Week12_Assignment

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Assignment

Purpose

The goal of this assignment is to practice writing and using for loops for iteration.

Task

Write R code to successfully answer each question below.

Criteria for Success

- Code is within the provided code chunks or new code chunks are created where necessary
- Code chunks run without errors
- Code chunks have brief comments indicating which code is answering which part of the question
- Code will be assessed as follows:
  - Produces the correct answer using the requested approach: 100%
  - Generally uses the right approach, but a minor mistake results in an incorrect answer: 90%
  - Attempts to solve the problem and makes some progress using the core concept, but returns the wrong answer and does not demonstrate comfort with the core concept: 50%
  - Answer demonstrates a lack of understanding of the core concept: 0%
- Any questions requiring written answers are answered with sufficient detail

Due Date

April 15 at midnight MST

Assignment Exercises

Set Up

Be sure to load the `tidyverse` to use later in the assignment.

```
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.3     v readr     2.1.4
## v forcats   1.0.0     v stringr   1.5.0
## v ggplot2   3.4.4     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.0
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
library(ggplot2)
```

1. For Loop Basics (30 pts)

Complete the following tasks.

I recommend copying the commented code and making changes to the copy. That way, if you have made edits that you haven't kept track of, you have the original code to start over as needed.

a. The code below prints the numbers 1 through 5 one line at a time. Modify it to print each of these numbers multiplied by 3.

```
# 1a
numbers <- c(1, 2, 3, 4, 5)
# for (number in numbers){
#    print(number)
#  }

for (number in numbers){
   print(number * 3)
}
```

```
## [1] 3
## [1] 6
## [1] 9
## [1] 12
## [1] 15
```

b. Write a for loop that loops over the following vector and prints out the mass in kilograms (`mass_kg = 2.2 * mass_lb`)

```
# 1b
mass_lbs <- c(2.2, 3.5, 9.6, 1.2)
for (mass in mass_lbs){
  mass_kg <- 2.2 * mass
  print(mass_kg)
}
```

```
## [1] 4.84
## [1] 7.7
## [1] 21.12
## [1] 2.64
```

c. Complete the code below so that it prints out the name of each bird one line at a time.

```
# 1c
birds = c('robin', 'woodpecker', 'blue jay', 'sparrow')
for (i in 1:length(birds)){
  print(birds[i])
}
```

```
## [1] "robin"
## [1] "woodpecker"
## [1] "blue jay"
## [1] "sparrow"
```

d. Complete the code below so that it stores one area for each radius.

```
# 1d
radius <- c(1.3, 2.1, 3.5)
areas <- vector(mode = "numeric", length = length(radius))
for (i in 1:length(radius)){
  areas[i] <- pi * radius[i] ^ 2
}
areas
```

```
## [1]  5.309292 13.854424 38.484510
```

e. Complete the code below to calculate an area for each pair of `lengths` and `widths`, store the areas in a vector, and after they are all calculated print them out:

```
# 1e
lengths = c(1.1, 2.2, 1.6)
widths = c(3.5, 2.4, 2.8)
areas <- vector(length = length(lengths))
for (i in 1:length(lengths)) {
  areas[i] <- lengths[i] * widths[i]
}
areas
```

```
## [1] 3.85 5.28 4.48
```

2. Size Estimates by Name (30 pts)

This is a followup to "Size Estimates by Name" from last week.

Download the `dinosaur_lengths.csv` file from D2L and place it in the correct directory. Read the file into R.

Write a function `mass_from_length()` that uses the equation `mass <- a * length^b` to estimate the size of a dinosaur from its length. This function should take two arguments, `length` and `species`. For each of the following inputs for `species`, so use the associated `a` and `b` values to estimate the species mass using these equations:

- *Stegosauria*: `mass = 10.95 * length ^ 2.64` (Seebacher 2001).

- *Theropoda*: `mass = 0.73 * length ^ 3.63` (Seebacher 2001).
- *Sauropoda*: `mass = 214.44 * length ^ 1.46` (Seebacher 2001).
- For any other value of `species`: `mass = 25.37 * length ^ 2.49`

```
dinos <- read_csv("../data_raw/dinosaur_lengths.csv")
```

```
## Rows: 500 Columns: 2
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## chr (1): species
## dbl (1): lengths
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
mass_from_length <- function(length, species){
 if(species == "Stegosauria") {
   mass = 10.95 * length ^ 2.64
 } else if (species == "Theropoda") {
   mass = 0.73 * length ^ 3.63
 } else if (species == "Sauropoda") {
   mass = 214.44 * length ^ 1.46
 } else {
   mass = 25.37 * length ^ 2.49
 }
   return(mass)
}
```

a. Use this function and a for loop to calculate the estimated mass for each dinosaur, store the masses in a vector, and after all of the calculations are complete show the first few items in the vector using `head()`.

```
# 2a
masses <- vector(mode = "numeric", length = length(dinos$species))

for (i in 1:length(dinos$species)) {
  masses[i] <- mass_from_length(length = dinos$lengths[i], species = dinos$species[i])
}
head(masses)
```

```
## [1] 24341.68 27017.90 67453.38 22114.19 53884.76 52026.34
```

b. Add the results in the vector back to the original data frame. Show the first few rows of the data frame using `head()`.

```
# 2b
dinos$masses <- masses

head(dinos)
```

```
## # A tibble: 6 x 3
```

```
##   species      lengths masses
##   <chr>          <dbl>  <dbl>
## 1 Stegosauria     18.5 24342.
## 2 Ankylosauria    16.4 27018.
## 3 Ankylosauria    23.7 67453.
## 4 Sauropoda       23.9 22114.
## 5 Ankylosauria    21.7 53885.
## 6 Ankylosauria    21.4 52026.
```

c. Calculate the mean mass for each `species` using `dplyr` (no `for` loops).

```
# 2c
dinos %>%
  group_by(species) %>%
  summarize(avg_mass = mean(masses))
```

```
## # A tibble: 4 x 2
##   species      avg_mass
##   <chr>           <dbl>
## 1 Ankylosauria   46819.
## 2 Sauropoda      16104.
## 3 Stegosauria    31924.
## 4 Theropoda      45572.
```

3. Multi-file Analysis (40 pts)

You have satellite collars on a number of different individuals and want to be able to quickly look at all of their recent movements at once. The data is posted daily to a URL that contains one csv file for each individual: zip file

Start your solution by:

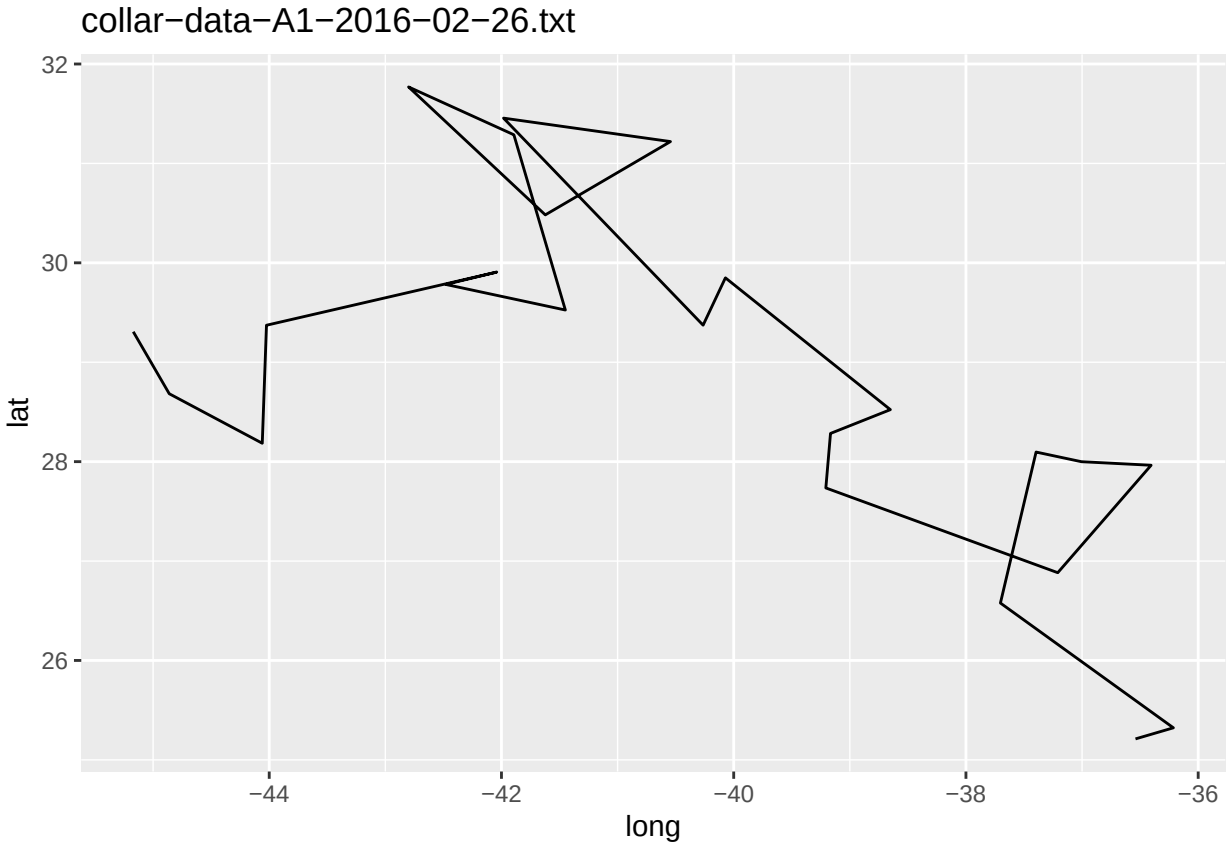
- If `individual_collar_data.zip` is not already in your working directory, download it from the link above and place the zip file in the correct directory.
- Unzip it using `unzip()`
- Obtain a list of all of the files with file names matching the pattern `"collar-data-.*.txt"` (using `list.files()`)

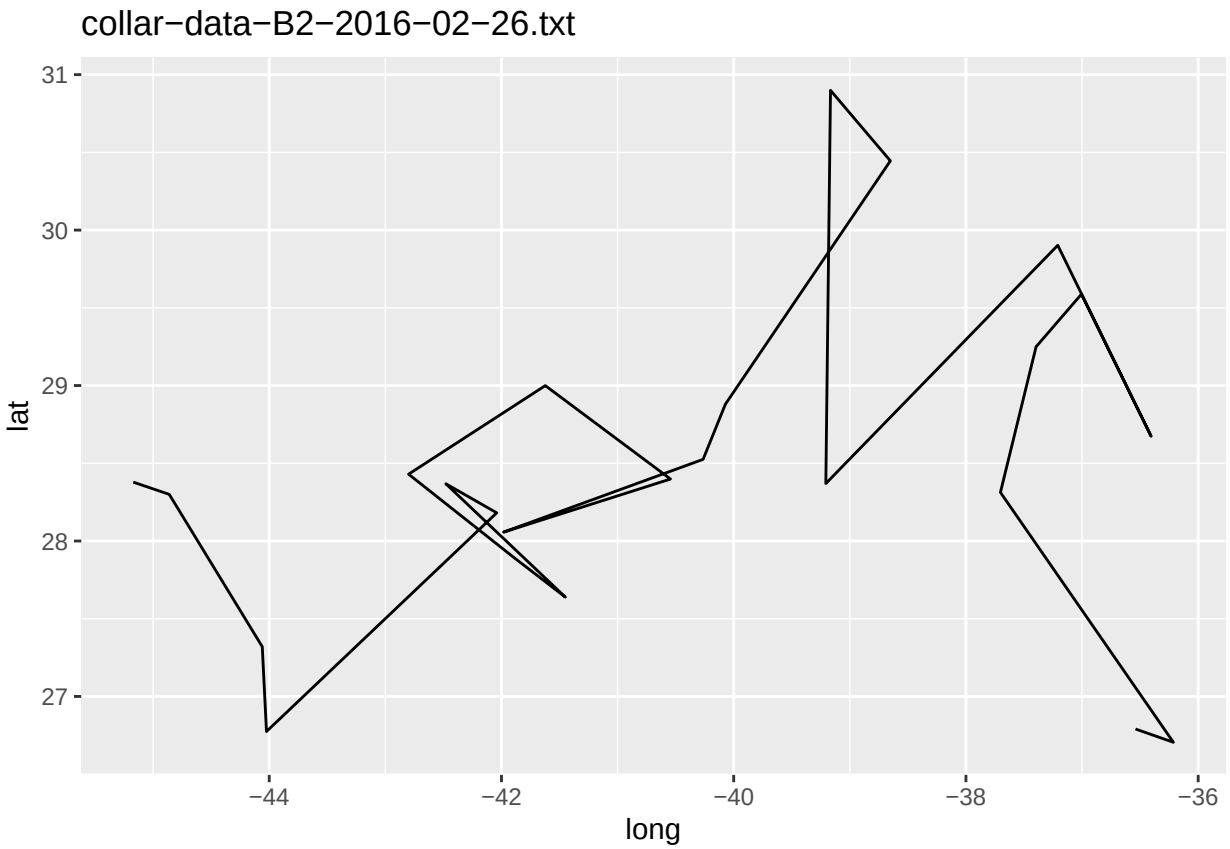
a. Use a loop to load each of these files into R and make a line plot (using `geom_path()`) for each file with `long` on the `x` axis and `lat` on the `y` axis.

```
# 3a
download.file("http://www.datacarpentry.org/semester-biology/data/individual_collar_data.zip",
              "../data_raw/individual_collar_data.zip")

unzip("../data_raw/individual_collar_data.zip", exdir = "../data_raw")

data_files <- list.files(path = "../data_raw",
                         pattern = "collar-data-.*.txt")

data_files
```

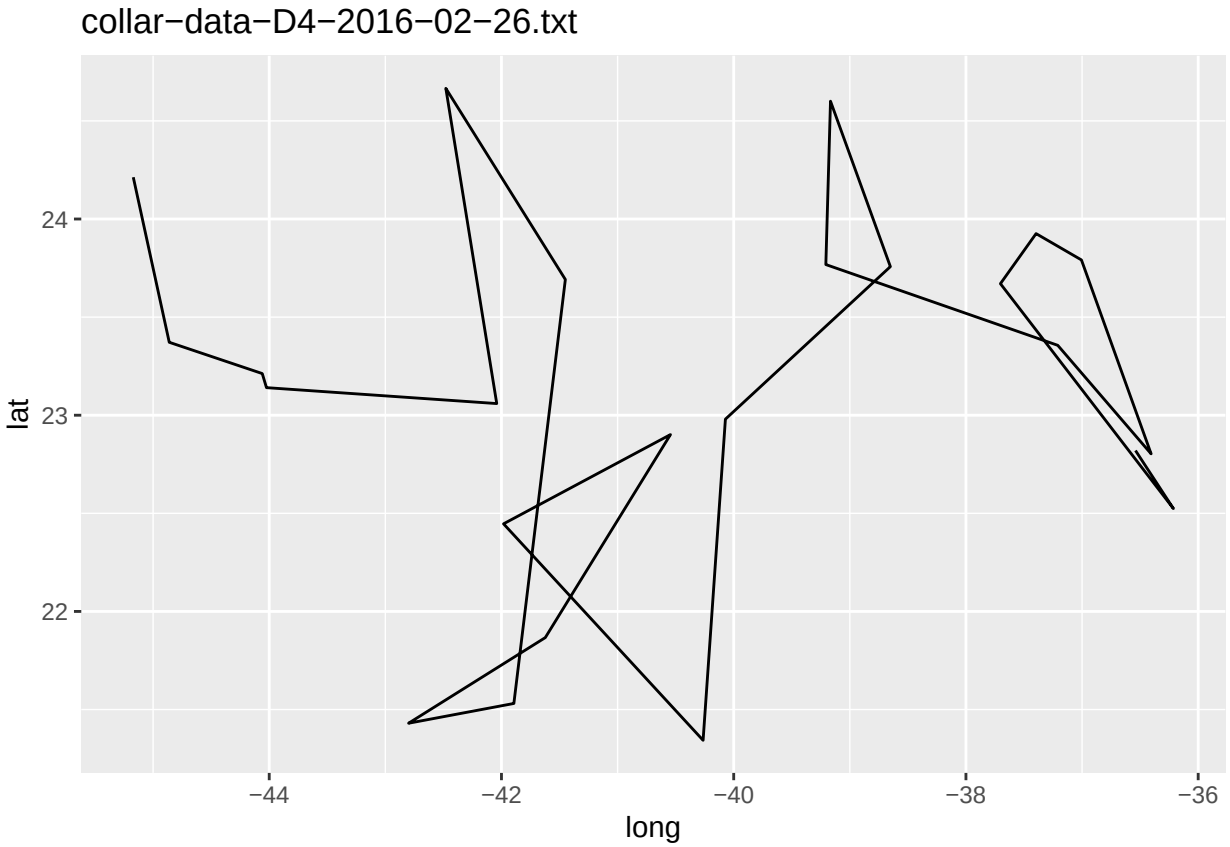
```
##  [1] "collar-data-A1-2016-02-26.txt"  "collar-data-B2-2016-02-26.txt"
##  [3] "collar-data-C3-2016-02-26.txt"  "collar-data-D4-2016-02-26.txt"
##  [5] "collar-data-E5-2016-02-26.txt"  "collar-data-F6-2016-02-26.txt"
##  [7] "collar-data-G7-2016-02-26.txt"  "collar-data-H8-2016-02-26.txt"
##  [9] "collar-data-I9-2016-02-26.txt"  "collar-data-J10-2016-02-26.txt"
```

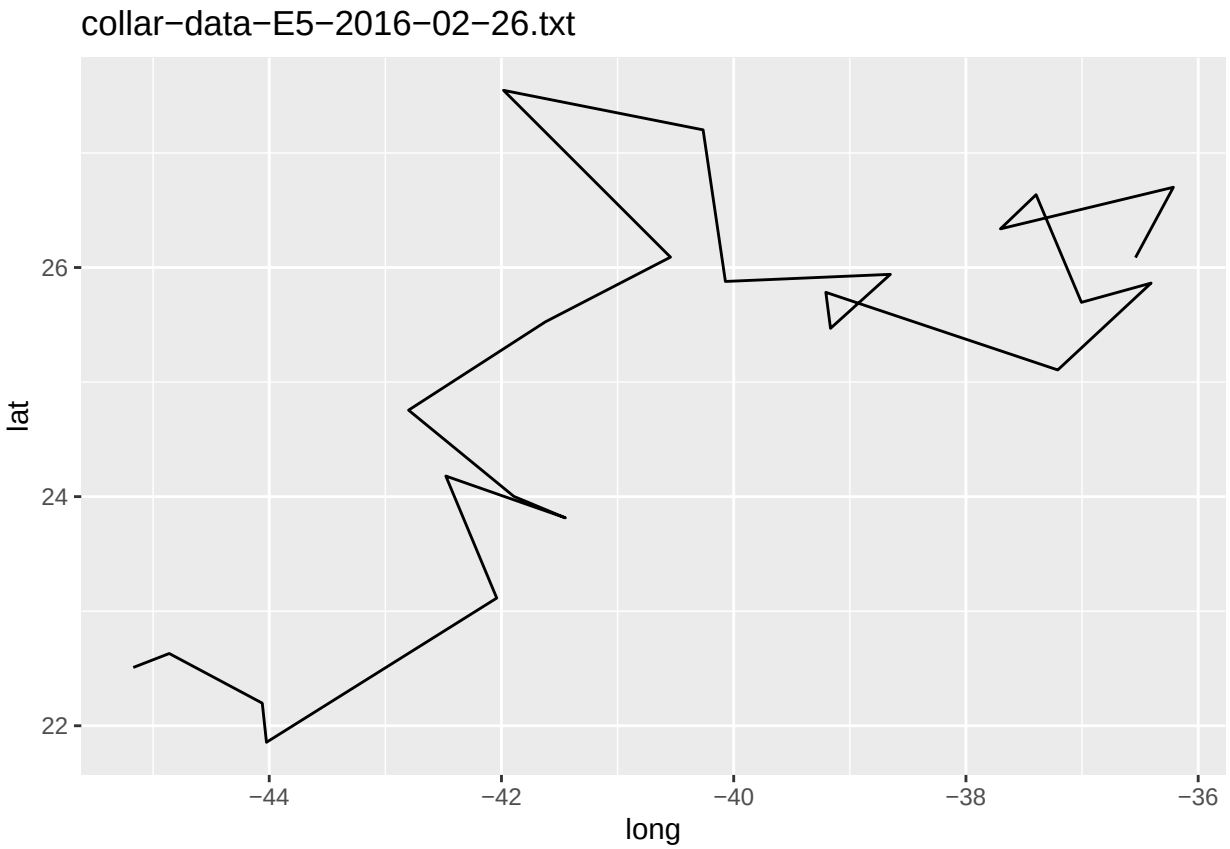
```r
num_files <- length(data_files)

for (i in 1:num_files) {
  # specify the file
  filename <- data_files[i]
  # read in the text file
  data <- read.csv(paste0("../data_raw/", filename))
  # make plot for each file
  plot <- ggplot(data, aes(x = long, y = lat)) +
    geom_path() +
    ggtitle(filename)
  print(plot)
}
```

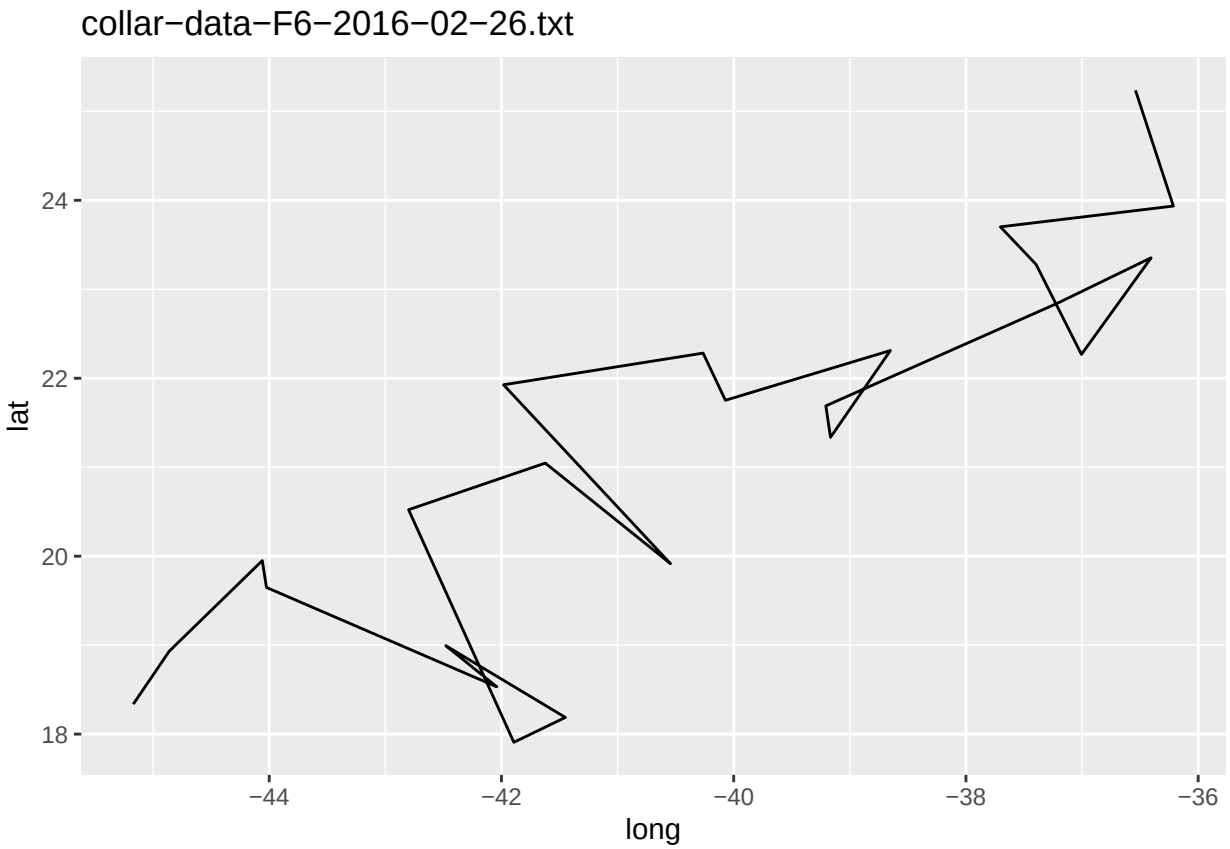



collar−data−B2−2016−02−26.txt
31
30
29
28
27
lat
−44
−42
−40
−38
−36
long

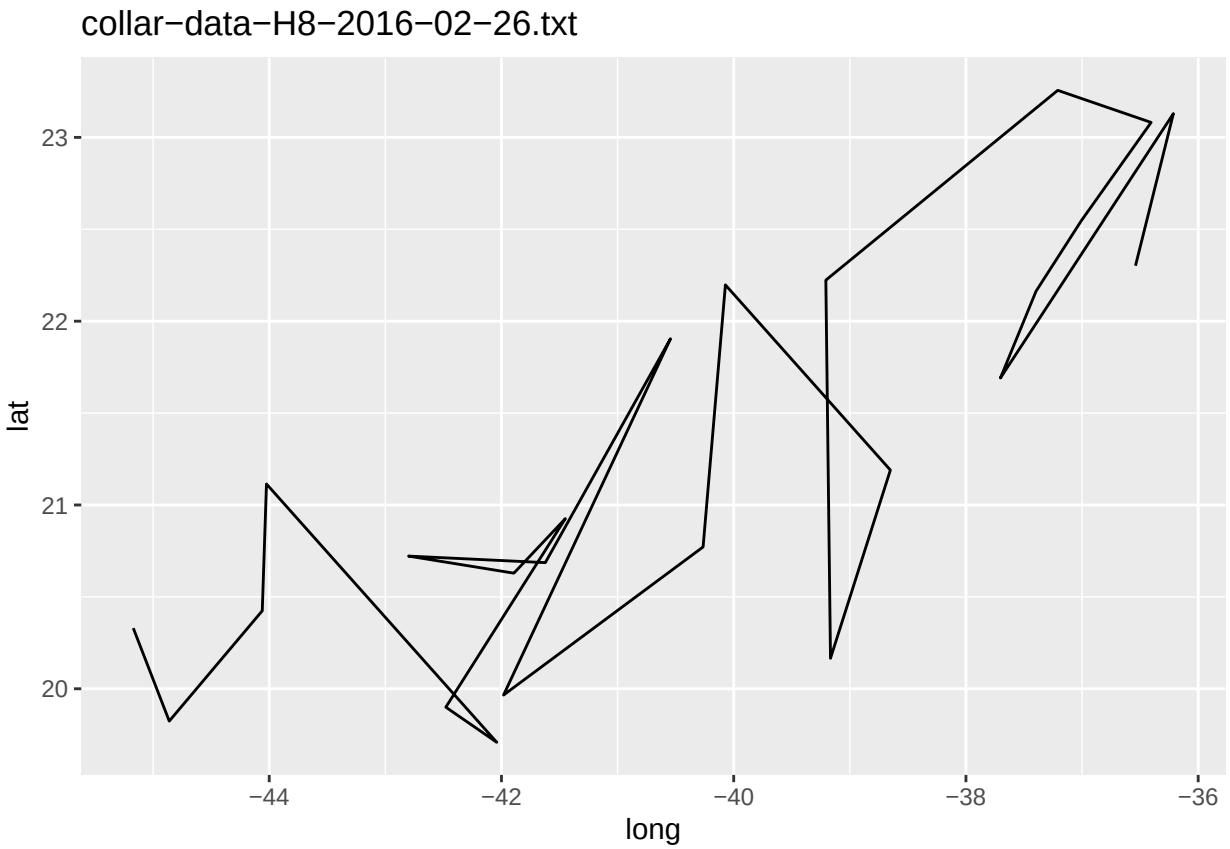

collar−data−C3−2016−02−26.txt
33
32
31
30
29
lat
−44
−42
−40
−38
−36
long


collar−data−D4−2016−02−26.txt
lat
24
23
22
−44
−42
−40
−38
−36
long


collar−data−E5−2016−02−26.txt
lat
26
24
22
−44
−42
−40
−38
−36
long


collar−data−F6−2016−02−26.txt
24
22
20
18
lat
−44
−42
−40
−38
−36
long


collar−data−G7−2016−02−26.txt
lat
31
30
29
28
−44
−42
−40
−38
−36
long


collar−data−H8−2016−02−26.txt
lat
long
23
22
21
20
−44
−42
−40
−38
−36


collar−data−I9−2016−02−26.txt
28.5
28.0
27.5
27.0
26.5
26.0
lat
−44
−42
−40
−38
−36
long

Graphs, like other types of output, won't display inside a loop unless you explicitly display them, so you need put your `ggplot()` command inside a `print()` statement.

Include the name of the file in the graph as the graph title using the `ggtitle()`.

b. Add code to the loop to calculate the minimum and maximum latitude in the file, and store these values, along with the name of the file, in a data frame.

Show the data frame as output.

```
# 3b
results_df <- data.frame(file_name = vector(mode = "character", length = num_files),
                         minimum = vector(mode = "numeric", length = num_files),
                         maximum = vector(mode = "numeric", length = num_files))

for (i in 1:num_files) {
  # specify the file
  filename <- data_files[i]
  # read in the text file
  data <- read.csv(paste0("../data_raw/", filename))
  # specify min and max
  min <- min(data$lat)
  max <- max(data$lat)
  # save in dataframe
  results_df$file_name[i] <- filename
  results_df$minimum[i] <- min
```

```
  results_df$maximum[i] <- max
  # print dataframe
}

results_df
```

```
##                          file_name  minimum  maximum
## 1   collar-data-A1-2016-02-26.txt 25.21080 31.76912
## 2   collar-data-B2-2016-02-26.txt 26.70509 30.89907
## 3   collar-data-C3-2016-02-26.txt 28.86998 33.44421
## 4   collar-data-D4-2016-02-26.txt 21.34315 24.66598
## 5   collar-data-E5-2016-02-26.txt 21.85565 27.54663
## 6   collar-data-F6-2016-02-26.txt 17.90788 25.23623
## 7   collar-data-G7-2016-02-26.txt 27.67120 31.63272
## 8   collar-data-H8-2016-02-26.txt 19.70875 23.25601
## 9   collar-data-I9-2016-02-26.txt 25.70252 28.49172
## 10 collar-data-J10-2016-02-26.txt 24.71200 27.80325
```

Reflection

This reflection is worth 25 points, separate from your Week 12 assignment. Reflections are graded for completion only.

Write about 5 sentences addressing *at least* one of the following questions.

- What has worked well for you in this course for you so far?
- What has been particularly challenging for you so far?
- Is there anything that I can do to help your learning in the course?
- Other reflections about the content of the course that you would like to share.

Answer: I like the assignments. They're just enough for us to get concepts down, but not so much that it feels like busy work. The work we do in class feels very stepwise and works us up to a comfort level with the functions we learn. We get to challenging concepts, but start very small so it's not overwhelming, and we really are able to internalize the different parts of each function, what they mean, and why they're necessary.