PLPA 6820 Coding Challenge 5

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# Github Link

Sam Donohoo - PLPA 6820 - <https://github.com/sad0046/PLPA6820_SP25>

### Question 1 - Adding Data

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

# Load in Libraries  
library(tidyverse)  
  
# Load in Metadata Data  
metaData <- read.csv("Metadata.csv", header = TRUE, na.strings = "na")  
  
# Load in Diversity Data  
divData <- read.csv("DiversityData.csv", header = TRUE, na.strings = "na")

### Question 2 - Combining Data

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

# Join Dataframes Together  
# Name Combined Dataframe alpha  
alpha <- full\_join(metaData, divData, by = "Code")  
  
head(alpha) # Print First 6 Rows

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

### Question 3 - Pielou’s Evenness Index

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.

# Calculate Pielou's Evenness Index = Shannon / log(richness)  
alpha\_even <- alpha %>%  
 mutate(logRich = log(richness)) %>% # creating a new column of the Log Richness  
 mutate(even = shannon/logRich) # creating a new column of Pielou's Evenness  
  
head(alpha\_even) # Print First 6 Rows

## Code Crop Time\_Point Replicate Water\_Imbibed shannon invsimpson simpson  
## 1 S01\_13 Soil 0 1 NA 6.624921 210.7279 0.9952545  
## 2 S02\_16 Soil 0 2 NA 6.612413 206.8666 0.9951660  
## 3 S03\_19 Soil 0 3 NA 6.660853 213.0184 0.9953056  
## 4 S04\_22 Soil 0 4 NA 6.660671 204.6908 0.9951146  
## 5 S05\_25 Soil 0 5 NA 6.610965 200.2552 0.9950064  
## 6 S06\_28 Soil 0 6 NA 6.650812 199.3211 0.9949830  
## richness logRich even  
## 1 3319 8.107419 0.8171431  
## 2 3079 8.032360 0.8232216  
## 3 3935 8.277666 0.8046776  
## 4 3922 8.274357 0.8049774  
## 5 3196 8.069655 0.8192376  
## 6 3481 8.155075 0.8155427

### Question 4 - Summarise

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.

# Using summarise() Calculate Mean and Standard Error Grouped by Crop Over Time  
alpha\_average <- alpha\_even %>%  
 group\_by(Crop, Time\_Point) %>% # Grouping by Crop and Time Point  
 summarise(Mean.even = mean(even), # Calculating the Mean and Standard Error for Evenness  
 n = n(),  
 sd.dev = sd(even)) %>%  
 mutate(std.err = sd.dev/sqrt(n))  
  
alpha\_average # Print Entire Table

## # A tibble: 12 × 6  
## # Groups: Crop [3]  
## Crop Time\_Point Mean.even n sd.dev std.err  
## <chr> <int> <dbl> <int> <dbl> <dbl>  
## 1 Cotton 0 0.820 6 0.00556 0.00227  
## 2 Cotton 6 0.805 6 0.00920 0.00376  
## 3 Cotton 12 0.767 6 0.0157 0.00640  
## 4 Cotton 18 0.755 5 0.0169 0.00755  
## 5 Soil 0 0.814 6 0.00765 0.00312  
## 6 Soil 6 0.810 6 0.00587 0.00240  
## 7 Soil 12 0.798 6 0.00782 0.00319  
## 8 Soil 18 0.800 5 0.0104 0.00465  
## 9 Soybean 0 0.822 6 0.00270 0.00110  
## 10 Soybean 6 0.764 6 0.0400 0.0163   
## 11 Soybean 12 0.687 6 0.0643 0.0263   
## 12 Soybean 18 0.716 6 0.0153 0.00626

### Question 5 - Differences

Calculate the difference between the soybean column, the soil column, and the difference between the cotton column and the soil column.

# Calculate Difference Between Soybean+Soil and Cotton+Soil  
alpha\_average2 <- alpha\_average %>%  
 select(Time\_Point, Crop, Mean.even) %>% # Selecting Columns  
 pivot\_wider(names\_from = Crop, values\_from = Mean.even) %>% # Pivot to Wide Format  
 mutate(diff.cotton.even = Soil - Cotton) %>% # calculates the mean per Treatment and Fungicide  
 mutate(diff.soybean.even = Soil - Soybean)  
  
alpha\_average2 # Print Entire Table

## # A tibble: 4 × 6  
## Time\_Point Cotton Soil Soybean diff.cotton.even diff.soybean.even  
## <int> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 0 0.820 0.814 0.822 -0.00602 -0.00740  
## 2 6 0.805 0.810 0.764 0.00507 0.0459   
## 3 12 0.767 0.798 0.687 0.0313 0.112   
## 4 18 0.755 0.800 0.716 0.0449 0.0833

### Question 6 - Plotting

Connecting it to plots.

# Plot Differences using ggplot2  
# Time\_Point on the X, Value on the Y, Color Lines by Diff  
alpha\_average2\_plot <- alpha\_average2 %>%  
 select(Time\_Point, diff.cotton.even, diff.soybean.even) %>% # Selecting Columns  
 pivot\_longer(c(diff.cotton.even, diff.soybean.even), names\_to = "diff") %>% # Pivot to Long Format  
 ggplot(aes(x = Time\_Point, y = value, color = diff)) + # Plot  
 geom\_line() +  
 theme\_classic() +  
 xlab("Time (hrs)") +  
 ylab("Difference from soil in Pielou's evenness")  
  
alpha\_average2\_plot # Print Plot

