# Dayton's Weather in 2014

Rabin Paudel

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```
library(dplyr)
```

**Temp trend in Dayton, OH. This data for this graphic is available as a white-space separated file. We first read the data and rename the columns.**

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.3.1 --

## v ggplot2 3.3.5     v purrr   0.3.4
## v tibble  3.1.6     v stringr 1.4.0
## v tidyr   1.1.4     v forcats 0.5.1
## v readr   2.1.0

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

```
library(ggplot2)
DAY <- read_table("https://bit.ly/2NGLI7N", col_names = FALSE)
```

```
##
## -- Column specification --------------------------------------------------------
## cols(
##   X1 = col_double(),
##   X2 = col_double(),
##   X3 = col_double(),
##   X4 = col_double()
## )
```

```
## Warning: 4 parsing failures.
##  row col  expected    actual                     file
## 4623  -- 4 columns 5 columns 'https://bit.ly/2NGLI7N'
## 4979  -- 4 columns 5 columns 'https://bit.ly/2NGLI7N'
## 5016  -- 4 columns 5 columns 'https://bit.ly/2NGLI7N'
## 5213  -- 4 columns 5 columns 'https://bit.ly/2NGLI7N'
```

```
names(DAY) <- c("Month", "Day", "Year", "Temp")
DAY <- select(DAY, "Year", "Month", "Day", "Temp")
DAY
```

```
## # A tibble: 9,265 x 4
##     Year Month   Day  Temp
##    <dbl> <dbl> <dbl> <dbl>
##  1  1995     1     1  39
##  2  1995     1     2  19.6
##  3  1995     1     3  20.6
##  4  1995     1     4  11.3
##  5  1995     1     5   6.8
##  6  1995     1     6  23
##  7  1995     1     7  28.2
##  8  1995     1     8  24.7
##  9  1995     1     9  25
## 10  1995     1    10  23.6
## # ... with 9,255 more rows
```

```
NEWDAY <- DAY %>%
  group_by(Year) %>%
  mutate(newDay = seq(1, length(Day))) %>%
  ungroup()

Past <- NEWDAY %>%
  filter(Temp != -99 & Year != 2014) %>% #-99 is missing
  group_by(newDay) %>%
  mutate(upper = max(Temp), #identify max value for each day
         lower = min(Temp), # identify min value for each day
         avg = mean(Temp), # calculate mean value for each day
         se = sd(Temp)/sqrt(length(Temp)),#standard error
         avg_upper = avg+(2.101*se), # 99% "confidence" interval
         avg_lower = avg-(2.101*se)) %>% ungroup()
Past
```

**We then create a data frame of the historical data from 1995 to 2013. Output newDay goes 1 to 365/366 each year.**

```
## # A tibble: 8,884 x 11
##     Year Month   Day  Temp newDay upper lower   avg    se avg_upper avg_lower
##    <dbl> <dbl> <dbl> <dbl>  <int> <dbl> <dbl> <dbl> <dbl>     <dbl>     <dbl>
##  1  1995     1     1  39         1  50.8  -0.3  31.4  2.39      36.5      26.4
##  2  1995     1     2  19.6       2  54.1  -3.6  30.8  2.88      36.9      24.8
```

```
##  3  1995     1     3  20.6      3  56.8   8.8  31.9  3.19      38.6      25.2
##  4  1995     1     4  11.3      4  59.2   7.1  31.6  2.79      37.5      25.7
##  5  1995     1     5   6.8      5  56.5   0    28.1  2.84      34.1      22.2
##  6  1995     1     6  23        6  56.3   2.4  28.8  2.58      34.2      23.4
##  7  1995     1     7  28.2      7  59.2   4.6  28.3  2.65      33.8      22.7
##  8  1995     1     8  24.7      8  59.1   0.8  28.6  2.66      34.2      23.0
##  9  1995     1     9  25        9  48.6  14.8  30.2  2.06      34.6      25.9
## 10  1995     1    10  23.6     10  52.6   6.2  30.0  2.33      34.9      25.1
## # ... with 8,874 more rows
```

```
filter(Past, newDay == 1)
```

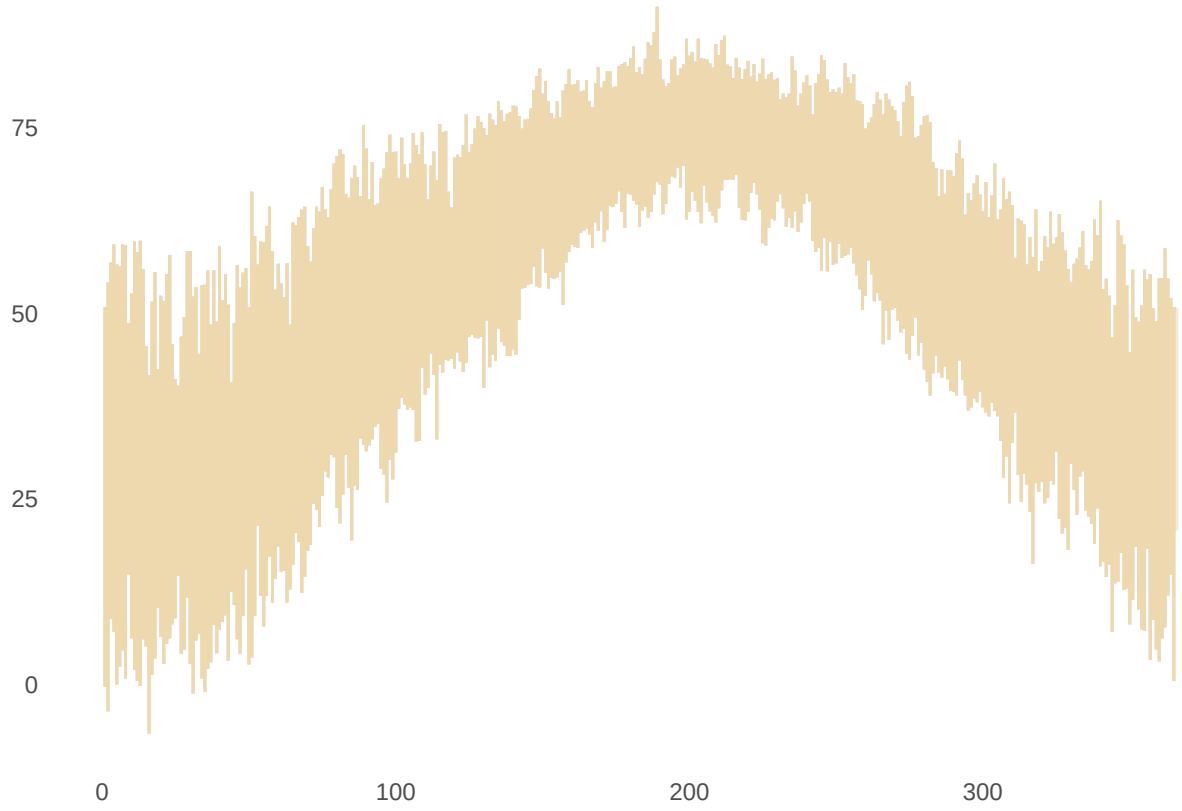
```
## # A tibble: 25 x 11
##     Year Month   Day  Temp newDay upper lower   avg    se avg_upper avg_lower
##    <dbl> <dbl> <dbl> <dbl>  <int> <dbl> <dbl> <dbl> <dbl>     <dbl>     <dbl>
##  1  1995     1     1  39         1  50.8  -0.3  31.4  2.39      36.5      26.4
##  2  1996     1     1  34.5       1  50.8  -0.3  31.4  2.39      36.5      26.4
##  3  1997     1     1  38.9       1  50.8  -0.3  31.4  2.39      36.5      26.4
##  4  1998     1     1  20.3       1  50.8  -0.3  31.4  2.39      36.5      26.4
##  5  1999     1     1  10         1  50.8  -0.3  31.4  2.39      36.5      26.4
##  6  2000     1     1  39.3       1  50.8  -0.3  31.4  2.39      36.5      26.4
##  7  2001     1     1  23.2       1  50.8  -0.3  31.4  2.39      36.5      26.4
##  8  2002     1     1  16.2       1  50.8  -0.3  31.4  2.39      36.5      26.4
##  9  2003     1     1  34.9       1  50.8  -0.3  31.4  2.39      36.5      26.4
## 10  2004     1     1  37.1       1  50.8  -0.3  31.4  2.39      36.5      26.4
## # ... with 15 more rows
```

```
Present <- NEWDAY %>%
  filter(Temp != -99 & Year == 2014)
# Create dataframe that represents the lowest and highest
# temp for each day for the historical data from 1995 to 2013.

PastRecords <- Past %>%
  group_by(newDay) %>%
  summarise(Pastlow = min(Temp),
            Pasthigh = max(Temp))
## create dataframe that identifies the days in 2014 in which temps
## were either lower or higher than all previous 19 years.

PresentRecords <- Present %>%
  left_join(PastRecords, by = "newDay") %>%
  mutate(recordlow = ifelse(Temp < Pastlow, "Y", "N"),
         recordhigh = ifelse(Temp > Pasthigh, "Y", "N")) %>%
  filter(recordlow == "Y" | recordhigh == "Y")
```

```
p <- ggplot(Past, mapping = aes(newDay, Temp)) +
  theme(plot.background = element_blank(),
        panel.grid.minor = element_blank(),
        panel.grid.major = element_blank(),
```

```
        panel.border = element_blank(),
        panel.background = element_blank(),
        axis.ticks = element_blank(), axis.title = element_blank())+
  geom_linerange(Past,
                 mapping = aes(x = newDay, ymin = lower, ymax = upper),
                 colour = "wheat2", alpha = .1)
p
```

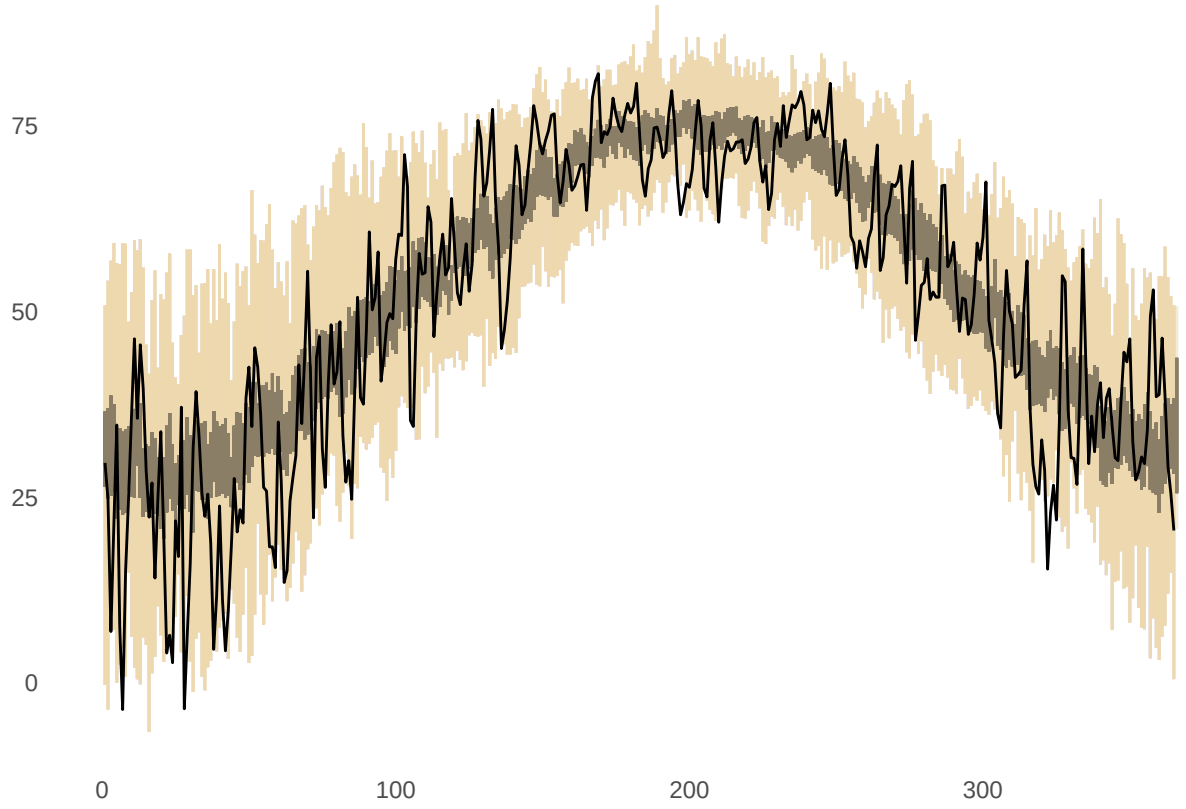
**We next extract data for the Year 2014. We then create data frames representing the lowest and highest temp for each day of the year for the historical data.**




**We first plot the historical data.**

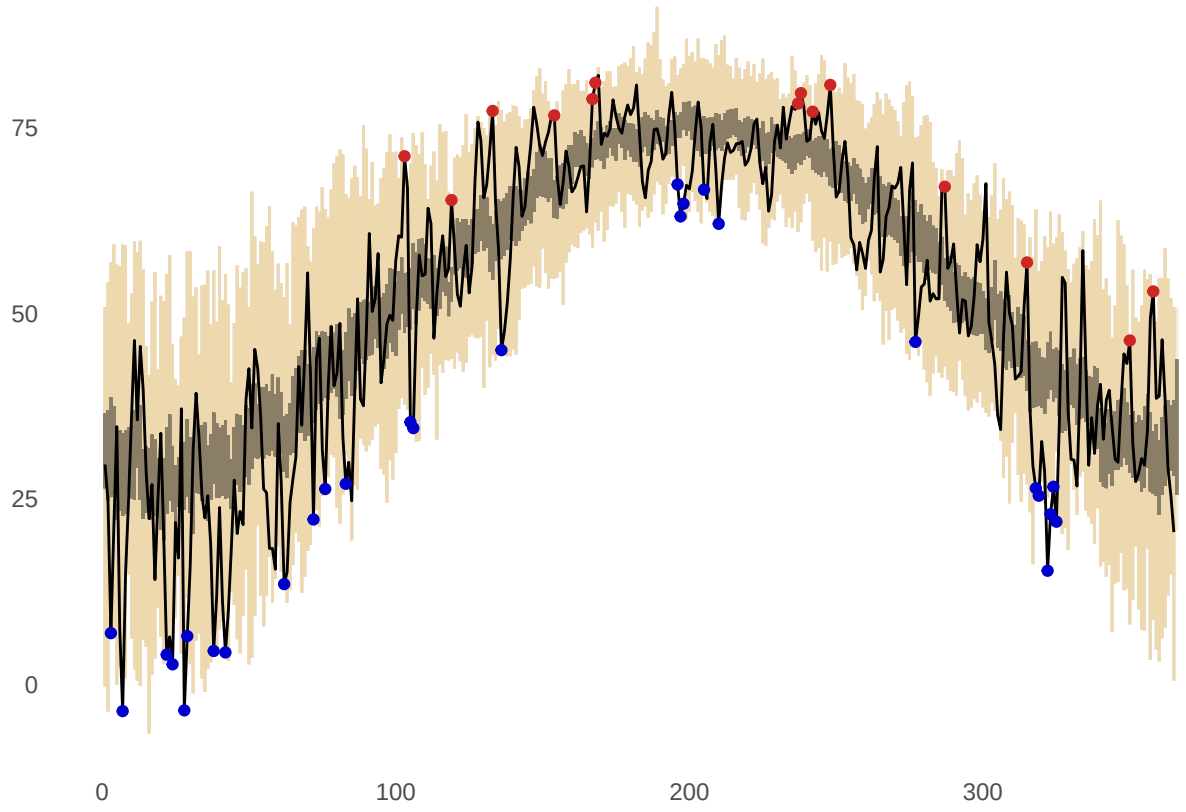
```
p <- p + geom_linerange(Past, mapping = aes(x = newDay, ymin = avg_lower, ymax = avg_upper),
                        colour = "wheat4")
p <- p + geom_line(Present, mapping = aes(x = newDay, y = Temp))
p
```

**We next plot the temp. for 2014 along with the avearge temp. based on historical data.**



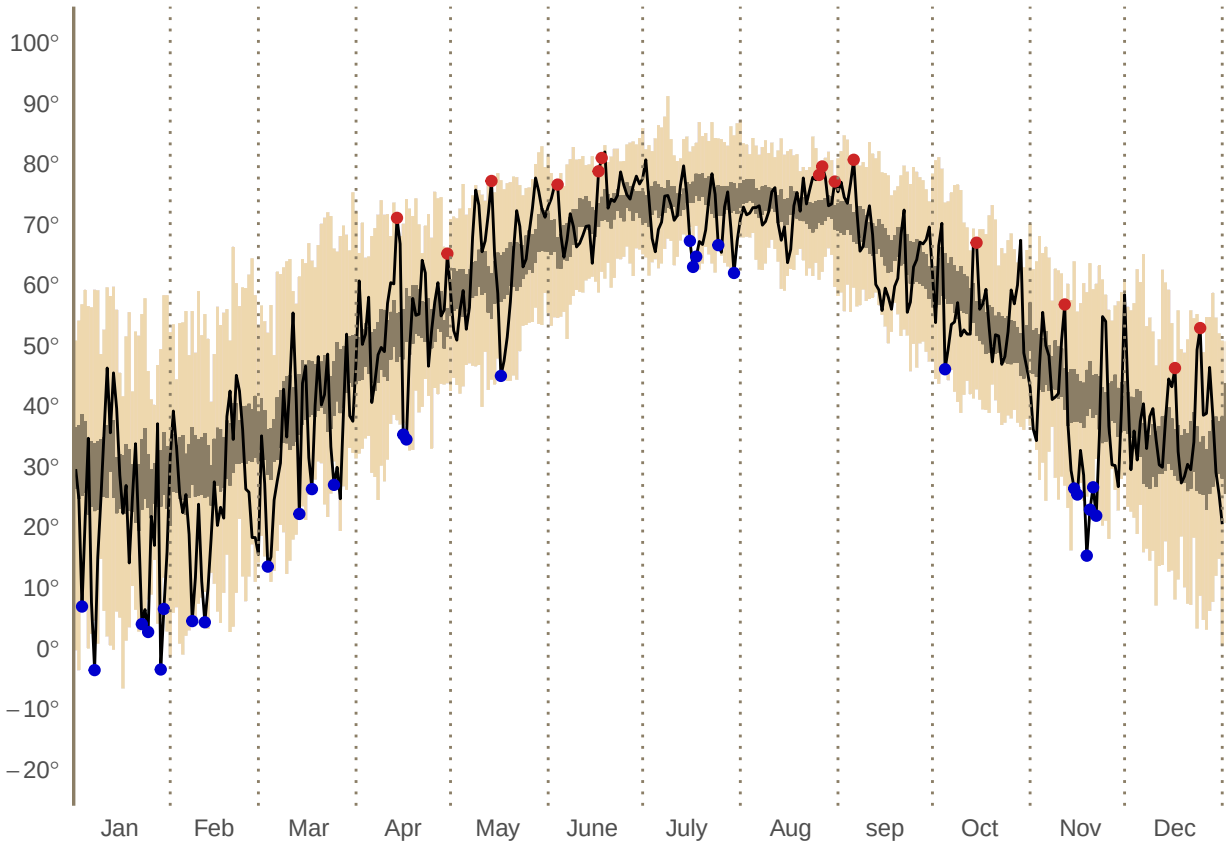

**We then plot the dates (in 2014) for which the temperature break either the lowest or the highest record.**

```
p <- p + geom_point(data = filter(PresentRecords, recordlow == "Y"), aes(x = newDay, y = Temp), colour =
  geom_point(data = filter(PresentRecords, recordhigh == "Y"),
             aes(x = newDay, y = Temp), colour = "firebrick3")
p
```




**We then setup the axis and labels.**

```
p <- p + geom_vline(xintercept = 0, colour = "wheat4", linetype = 1, size = 1)
xseq <- c(31,59,90,120,151,181,212,243,273,304,334,365)
for(x in xseq){
  p <- p + geom_vline(xintercept = x, colour = "wheat4",
                      linetype = 3, size = .5)
}
dgr_fmt <- function(x, ...){
  parse(text = paste(x, "*degree", sep = ""))
}
# create y-axis variable
a <- dgr_fmt(seq(-20,100, by = 10))

p <- p + coord_cartesian(ylim = c(-20,100))+
  scale_y_continuous(breaks = seq(-20,100, by =10), labels = a)+
  scale_x_continuous(expand = c(0,0),
                     breaks = c(15,45,75,105,135,165,195,
                                228,258,288,320,350),
                     labels = c("Jan", "Feb", "Mar", "Apr",
                                "May", "June", "July", "Aug", "sep", "Oct", "Nov", "Dec"))
p
```




**Final output is obtained by adding annotate commands for the annotations**

```
p <- p + ggtitle("Dayton's weather in 2014") +
  theme(plot.title = element_text(face = "bold", hjust = 0.012, vjust = 0.8, colour = "#3C3C3C", size =
  annotate("text", x = 119, y = 98, label = "Temperature", size = 4, fortface = "bold")
```

```
## Warning: Ignoring unknown parameters: fortface
```

```
p <- p + annotate("text", x = 126, y = 93,
                  label = paste("Data represents average daily",
                                "temperatures. Accessible data dates",
                                "back to"),
                  size = 3, colour = "gray30") +
  annotate("text", x = 122, y = 89,
           label = paste("January 1, 1995. Data for 2014 is",
                         "only available through December 16."),
           size = 3, colour = "gray30") +
  annotate("text", x = 124, y = 85,
           label = paste("Average temperature for the year was",
                         "51.9 degree making 2014 the 9th coldest"),
           size = 3, colour = "gray30")+
  annotate("text", x = 128, y = 81, label = "year since 1995",
           size = 3, colour = "gray30")
```

```
p <- p +
  annotate("segment", x = 30, xend = 40, y = -5,
           yend = -10, colour = "blue3") +
  annotate("text", x = 65, y = -10,
           label = "We had 35 days that were the",
           size = 3, colour = "blue3") +
  annotate("text", x = 56, y = -14,
           label = "coldest since 1995",
           size = 3, colour = "blue3") +
  annotate("segment", x = 302, xend = 307, y = 74,
           yend = 82, colour = "firebrick3") +
  annotate("text", x = 333, y = 92,
           label = "we had 19 days that were the",
           size = 3, colour = "firebrick3") +
  annotate("text", x = 324, y = 88,
           label = "hottest since 1995",
           size = 3, colour = "firebrick3")
p
```