Coding Challenge 5

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### Question 1

3pts. Download two .csv files from Canvas called DiversityData.csv and Metadata.csv, and read them into R using relative file paths.

library(tidyverse)

## ── Attaching core tidyverse packages ──────────────────────── tidyverse 2.0.0 ──  
## ✔ dplyr 1.1.4 ✔ readr 2.1.5  
## ✔ forcats 1.0.0 ✔ stringr 1.5.1  
## ✔ ggplot2 3.5.1 ✔ tibble 3.2.1  
## ✔ lubridate 1.9.4 ✔ tidyr 1.3.1  
## ✔ purrr 1.0.2   
## ── Conflicts ────────────────────────────────────────── tidyverse\_conflicts() ──  
## ✖ dplyr::filter() masks stats::filter()  
## ✖ dplyr::lag() masks stats::lag()  
## ℹ Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors

diversity<- read.csv ("DiversityData.csv", na.strings = "na")  
str(diversity)

## 'data.frame': 70 obs. of 5 variables:  
## $ Code : chr "S01\_13" "S02\_16" "S03\_19" "S04\_22" ...  
## $ shannon : num 6.62 6.61 6.66 6.66 6.61 ...  
## $ invsimpson: num 211 207 213 205 200 ...  
## $ simpson : num 0.995 0.995 0.995 0.995 0.995 ...  
## $ richness : int 3319 3079 3935 3922 3196 3481 3250 3170 3657 3177 ...

meta<- read.csv ("Metadata.csv", na.strings= "na")  
str(meta)

## 'data.frame': 70 obs. of 5 variables:  
## $ Code : chr "S01\_13" "S02\_16" "S03\_19" "S04\_22" ...  
## $ Crop : chr "Soil" "Soil" "Soil" "Soil" ...  
## $ Time\_Point : int 0 0 0 0 0 0 6 6 6 6 ...  
## $ Replicate : int 1 2 3 4 5 6 1 2 3 4 ...  
## $ Water\_Imbibed: num NA NA NA NA NA NA NA NA NA NA ...

### Question 2

4 pts. Join the two dataframes together by the common column ‘Code’. Name the resulting dataframe alpha.

alpha <-left\_join(diversity, meta, by= "Code") #join the two dataframes into one and name it alpha.  
head(alpha)

## Code shannon invsimpson simpson richness Crop Time\_Point Replicate  
## 1 S01\_13 6.624921 210.7279 0.9952545 3319 Soil 0 1  
## 2 S02\_16 6.612413 206.8666 0.9951660 3079 Soil 0 2  
## 3 S03\_19 6.660853 213.0184 0.9953056 3935 Soil 0 3  
## 4 S04\_22 6.660671 204.6908 0.9951146 3922 Soil 0 4  
## 5 S05\_25 6.610965 200.2552 0.9950064 3196 Soil 0 5  
## 6 S06\_28 6.650812 199.3211 0.9949830 3481 Soil 0 6  
## Water\_Imbibed  
## 1 NA  
## 2 NA  
## 3 NA  
## 4 NA  
## 5 NA  
## 6 NA

### Question 3

4 pts. Calculate Pielou’s evenness index: Pielou’s evenness is an ecological parameter calculated by the Shannon diversity index (column Shannon) divided by the log of the richness column.

1. Using mutate, create a new column to calculate Pielou’s evenness index.
2. Name the resulting dataframe alpha\_even.

alpha\_even<-alpha%>% #create new dataframe called alpha\_even(b)  
 mutate(even=shannon/log(richness)) #mutate to create new column to calculate   
 #Pieloe's evenness by dividing the shannon column by the log of the richness column (a).  
  
head(alpha\_even) #check data frame.

## Code shannon invsimpson simpson richness Crop Time\_Point Replicate  
## 1 S01\_13 6.624921 210.7279 0.9952545 3319 Soil 0 1  
## 2 S02\_16 6.612413 206.8666 0.9951660 3079 Soil 0 2  
## 3 S03\_19 6.660853 213.0184 0.9953056 3935 Soil 0 3  
## 4 S04\_22 6.660671 204.6908 0.9951146 3922 Soil 0 4  
## 5 S05\_25 6.610965 200.2552 0.9950064 3196 Soil 0 5  
## 6 S06\_28 6.650812 199.3211 0.9949830 3481 Soil 0 6  
## Water\_Imbibed even  
## 1 NA 0.8171431  
## 2 NA 0.8232216  
## 3 NA 0.8046776  
## 4 NA 0.8049774  
## 5 NA 0.8192376  
## 6 NA 0.8155427

### Question 4

1. Pts. Using tidyverse language of functions and the pipe, use the summarise function and tell me the mean and standard error evenness grouped by crop over time.
2. Start with the alpha\_even dataframe
3. Group the data: group the data by Crop and Time\_Point.
4. Summarize the data: Calculate the mean, count, standard deviation, and standard error for the even variable within each group.
5. Name the resulting dataframe alpha\_average

alpha\_average<- alpha\_even%>% #use the alpha dataframe and create new dataframe cammed alpha\_average  
 group\_by(Crop, Time\_Point)%>% #grouping by crop and time\_point  
 summarise(  
 mean.even=mean(even), #mean of the Pielou’s evenness index from the new coumn named even  
 n=n(),  
 std.dev=sd(even),   
 std.err = (std.dev/sqrt(n))  
 )

## `summarise()` has grouped output by 'Crop'. You can override using the  
## `.groups` argument.

### Question 5

1. Pts. Calculate the difference between the soybean column, the soil column, and the difference between the cotton column and the soil column
2. Start with the alpha\_average dataframe
3. Select relevant columns: select the columns Time\_Point, Crop, and mean.even.
4. Reshape the data: Use the pivot\_wider function to transform the data from long to wide format, creating new columns for each Crop with values from mean.even.
5. Calculate differences: Create new columns named diff.cotton.even and diff.soybean.even by calculating the difference between Soil and Cotton, and Soil and Soybean, respectively.
6. Name the resulting dataframe alpha\_average2

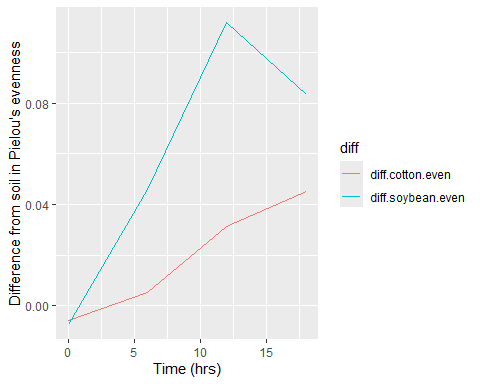
alpha\_average2<- alpha\_average%>% #new new data frame and use alpha\_average as ref.  
 select(Time\_Point, Crop, mean.even)%>% # select relevant columns  
 pivot\_wider(names\_from = Crop, values\_from= mean.even)%>% #convert data to long form wide form  
 mutate(diff.cotton.even = Soil - Cotton)%>% #new column with difference from soil and cotton  
 mutate(diff.soybean.even = Soil - Soybean) #new column with difference between soil and soybean

### Question 6

4 pts. Conecting it to plots.

1. Start with the alpha\_average2 dataframe
2. Select relevant columns: select the columns Time\_Point, diff.cotton.even, and diff.soybean.even
3. Reshape the data: Use the pivot\_longer function to transform the data from wide to long format, creating a new column named diff that contains the values from diff.cotton.even and diff.soybean.even.
4. This might be challenging, so I’ll give you a break. The code is below
5. Create the plot: Use ggplot and geom\_line() with ‘Time\_Point’ on the x-axis, the column ‘values’ on the y-axis, and different colors for each ‘diff’ category. The column name ‘values’ come from the pivot\_longer. The resulting plot should look like the one to the right

#still need to remove background!!!  
alpha\_average2%>% #part 6a  
 select(Time\_Point,diff.cotton.even, diff.soybean.even)%>% #6b  
 pivot\_longer(c(diff.cotton.even, diff.soybean.even), names\_to = "diff")%>%#6c  
 ggplot( aes(x = Time\_Point, y = value, color = diff, group = diff))+  
 geom\_line()+  
 xlab("Time (hrs)")+  
 ylab ("Difference from soil in Pielou's evenness")



### Question 7

Commit and push a gfm .md file to GitHub inside a directory called Coding Challenge 5. Provide me a link to your github written as a clickable link in your .pdf or .docx

[Katie Temple’s GitHub Coding Challenge 5 Directory](https://github.com/temkat/TempleReproducibilityClass2025/tree/69531926d11d94f37eec0ff0bfdad75b7e135173/CodingChallenge_5)