the "merge" function instead "left join"

If I used AI to generate new code, it would often assume file/column names When I input my edited code (with corrected file and column names), it would solve problems in the code but still using the file names it originally created Not a terrible issue, just annoying

sometimes it would make the code too long & complicated when it could really be more concise & it became really challenging when trying to use Al to help with uploading thing like soilChem and definitely NEONmag

Sometimes, AI would suggest code that included words/phrases that weren't in the data set, so I struggled to know what I should enter instead

I was trying to join two data sets but the IDs in the data sets had slightly different suffixes The suggestion that AI was giving me wasn't working in removing the suffix but it kept going around in the same circle Eventually, AI was able to make the join work but I am not sure how

I found that some of the unhelpful/incorrect Ai responses typically had to do with sometimes I felt like it did not listen to my requests or it would suggest troubleshooting techniques that would not work

When AI would try to overcomplicate analysis (that would not run) and make me download a bunch of new libraries for one prompt By the end of lab 13 I have

library(ggfortify), library(vegan), library(plotly), library(respirometry), library(ggplot2), and library(corrplot)

Sometimes it would output code that did not do what I wanted it to do; then I would have to refine it and tell it to redo it until it got it right Also, sometimes the graphs or figures it would make would be cramped together and not legible

AI made some graphs that were not accurate or did not have a good set up Also certain commands it was not good at using

For some of the more complicated data analysis there will be some lines where you get an error and try to use AI to solve it However it can't solve it (maybe due to package/R version incompatibility) and you end up going down a rabbit hole and wasting time

Would over-complicate simple exercises, adding unnecessary steps

In lab S3 Connecting a Github repo site with a new RStudio project It kept giving me wrong code to link and due to that the Lab was not loading

When AI will give me different variations of the same code and it will still not work even after going back and forth with it for 30 minutes It happened to me multiple times that I asked my classmates for help Another bad short examples will be AI using outdated syntax, complex code for simple tax and misinterpreting data types

some wrong solution making everything complicated, ai love to Change environment for some reasones

Not an exact example but the answers that misinterpreted the prompts or didn’t have the full data sets weren’t helpful

An unhelpful AI response might be overly vague, like ‘Just fix the code somehow’, which gives no actionable guidance Another incorrect response could confidently suggest a function or method that doesn’t exist, leaving the user confused and misled

For me, examples would be when the code simply doesn’t work Sometimes it’s due to base R issues or packages and version incompatibility-things like that I don’t know any technical terms to describe what the issues are more specifically I also don’t have a good understanding of how computers work One specific example is when I wanted to do an analysis of MAG data using a heat map based

on soil moisture My input was, "Here's my code so far where I got the average soil temperature for each phyla How do I make a heat map from here?" AI gave me a solution where I had to convert my data frame to a matrix first The code didn't work from there due to some issues with creating the matrix I believe I could have troubleshooted some more, as well as learn more about matrices on my own, but in that moment I really just wanted a quick visual and wasn't willing to spend time to learn about matrices I think the only issue with AI feedback here is that my code is nuanced to the data I'm working with and AI doesn't get to have the full picture I admit I could have been less lazy here and try troubleshooting it myself!

"Here is an answer" with facts that are wrong or made up (hallucinating)

AI going in the wrong direction about my code

Misunderstanding the prompt, hallucinations

Hardest to solve problems If something did not work or wrong answer, needed to figure it out mostly on my own, AI hardly could fix it

NA

0.15 Suggested changes for future offering - Open response

More help on github pushing and just using github as a whole

I think AI helped my learning expirence I would just add more to debugging and varifying AI like how to maybe do a monday class on this instead of a lab

I definitely think that lab reports should require students to report the prompt that was used to generate any code they used, preceding an exercise I think this is important data for this class and can be used to think of effective prompting strategies One idea I had, is to use Monday discussions to do either class-wide or team/table debriefing in which we talk about what sort of code we are getting from AI I think a collaborative aspect in this class would be helpful for keeping students on track together

The problems often felt formatted/designed in a way where AI use could easily solve them without requiring critical thinking from the student I think problems that focus more on having students determine what steps (or generated code chunks) would need to be taken could help the course encourage greater learning

NA

Covering more on ethics and AI use

NA

I think because there is a Monday and Wednesday portion, The Monday portion should be spent explaining what the lab on Wednesday will be I found myself using AI a lot for things that I felt could've been discussed in class

Some assignments that focus more on the content of the course (ie assignments that teach about NEON and soil chemistry/make up and how the research is advancing) and where AI is not used

NA

I think when starting with AI sometimes it's easy to just copy and paste the question we're asked, but I think it would be helpful to start off with examples of how we can prompt AI to guide us in answering our problems

NA

n/a

I would not say change anything but maybe more AI use towards the end of a specific subject so students have time to actually learn about the topic (ex No AI use allowed monday(introduxe topic), AI use allowed in wednesday labs

Incorporating learning R code without AI first would help give students a baseline of what R code should look and function like without having to rely on AI too much

maybe not allow AI until a little further into the course and making the assignments not so full so that we could focus on learning rather than just getting all the assignments and examples and then exercises done

Using AI and giving it some background before asking questions so it has the knowledge to help instead of pulling information from places that are irreverent to the person using it

Nothing right now

The class relied too heavily on AI I think it would have been helpful to have

the first couple of weeks without AI so we could learn the basics of R before delving into more complicated analysis with AI Also I felt that I didn't learn how to properly cite AI sources with respect to a coding assignment

NA

I would say there is not much to change, I think AI definitely brought my abilities of working with R to the next level The only thing I'd recommend is going over how to verify the AI outputs because sometimes I would get the wrong code or have to install packages that we do not need for this class

I would think it would be great if we could get to the MAG data earlier in the class and learn more about different metagenomic analyses

I think it was sometimes confusing to know exactly how to cite AI in the course, so more clarity on when/how it should be used in the earlier labs would be helpful

I know students will use Al to help them in this course in one way or another but if there's a way to help improve learning I know many of us had no background use of coding at all and we kind of jumped in quickly so I would depend on Al a lot to simply just get my work done

NA

AI skyrocketed my coding capabilities However, I don't feel very confident in coding without AI This class would benefit from spending more time on ingraining R/coding basics before moving to advanced R coding and metagenomic analysis Maybe the first half of the course could be ingraining both the basics in code and metagenomic analysis and the second half could be the explosive, exciting, AI based coding and analysis Using AI was a world-opening experience for me in coding

N/A

Ask people to discuss there code, or allow for people to do independent projects I really enjoyed the last lab that was open ended If we did the end of year project I think that I would have been able to utilize all the skills that I learned

I would suggest more instruction for how to ask AI questions to get the results you want Also, more help to verify if the results that the AI produced is actually what you want / answers the question how you wanted it answered Also,

how to make AI create more legible graphs where the labels or axes are not all clumped together so much

More help with learning how to write code on your own before working AI into the course I feel like maybe the first few classes should be without AI and trying to do things on your own and the bring AI in to help make more advanced code

Using some measure to prevent over reliance on AI to write all the code without understanding it Maybe having fewer exercises per lab, but requiring students to annotate their code and explain what was accomplished by the finished code

NA

More activities in the beginning of the course

I had hoped that the class would be more focused on the NEON Lab data and allow more time to work with it We only engaged with the dataset for the last 2 weeks of classes And while the previous R sessions did build foundational skills that definitely helped in analyzing the NEON Lab data, it would have been more beneficial to introduce and work with the data earlier during the course Because for me, doing so could have helped with better understanding the value of using coding tools for biological data

NA

Have a class specifically for how to ask copilot for help with R coding, including how to write a helpful prompt and dissect the answers so that you are able to use them in your actual code

NA

I feel like *Debugging with AI* is the most common issue I experience when using AI for code because what we are working on can be so nuanced Because of the nuance, I'm not sure how feasible in-class support with AI debugging would be (in the context of a whole class period), especially if everyone is working on different analyses / project? I would say the same thing for *Verifying AI output* I think AI is a useful tool used for assistance, but I also found that what we did in the course has been very valuable- namely doing the chapter outlines They can take quite a while to get through, but I agree that it's important for us to know the basics of R ourselves For Advanced analyses, maybe it would be helpful to have a brief overview in class of things like alpha-diversity and beta-diversity I learned about this before in other classes (and don't remember what they are), so maybe formally going over it in class,

if only briefly, would be good Maybe taking an additional lecture to explain more of what MAGs are and why they're useful in research, since I didn't get it the first time Eventually I came to understand what they are Also, personally I don't know anything about analyzing data, so if we received some advice about things to pay attention to (for example, make sure you take a larger sample size Or any research principles we aren't aware of? And what is ANOVA test, if we happened to need to use it) from class, just briefly, that would help As for using AI to help generate code for Advanced analyses, it helped so much Perhaps one thing I think would be good for this course is to require or at least highly encourage students to explain what their code chunk does, and put that explanation in the Quarto document above the code chunk Or to put comments in code in cases where the code looks suspiciously flawless We sometimes do these things by putting the header "AI note" and "Code chunk", but I wonder whether it would be good for students to go further than minimally stating what prompt they asked AI Either way, I suppose a student's ability to gain some useful knowledge is up to how disciplined they are able to be when they have powerful resources like AI

N/A

NA

NA

I think it's like a calculator, I would not use it for anything else It works less well than google for research, but it works as expected when given complex prompts You may need to amen/check the equation yourself for sure, but it will be able to give you a decent starting point/do the easy stuff faster than you

NA

0.16 Final comments and suggestions - Open response

Ai really did help and I feel like it is needed for advanced code based on the level of most students in this class, it just made it so coding felt robotic and I learned a little less

I liked being able to use AI but I wish I knew what to do if I fall down a rabbit hole of incorrect codes with CoPilot

Your suggestions of introducing the "Vibe" code mini labs earlier in the semester is interesting to me I think it would be helpful in one way, as it sort

of shows students our final goals for this class and can give ideas on what AI can be used to achieve On the other hand, it might introduce advanced code too quickly and can make students feel lost or left behind

NA

NA

Very well structured, I learned a lot

NA

NA

NA

NA

I think the integration of AI is helpful in beginner courses as sometimes AI has a good way to "dumb" things down almost to explain why the code produces the output that it does Sometimes having a conversation with AI helps the learner understand a lot more than just reading the textbook because sometimes we need more examples than just the ones provided to see what the concept is trying to show us

NA

helped me feel like i could confidently code if asked to

Loved this class, Dr Blanchard was super helpful and made coding seem fun even though I have never liked to code Love AI, makes sense for coding courses do not get rid of it completely

I enjoyed this class and performed analyses I never would have thought of without AI suggestions I would have liked to learn coding without AI first to establish a foundation, but ultimately, using AI allowed me to complete a lot more work and understand more functions in R code

I would not have been able to complete this class without the assistance of AI and if you want to continue to have a large workload AI is 100% necessary and is helpful It is more on the individual student themselves to actually make sure we learn the content rather than just copy and pasting

With zero knowledge of coding when coming into this class, AI helped me learn things along the way and made my life so much easier

No comments

Good course to introduce someone to the use of AI in R, but would have been helpful/interesting to learn some of the basics beforehand

Without the help of AI, I don't think I would've been able to complete this course at all, honestly Coding is just extremely hard for me, and using Copilot really helped to break it down into manageable chunks to learn/use

This has been a great semester! This class was super interesting!

Thanks for a great semester!

I feel like the effectiveness of AI in this course varies between students, so this survey is very interesting! I could see AI inhibiting learning if students used it heavily in the beginning of the course when we focused on R basics, because then that work is just busy work I feel like I learned the most from the beginning of the course just using AI as an occasional troubleshooting tool, but depending on AI from the start would have been detrimental

NA

AI helped me understand and learn a lot more in this course than I could have otherwise without it!

See suggested changes for future offerings

This was a very cool class!

Using on AI was appropriate in this course, but I don't think that it would be effective in every course I attached my mycology class analysis in the comments if you are interested in the analysis I did I presented the information to my class :) I really enjoyed the skills that I learned in this class and will be adding to my resume! Thank you for an amazing semester

I wish there was less of a need to use AI in this course, but once things started getting complicated it was very hard to do anything without the use of AI, especially considering most of us in the class had no experience with coding of any sort For example, I did not use AI for the first couple of labs, and that was on purpose because I did not want to have to rely on AI for everything I did

The first couple of labs were manageable to do without the use of AI, and they were just challenging enough where I was actually learning a lot of the basics of coding However, after a certain point, I felt I needed to use AI to get the work done because the level of difficulty increased too much for me to figure out the coding on my own After that point, I relied on AI too much, and I wasn't learning anymore

I really did enjoy the course overall, I like the room and set up of working with a group I think Dr Blanchard was helpful when I went to office hours or needed help in class I wish we learned a few more basic coding steps because I think I relied on AI too much I still think it should be a big part of the course but just that a little more coding without it at the start

I think AI has its place in the modern world but that place is not everywhere I understand the potential AI has for making coding more accessible for newcomers but it should not eliminate the learning process A balance needs to be found between AI use and organic learning

Without AI for this course, I doubt I would have been able to do the labs on my own I think the course name should be changed to "Coding with R" or something of a similar nature, because that is what the assignments were, going through the textbook While it was beneficial to get some exposure to R, it was not what I expected at all If I knew what it would be like beforehand, I would never have taken this course The time spent trying to resolve issues with no luck from AI and other sources added way too many hours into completing assignments I don't enjoy using AI and try to avoid it, but unfortunately with the way the class was formatted, I felt that there was no way I could have figured out the issues I had or solved the exercises without it

AI really helped understanding the coding

Using AI made me more comfortable with coding, and I am actually applying what I learned to one of my classes for a project

NA

None

NA

Using AI is extremely helpful in a coding class especially for students like me without much familiarity with code I wish more coding classes were offered more frequently in the Biology Department R programming is such a useful skill,

even if I'm a beginner, and I will certainly be using it to make visuals in the future I even saw my classmate from here using R to make graphs for project in a different course Since this is a research-based course and we have limited time this semester (the semester is very short, only 3-4 months), I loved that we gain hands-on, first-hand experience of working with real MAG data and doing analyses with it Doing the chapter outlines from the textbook was very helpful in providing us with foundational knowledge about code syntax and using dplyr and ggplot for visualization and analysis I like learning foundational principles of coding from a concrete source like a textbook, compared to self-teaching myself through google At the same time, I still think having resources like internet and AI are such a big help because they introduce me to so much I would't have explored (like other functions, more example uses, graph aesthetics, research ideas) And I'm sure that self-teaching is still an important part of learning to code and research, too (though I don't like thinking of the idea so much) I found that AI saved so much time when it came to problem-solving, troubleshooting errors, and me memorizing functions That can be a pain when working on coding assignments, which I've experienced before I think it's important to responsibly use AI as a tool to help with my understanding, but not just use it to get the assignment done That's why I don't just use AI to ask for code suggestions, but also for explanation for every function use I also take a look at how the code was structured to understand the problem-solving logic I think that goes back to how we emphasized vibe coding- you should be able to know how to approach the problem, even if you can't write the code just yet I have one comment about why students asked less questions to the instructor about the actual code itself and problem-solving (although maybe there were still questions about debugging?) I am sure the reason is obviously having the assistance of AI, which is a big help with coding But I think the underlying reason could be that most students hope to avoid asking a question and then being told to look into it themselves and check their resources they already have I hear instructors say this so often, even in my other research-based class I'm taking this semester Personally, this is a main reason I refrain from asking questions, because given enough time and (sometimes hard) effort on my own, I can answer my own question I just have to look for the answers myself on google or AI Most of the questions I want to ask are ones that I could answer given time and effort on my own I feel like instructors may think I am lazy if I don't try to first figure it out Also, another reason is that students are confused and want to ask questions, but don't know what exactly to ask or how to phrase it I've heard a classmate say this in another course, and I feel the same way sometimes It's harder when there are technical terms involved because I don't know how to describe what I'm confused about Overall, I personally don't find either of these things to be huge issues in this course, as you were always willing to help us and were a very encouraging instructor I never felt pressured in a negative way Given our resources, it made sense for me to try to

at least try to problem solve myself, which often resulted in me figuring out an answer…thanks to my resources, like AI! Overall, I'm not sure what changes I would suggest for this course, especially given our short semester The important thing was that I learned useful programming skills that I know I will apply in the future Thank you Dr Blanchard!

Thank you :)

AI removes the need to spend hours learning coding and allows me to focus on more important things

NA

I genuinely think the point of AI is like computers and calculators, make complex work easier I just think we should not confuse a glorified calculator with a friend, God's word, or an actual intelligent person (Cogito, ergo sum) Even if it was an intelligent person, I would check their words and answers if I suspected it sounded too good to be true (that's probably because by nature, I also have a tendency to say things with a lot of confidence even if they are not true-simply because I believe them) If someone came to me with the total confidence that there are three types of T cells, I would know better and tell them "that's not true" If they told me "a new type of IgG was discovered in a paper by Matt et al," I'd have a tendency to say "yes? Can you show me?" If I was told "Did you know there are over 300 types of turtles?" I may have a small doubt, but usually say "oh nice!" and accept it as a doubtful, but actual fact (and mess up and repeat it with total confidence to other people as a truth) Asking any question to AI comes with the understanding that it is only a computer and just does math But even if it could think and was human, wouldn't we also double-check their statement and thoughts? Or correct them, or ask for proofs?

NA

0.17 Table - Overall effectiveness / Likelihood to recommend AI

column	mean	sd	n
Likelihood to recommend AI use in similar courses	7.86	1.98	43
Overall effectiveness of AI in this course	8.60	1.22	43