Coding Challenge 5

Theresa Quintana

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You can find the corresponding documents to this assignment on my GitHub: Theresa's Coding Challenge 5 Github Access

#Question 1: Download two .csv files from Canvas called DiversityData.csv and Metadata.csv, and read them into R using relative file paths.

```
library(ggplot2)
library(tidyverse)
library(ggpubr)
library(ggrepel)
library(ggprism)
library(knitr)

diversity <- read.csv("DiversityData.csv", na.strings = "na")
meta <- read.csv("Metadata.csv", na.strings = "na")
```

#Question 2: Join the two dataframes together by the common column 'Code'. Name the resulting dataframe alpha.

```
alpha <- left_join(diversity, meta, by = "Code")
alpha
```

```
##        Code  shannon invsimpson   simpson richness    Crop Time_Point Replicate
## 1    S01_13 6.624921  210.72795 0.9952545     3319    Soil          0         1
## 2    S02_16 6.612413  206.86664 0.9951660     3079    Soil          0         2
## 3    S03_19 6.660853  213.01843 0.9953056     3935    Soil          0         3
## 4    S04_22 6.660671  204.69080 0.9951146     3922    Soil          0         4
## 5    S05_25 6.610965  200.25523 0.9950064     3196    Soil          0         5
## 6    S06_28 6.650812  199.32110 0.9949830     3481    Soil          0         6
## 7    S61_32 6.570679  200.23177 0.9950058     3250    Soil          6         1
## 8    S62_35 6.492227  171.27965 0.9941616     3170    Soil          6         2
## 9    S63_38 6.610986  192.08535 0.9947940     3657    Soil          6         3
## 10   S64_41 6.472259  163.99814 0.9939024     3177    Soil          6         4
## 11   S65_44 6.508824  181.69248 0.9944962     2985    Soil          6         5
## 12   S66_47 6.482495  176.90684 0.9943473     2770    Soil          6         6
## 13  S121_51 6.276073  126.56259 0.9920988     3040    Soil         12         1
## 14  S122_54 6.461118  152.98152 0.9934633     3192    Soil         12         2
## 15  S123_57 6.334648  138.92556 0.9928019     2673    Soil         12         3
## 16  S124_60 6.461988  171.13732 0.9941567     3180    Soil         12         4
## 17  S125_63 6.501973  172.97532 0.9942188     3320    Soil         12         5
## 18  S126_66 6.354387  142.61016 0.9929879     2773    Soil         12         6
```

```
## 19  S181_70 6.299381  142.64506 0.9929896     2806    Soil         18         1
## 20  S182_74 6.340644  145.48656 0.9931265     3047    Soil         18         2
## 21  S183_78 6.282807  150.39829 0.9933510     2190    Soil         18         3
## 22  S184_82 6.268316  141.14138 0.9929149     2488    Soil         18         4
## 23  S186_90 6.289000  140.45260 0.9928802     2684    Soil         18         6
## 24   C01_11 6.618126  220.66218 0.9954682     3076  Cotton          0         1
## 25   C02_14 6.627206  211.03921 0.9952615     3180  Cotton          0         2
## 26   C03_17 6.616958  216.06631 0.9953718     2938  Cotton          0         3
## 27   C04_20 6.626465  215.93901 0.9953691     3371  Cotton          0         4
## 28   C05_23 6.642822  211.08960 0.9952627     3435  Cotton          0         5
## 29   C06_26 6.679131  216.31351 0.9953771     3629  Cotton          0         6
## 30   C61_30 6.454741  170.03639 0.9941189     2767  Cotton          6         1
## 31   C62_33 6.484032  172.35279 0.9941979     3377  Cotton          6         2
## 32   C63_36 6.517958  173.41489 0.9942335     3804  Cotton          6         3
## 33   C64_39 6.476069  167.13138 0.9940167     3204  Cotton          6         4
## 34   C65_42 6.569722  197.01186 0.9949242     3250  Cotton          6         5
## 35   C66_45 6.482145  172.96394 0.9942184     3009  Cotton          6         6
## 36  C121_49 5.944568   71.55607 0.9860249     2779  Cotton         12         1
## 37  C122_52 6.187755   96.43939 0.9896308     3193  Cotton         12         2
## 38  C123_55 6.129460   81.26646 0.9876948     2859  Cotton         12         3
## 39  C124_58 6.028523   75.49726 0.9867545     2950  Cotton         12         4
## 40  C125_61 6.148179   98.94468 0.9898933     3018  Cotton         12         5
## 41  C126_64 6.347332  150.05708 0.9933359     2946  Cotton         12         6
## 42  C181_68 6.301392  132.36230 0.9924450     3266  Cotton         18         1
## 43  C182_72 6.000205   83.90929 0.9880824     2969  Cotton         18         2
## 44  C183_76 5.981284   82.44127 0.9878702     2636  Cotton         18         3
## 45  C184_80 5.578566   50.73174 0.9802885     2043  Cotton         18         4
## 46  C185_84 6.064655   87.82732 0.9886140     3113  Cotton         18         5
## 47  SB01_12 6.644864  216.86110 0.9953888     3203 Soybean          0         1
## 48  SB02_15 6.615662  211.32573 0.9952680     3055 Soybean          0         2
## 49  SB03_18 6.693987  230.45439 0.9956607     3595 Soybean          0         3
## 50  SB04_21 6.647502  234.80343 0.9957411     3253 Soybean          0         4
## 51  SB05_24 6.605749  198.57265 0.9949641     3187 Soybean          0         5
## 52  SB06_27 6.640696  215.26494 0.9953546     3190 Soybean          0         6
## 53  SB61_31 6.044229   89.13912 0.9887816     2371 Soybean          6         1
## 54  SB62_34 6.437589  154.21624 0.9935156     3248 Soybean          6         2
## 55  SB63_37 6.194632   83.11681 0.9879687     2976 Soybean          6         3
## 56  SB64_40 6.117393   87.20257 0.9885324     3006 Soybean          6         4
## 57  SB65_43 5.439798   29.48338 0.9660826     2809 Soybean          6         5
## 58  SB66_46 6.195816  108.22394 0.9907599     2680 Soybean          6         6
## 59 SB121_50 4.393341   12.39587 0.9193280     2508 Soybean         12         1
## 60 SB122_53 5.630929   52.97931 0.9811247     2403 Soybean         12         2
## 61 SB123_56 5.579523   48.59842 0.9794232     2752 Soybean         12         3
## 62 SB124_59 5.406651   34.08685 0.9706632     2946 Soybean         12         4
## 63 SB125_62 5.863941   63.33020 0.9842097     3165 Soybean         12         5
## 64 SB126_65 5.738025   57.88780 0.9827252     2705 Soybean         12         6
## 65 SB181_69 5.671024   57.37726 0.9825715     2642 Soybean         18         1
## 66 SB182_73 5.489406   43.16854 0.9768350     2773 Soybean         18         2
## 67 SB183_77 5.713960   60.47882 0.9834653     2454 Soybean         18         3
## 68 SB184_81 5.467076   44.06798 0.9773078     2365 Soybean         18         4
## 69 SB185_85 5.729473   55.95864 0.9821297     2789 Soybean         18         5
## 70 SB186_89 5.556356   54.34527 0.9815991     2050 Soybean         18         6
##    Water_Imbibed
## 1             NA
```

```
## 2             NA
## 3             NA
## 4             NA
## 5             NA
## 6             NA
## 7             NA
## 8             NA
## 9             NA
## 10            NA
## 11            NA
## 12            NA
## 13            NA
## 14            NA
## 15            NA
## 16            NA
## 17            NA
## 18            NA
## 19            NA
## 20            NA
## 21            NA
## 22            NA
## 23            NA
## 24        0.0042
## 25        0.0091
## 26        0.0013
## 27        0.0087
## 28        0.0075
## 29        0.0046
## 30        0.0580
## 31        0.0440
## 32        0.0569
## 33        0.0841
## 34        0.0535
## 35        0.0029
## 36        0.0651
## 37        0.0527
## 38        0.0675
## 39        0.0545
## 40        0.0623
## 41        0.0021
## 42        0.0034
## 43        0.0632
## 44        0.0514
## 45        0.0577
## 46        0.0554
## 47        0.1664
## 48        0.0942
## 49        0.1248
## 50        0.1150
## 51        0.0993
## 52        0.1005
## 53        0.2308
## 54        0.2603
## 55        0.2111
```

```
## 56        0.2808
## 57        0.2712
## 58        0.2887
## 59        0.2822
## 60        0.2557
## 61        0.2982
## 62        0.2489
## 63        0.2573
## 64        0.2285
## 65        0.2528
## 66        0.2706
## 67        0.3196
## 68        0.2437
## 69        0.2461
## 70        0.3010
```

#Question 3: 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.

```
#a. Using mutate, create a new column to calculate Pielou's evenness index.
#b. Name the resulting dataframe alpha_even.
alpha_even <- mutate(alpha, PielouIndex = shannon/log(richness))
alpha_even
```

```
##        Code  shannon invsimpson   simpson richness    Crop Time_Point Replicate
## 1    S01_13 6.624921  210.72795 0.9952545     3319    Soil          0         1
## 2    S02_16 6.612413  206.86664 0.9951660     3079    Soil          0         2
## 3    S03_19 6.660853  213.01843 0.9953056     3935    Soil          0         3
## 4    S04_22 6.660671  204.69080 0.9951146     3922    Soil          0         4
## 5    S05_25 6.610965  200.25523 0.9950064     3196    Soil          0         5
## 6    S06_28 6.650812  199.32110 0.9949830     3481    Soil          0         6
## 7    S61_32 6.570679  200.23177 0.9950058     3250    Soil          6         1
## 8    S62_35 6.492227  171.27965 0.9941616     3170    Soil          6         2
## 9    S63_38 6.610986  192.08535 0.9947940     3657    Soil          6         3
## 10   S64_41 6.472259  163.99814 0.9939024     3177    Soil          6         4
## 11   S65_44 6.508824  181.69248 0.9944962     2985    Soil          6         5
## 12   S66_47 6.482495  176.90684 0.9943473     2770    Soil          6         6
## 13  S121_51 6.276073  126.56259 0.9920988     3040    Soil         12         1
## 14  S122_54 6.461118  152.98152 0.9934633     3192    Soil         12         2
## 15  S123_57 6.334648  138.92556 0.9928019     2673    Soil         12         3
## 16  S124_60 6.461988  171.13732 0.9941567     3180    Soil         12         4
## 17  S125_63 6.501973  172.97532 0.9942188     3320    Soil         12         5
## 18  S126_66 6.354387  142.61016 0.9929879     2773    Soil         12         6
## 19  S181_70 6.299381  142.64506 0.9929896     2806    Soil         18         1
## 20  S182_74 6.340644  145.48656 0.9931265     3047    Soil         18         2
## 21  S183_78 6.282807  150.39829 0.9933510     2190    Soil         18         3
## 22  S184_82 6.268316  141.14138 0.9929149     2488    Soil         18         4
## 23  S186_90 6.289000  140.45260 0.9928802     2684    Soil         18         6
## 24   C01_11 6.618126  220.66218 0.9954682     3076  Cotton          0         1
## 25   C02_14 6.627206  211.03921 0.9952615     3180  Cotton          0         2
## 26   C03_17 6.616958  216.06631 0.9953718     2938  Cotton          0         3
## 27   C04_20 6.626465  215.93901 0.9953691     3371  Cotton          0         4
## 28   C05_23 6.642822  211.08960 0.9952627     3435  Cotton          0         5
```

```
## 29   C06_26 6.679131  216.31351 0.9953771     3629  Cotton          0         6
## 30   C61_30 6.454741  170.03639 0.9941189     2767  Cotton          6         1
## 31   C62_33 6.484032  172.35279 0.9941979     3377  Cotton          6         2
## 32   C63_36 6.517958  173.41489 0.9942335     3804  Cotton          6         3
## 33   C64_39 6.476069  167.13138 0.9940167     3204  Cotton          6         4
## 34   C65_42 6.569722  197.01186 0.9949242     3250  Cotton          6         5
## 35   C66_45 6.482145  172.96394 0.9942184     3009  Cotton          6         6
## 36  C121_49 5.944568   71.55607 0.9860249     2779  Cotton         12         1
## 37  C122_52 6.187755   96.43939 0.9896308     3193  Cotton         12         2
## 38  C123_55 6.129460   81.26646 0.9876948     2859  Cotton         12         3
## 39  C124_58 6.028523   75.49726 0.9867545     2950  Cotton         12         4
## 40  C125_61 6.148179   98.94468 0.9898933     3018  Cotton         12         5
## 41  C126_64 6.347332  150.05708 0.9933359     2946  Cotton         12         6
## 42  C181_68 6.301392  132.36230 0.9924450     3266  Cotton         18         1
## 43  C182_72 6.000205   83.90929 0.9880824     2969  Cotton         18         2
## 44  C183_76 5.981284   82.44127 0.9878702     2636  Cotton         18         3
## 45  C184_80 5.578566   50.73174 0.9802885     2043  Cotton         18         4
## 46  C185_84 6.064655   87.82732 0.9886140     3113  Cotton         18         5
## 47  SB01_12 6.644864  216.86110 0.9953888     3203 Soybean          0         1
## 48  SB02_15 6.615662  211.32573 0.9952680     3055 Soybean          0         2
## 49  SB03_18 6.693987  230.45439 0.9956607     3595 Soybean          0         3
## 50  SB04_21 6.647502  234.80343 0.9957411     3253 Soybean          0         4
## 51  SB05_24 6.605749  198.57265 0.9949641     3187 Soybean          0         5
## 52  SB06_27 6.640696  215.26494 0.9953546     3190 Soybean          0         6
## 53  SB61_31 6.044229   89.13912 0.9887816     2371 Soybean          6         1
## 54  SB62_34 6.437589  154.21624 0.9935156     3248 Soybean          6         2
## 55  SB63_37 6.194632   83.11681 0.9879687     2976 Soybean          6         3
## 56  SB64_40 6.117393   87.20257 0.9885324     3006 Soybean          6         4
## 57  SB65_43 5.439798   29.48338 0.9660826     2809 Soybean          6         5
## 58  SB66_46 6.195816  108.22394 0.9907599     2680 Soybean          6         6
## 59 SB121_50 4.393341   12.39587 0.9193280     2508 Soybean         12         1
## 60 SB122_53 5.630929   52.97931 0.9811247     2403 Soybean         12         2
## 61 SB123_56 5.579523   48.59842 0.9794232     2752 Soybean         12         3
## 62 SB124_59 5.406651   34.08685 0.9706632     2946 Soybean         12         4
## 63 SB125_62 5.863941   63.33020 0.9842097     3165 Soybean         12         5
## 64 SB126_65 5.738025   57.88780 0.9827252     2705 Soybean         12         6
## 65 SB181_69 5.671024   57.37726 0.9825715     2642 Soybean         18         1
## 66 SB182_73 5.489406   43.16854 0.9768350     2773 Soybean         18         2
## 67 SB183_77 5.713960   60.47882 0.9834653     2454 Soybean         18         3
## 68 SB184_81 5.467076   44.06798 0.9773078     2365 Soybean         18         4
## 69 SB185_85 5.729473   55.95864 0.9821297     2789 Soybean         18         5
## 70 SB186_89 5.556356   54.34527 0.9815991     2050 Soybean         18         6
##    Water_Imbibed PielouIndex
## 1             NA   0.8171431
## 2             NA   0.8232216
## 3             NA   0.8046776
## 4             NA   0.8049774
## 5             NA   0.8192376
## 6             NA   0.8155427
## 7             NA   0.8125582
## 8             NA   0.8053387
## 9             NA   0.8057856
## 10            NA   0.8026420
## 11            NA   0.8134652
```

```
## 12           NA   0.8178151
## 13           NA   0.7825905
## 14           NA   0.8007927
## 15           NA   0.8027732
## 16           NA   0.8012745
## 17           NA   0.8019483
## 18           NA   0.8015438
## 19           NA   0.7934213
## 20           NA   0.7904154
## 21           NA   0.8168340
## 22           NA   0.8016534
## 23           NA   0.7965737
## 24       0.0042   0.8240330
## 25       0.0091   0.8217613
## 26       0.0013   0.8286233
## 27       0.0087   0.8157692
## 28       0.0075   0.8158938
## 29       0.0046   0.8148549
## 30       0.0580   0.8144250
## 31       0.0440   0.7980600
## 32       0.0569   0.7906489
## 33       0.0841   0.8022726
## 34       0.0535   0.8124399
## 35       0.0029   0.8093209
## 36       0.0651   0.7496447
## 37       0.0527   0.7668822
## 38       0.0675   0.7702042
## 39       0.0545   0.7545500
## 40       0.0623   0.7673379
## 41       0.0021   0.7945881
## 42       0.0034   0.7787840
## 43       0.0632   0.7504026
## 44       0.0514   0.7593336
## 45       0.0577   0.7318864
## 46       0.0554   0.7539969
## 47       0.1664   0.8232153
## 48       0.0942   0.8244294
## 49       0.1248   0.8176063
## 50       0.1150   0.8219646
## 51       0.0993   0.8188774
## 52       0.1005   0.8231136
## 53       0.2308   0.7777862
## 54       0.2603   0.7961603
## 55       0.2111   0.7744902
## 56       0.2808   0.7638754
## 57       0.2712   0.6850627
## 58       0.2887   0.7849191
## 59       0.2822   0.5612885
## 60       0.2557   0.7233538
## 61       0.2982   0.7044778
## 62       0.2489   0.6768294
## 63       0.2573   0.7275444
## 64       0.2285   0.7260697
## 65       0.2528   0.7197378
```

```
## 66        0.2706   0.6924349
## 67        0.3196   0.7320451
## 68        0.2437   0.7037462
## 69        0.2461   0.7221929
## 70        0.3010   0.7286456
```

#Question 4: 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.

```
#a. Start with the alpha_even dataframe
#b. Group the data: group the data by Crop and Time_Point.
#c. Summarize the data: Calculate the mean, count, standard deviation, and standard error for the even
#d. Name the resulting dataframe alpha_average

alpha_average <- alpha_even %>%
  group_by(Crop, Time_Point) %>% #group by Crop & Time_Point to later calculate summary stats by group
  summarise(mean.even = mean(PielouIndex), #calculate the mean, stdeviation, and standard error
            n = n(),
            sd.dev = sd(PielouIndex)) %>%
  mutate(std.err = sd.dev/sqrt(n))
alpha_average
```

```
## # A tibble: 12 x 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
```

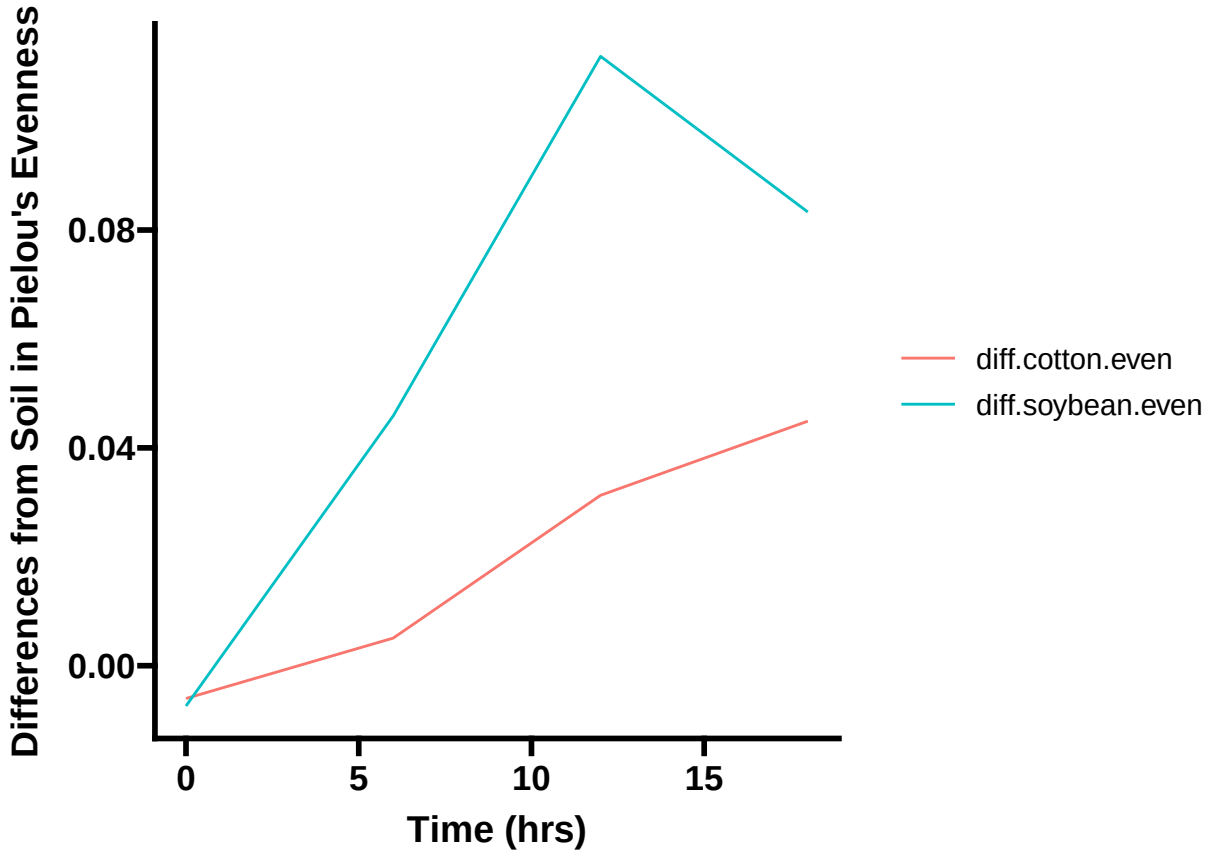
#Question 5: Calculate the difference between the soybean column, the soil column, and the difference between the cotton column and the soil column

```
#a. Start with the alpha_average dataframe
#b. Select relevant columns: select the columns Time_Point, Crop, and mean.even.
#c. Reshape the data: Use the pivot_wider function to transform the data from long to wide format, crea
#d. Calculate differences: Create new columns named diff.cotton.even and diff.soybean.even by calculati
#e. Name the resulting dataframe alpha_average2

alpha_average2 <- alpha_average %>%
  select(Time_Point, Crop, mean.even) %>%
  pivot_wider(names_from = Crop, values_from = mean.even) %>%
  mutate(diff.cotton.even = Soil - Cotton) %>%
  mutate(diff.soybean.even = Soil - Soybean)
alpha_average2
```

```
## # A tibble: 4 x 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: Connecting it to plots

```
#a. Start with the alpha_average2 dataframe
#b. Select relevant columns: select the columns Time_Point, diff.cotton.even, and diff.soybean.even.
#c. Reshape the data: Use the pivot_longer function to transform the data from wide to long format, cre
#d. Create the plot: Use ggplot and geom_line() with 'Time_Point' on the x-axis, the column 'values' on

Plot <- alpha_average2 %>%
  select(Time_Point, diff.cotton.even, diff.soybean.even) %>%
  pivot_longer(c(diff.cotton.even, diff.soybean.even), names_to = "diff") %>%
  ggplot(aes(x = Time_Point, y = value, color = diff)) + # add the ggplot
  geom_line() +
  xlab("Time (hrs)") +
  ylab("Differences from Soil in Pielou's Evenness") +
  theme_prism()
Plot
```



#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