coding challenge 6

lihui xiang

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###3. Read in the Cities.csv file from Canvas using a relative file path.

```
cities <- read.csv("Cities.csv")
```

###4. Write a function to calculate the distance between two pairs of coordinates based on the Haversine formula

```
auburn_lat <- 32.6099
auburn_lon <- -85.4808    ### Define Auburn's coordinates

haversine_distance <- function(lat1, lon1, lat2, lon2) {

  rad.lat1 <- lat1 * pi / 180
  rad.lon1 <- lon1 * pi / 180
  rad.lat2 <- lat2 * pi / 180
  rad.lon2 <- lon2 * pi / 180   ## Convert degrees to radians

  delta_lat <- rad.lat2 - rad.lat1
  delta_lon <- rad.lon2 - rad.lon1
  a <- sin(delta_lat / 2)^2 + cos(rad.lat1) * cos(rad.lat2) * sin(delta_lon / 2)^2
  c <- 2 * asin(sqrt(a))     # Haversine formula

  earth_radius <- 6378137     ###Earth's radius in meters

  distance_km <- (earth_radius * c) / 1000    ###Distance in kilometers

  return(distance_km)
}


distances <- c()  ##Initialize an empty vector to store distances


for (i in 1:nrow(cities)) {   ###Loop through each city in the dataset and compute distance
  lat <- cities$lat[i]
  lon <- cities$long[i]

  d <- haversine_distance(32.6099, -85.4808, lat, lon)
  distances <- c(distances, d)
}
```

```r
cities$DistanceFromAuburn <- distances  ## Add distances as a new column to the dataset

for (i in 1:length(distances)) {      ###print the results
  cat("City:", cities$City[i],
      "| State:", cities$State[i],
      "| Distance from Auburn (km):", round(distances[i], 2), "\n")
}
```

```
## City: | State: | Distance from Auburn (km): 1367.12
## City: | State: | Distance from Auburn (km): 3052.68
## City: | State: | Distance from Auburn (km): 1045.55
## City: | State: | Distance from Auburn (km): 916.01
## City: | State: | Distance from Auburn (km): 993.92
## City: | State: | Distance from Auburn (km): 1056.9
## City: | State: | Distance from Auburn (km): 1239.24
## City: | State: | Distance from Auburn (km): 161.87
## City: | State: | Distance from Auburn (km): 1036.26
## City: | State: | Distance from Auburn (km): 1664.97
## City: | State: | Distance from Auburn (km): 2477.11
## City: | State: | Distance from Auburn (km): 1107.94
## City: | State: | Distance from Auburn (km): 3508.56
## City: | State: | Distance from Auburn (km): 3389.16
## City: | State: | Distance from Auburn (km): 2952.24
## City: | State: | Distance from Auburn (km): 1530.44
## City: | State: | Distance from Auburn (km): 590.78
## City: | State: | Distance from Auburn (km): 1362.48
## City: | State: | Distance from Auburn (km): 1910.49
## City: | State: | Distance from Auburn (km): 1379.41
## City: | State: | Distance from Auburn (km): 2961.97
## City: | State: | Distance from Auburn (km): 2753.63
## City: | State: | Distance from Auburn (km): 1091.54
## City: | State: | Distance from Auburn (km): 797.1
## City: | State: | Distance from Auburn (km): 3480.19
## City: | State: | Distance from Auburn (km): 1291.45
## City: | State: | Distance from Auburn (km): 3302.77
## City: | State: | Distance from Auburn (km): 1192.57
## City: | State: | Distance from Auburn (km): 607.71
## City: | State: | Distance from Auburn (km): 2503.97
## City: | State: | Distance from Auburn (km): 3338.07
## City: | State: | Distance from Auburn (km): 800.08
## City: | State: | Distance from Auburn (km): 1000.55
## City: | State: | Distance from Auburn (km): 732.35
## City: | State: | Distance from Auburn (km): 1370.44
## City: | State: | Distance from Auburn (km): 1092.44
## City: | State: | Distance from Auburn (km): 1042.87
## City: | State: | Distance from Auburn (km): 850.99
## City: | State: | Distance from Auburn (km): 1381.65
## City: | State: | Distance from Auburn (km): 0.9
```

###5. Subset/filter the Cities.csv data to include only the latitude and longitude values you need and input as input to your function.

```r
nyc <- subset(cities, city == "New York" & state_name == "New York")  ##a data frame nyc with one row fo
nyc_lat <- nyc$lat
nyc_lon <- nyc$long  ##Extract NYC's coordinates
distance_to_nyc <- haversine_distance(auburn_lat, auburn_lon, nyc_lat, nyc_lon) ##Use function to compu
cat("Distance from Auburn, AL to New York City:", round(distance_to_nyc, 2), "km\n")  ##Print the resul
```

```
## Distance from Auburn, AL to New York City: 1367.12 km
```

###6. use your function within a for loop to calculate the distance between all other cities in the data.

```r
distances <- c()  ##Initialize empty vector to store distances


for (i in 1:nrow(cities)) {
  city_lat <- cities$lat[i]
  city_lon <- cities$long[i]      ##Loop through each city and compute distance

  d <- haversine_distance(auburn_lat, auburn_lon, city_lat, city_lon)
  distances <- c(distances, d)
}


for (i in 1:length(distances)) {
  print(distances[i])     ### Print the results
}
```

```
## [1] 1367.124
## [1] 3052.68
## [1] 1045.546
## [1] 916.0076
## [1] 993.9233
## [1] 1056.901
## [1] 1239.245
## [1] 161.8653
## [1] 1036.265
## [1] 1664.97
## [1] 2477.11
## [1] 1107.939
## [1] 3508.563
## [1] 3389.155
## [1] 2952.24
## [1] 1530.437
## [1] 590.7823
## [1] 1362.476
## [1] 1910.493
## [1] 1379.408
## [1] 2961.965
## [1] 2753.629
## [1] 1091.54
## [1] 797.1033
## [1] 3480.187
## [1] 1291.448
```

```
## [1] 3302.769
## [1] 1192.566
## [1] 607.7077
## [1] 2503.972
## [1] 3338.075
## [1] 800.0751
## [1] 1000.553
## [1] 732.3549
## [1] 1370.437
## [1] 1092.443
## [1] 1042.873
## [1] 850.9892
## [1] 1381.647
## [1] 0.9007905
```

##7.Commit and push a gfm .md file to GitHub inside a directory called Coding Challenge 6. Provide me a link to your github written as a clickable link in your .pdf or .docx

Challenge 6 Folder link