Northern Hemisphere

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Read the data from my folder

```
NHtemp <- read_csv("~/OneDrive/GitHub/NASADatanauts/data/NHtemp.csv",
                   na = "empty", comment = "*")
```

```
## Parsed with column specification:
## cols(
##   Year = col_integer(),
##   Jan = col_double(),
##   Feb = col_double(),
##   Mar = col_double(),
##   Apr = col_double(),
##   May = col_double(),
##   Jun = col_double(),
##   Jul = col_double(),
##   Aug = col_double(),
##   Sep = col_double(),
##   Oct = col_double(),
##   Nov = col_double(),
##   Dec = col_double(),
##   `J-D` = col_double(),
##   `D-N` = col_double(),
##   DJF = col_double(),
##   MAM = col_double(),
##   JJA = col_double(),
##   SON = col_double()
## )
```

```
## Warning in rbind(names(probs), probs_f): number of columns of result is not
## a multiple of vector length (arg 1)
```

```
## Warning: 2 parsing failures.
## row # A tibble: 2 x 5 col     row   col   expected    actual expected   <int> <chr>      <chr>
```

Pull out the monthly data for each year. Removing 2017 since it has missing data. Tidy the data, gather the months and mean temperatures into columns. Arrange the data by year, ascending. The month means for 1880 - 2016

```
NHyearlyTemp <- NHtemp %>%
    select(Year:Dec) %>%
    filter(Year != 2017) %>%
    gather(Months, MeanTemp, -Year) %>%
    arrange(Year)
```

The summer month means for 1880 - 2016

```
NHsummerTemp <- NHtemp %>%
    select(Year, Jun:Aug) %>%
```

```
    filter(Year != 2017) %>%
    gather(Months, MeanTemp, -Year) %>%
    arrange(Year)
```

Adding a column for the Year groups. This will be used as the frame parameter for the animation, shown below.

```
NHsummerTemp <- data.table(NHsummerTemp)
NHsummerTemp[, Group := ifelse(Year %in% c(1951:1980), "1951-1980",
                        ifelse(Year %in% c(1983:1993), "1983-1993",
                        ifelse(Year %in% c(1994:2004), "1994-2004",
                        ifelse(Year %in% c(2005:2015), "2005-2015", "1880-1950"))))]
```

The base period is 1951 - 1980. Let's pull that out to create the base plot. Just to show you what the yearly and summer month means loook like.

```
ggplot(data = filter(NHsummerTemp, between(Year, 1951, 1980)), mapping = aes(MeanTemp)) +
    geom_histogram(binwidth = 0.04, fill = "light gray", color = "black") +
    xlim(-1, 1) +
    ggtitle("Summer Month Mean For 1951 - 1980")
```
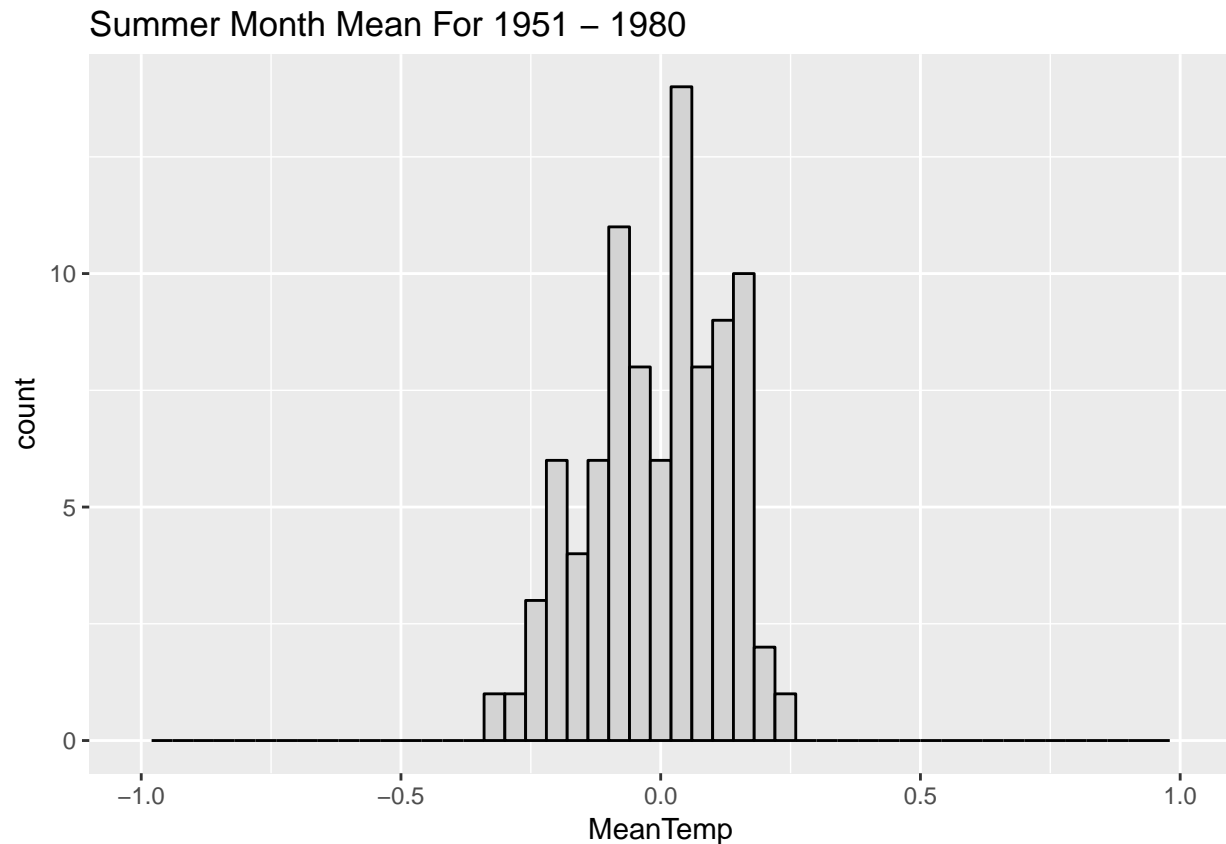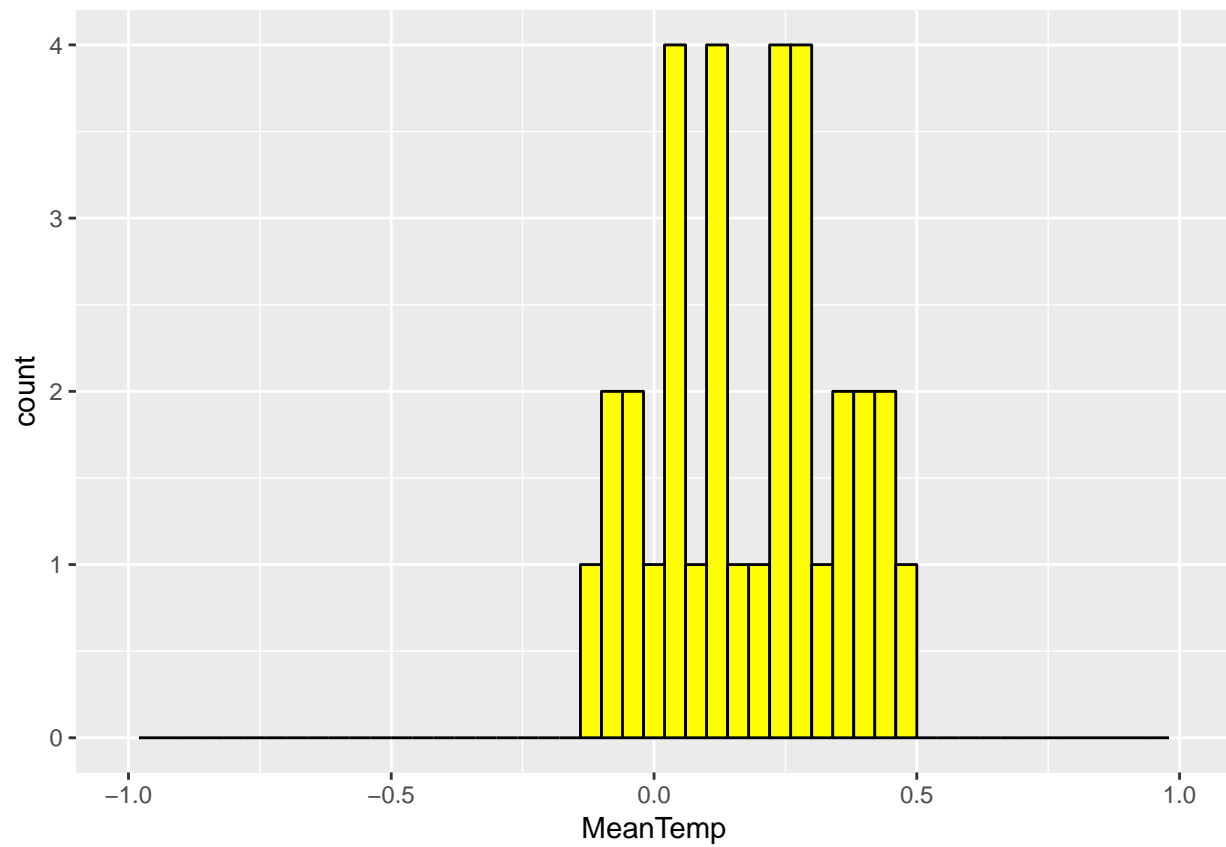


```
ggplot(data = filter(NHyearlyTemp, between(Year, 1951, 1980)), mapping = aes(MeanTemp)) +
    geom_histogram(binwidth = 0.04, fill = "light gray", color = "black") +
    xlim(-1, 1) +
    ggtitle("Yearly Month Mean For 1951 - 1980")
```

Yearly Month Mean For 1951 – 1980
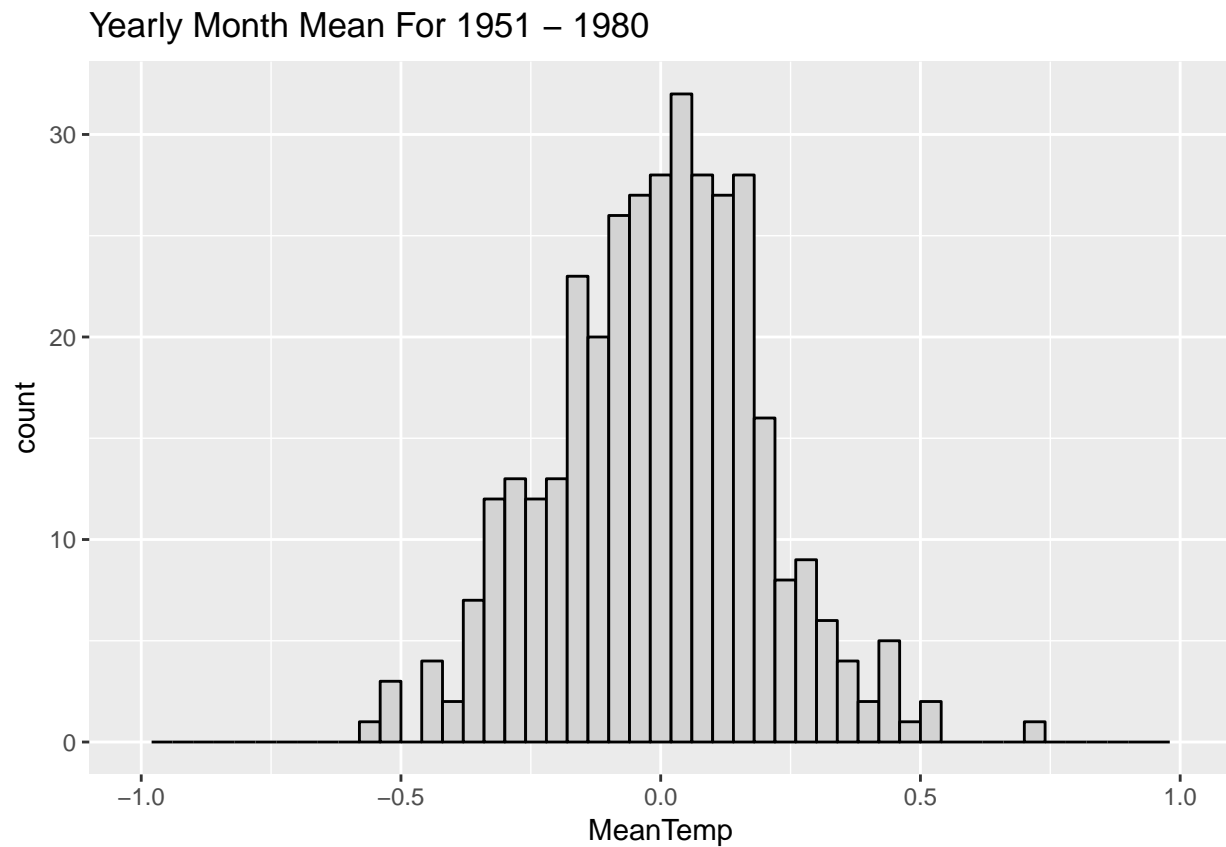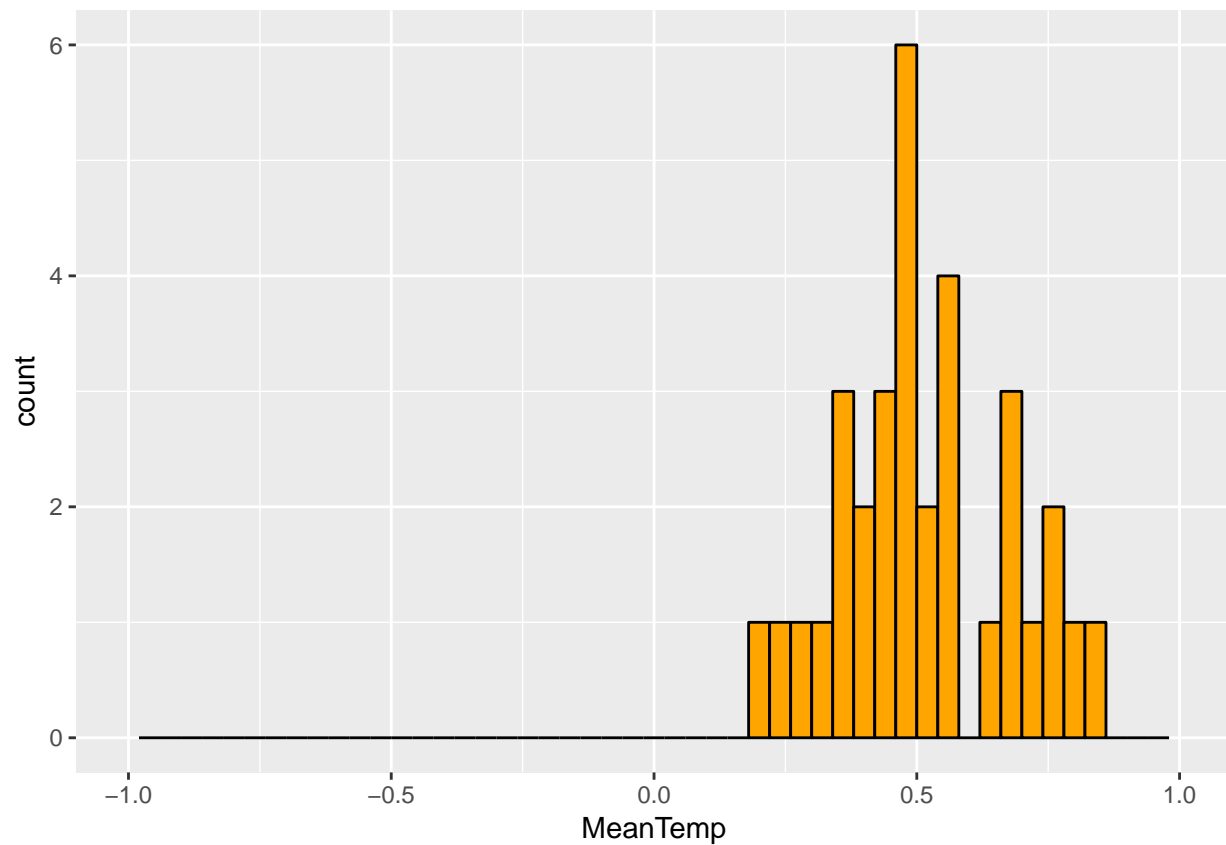

Stand Alone plots

For period is 1983 - 1993.

```
ggplot(data = filter(NHsummerTemp, between(Year, 1983, 1993)), mapping = aes(MeanTemp))  +
    geom_histogram(binwidth = 0.04, fill = "yellow", color = "black") +
    xlim(-1, 1)
```

The period is 1994 - 2004.

```
ggplot(data = filter(NHsummerTemp, between(Year, 1994, 2004)), mapping = aes(MeanTemp)) +
    geom_histogram(binwidth = 0.04, fill = "orange", color = "black") +
    xlim(-1, 1)
```

The period is 2005 - 2015.

```
ggplot(data = filter(NHsummerTemp, between(Year, 2005, 2015)), mapping = aes(MeanTemp)) +
    geom_histogram(binwidth = 0.04, fill = "red", color = "black") +
    xlim(-1, 1)
```

Warning: Removed 1 rows containing non-finite values (stat_bin).
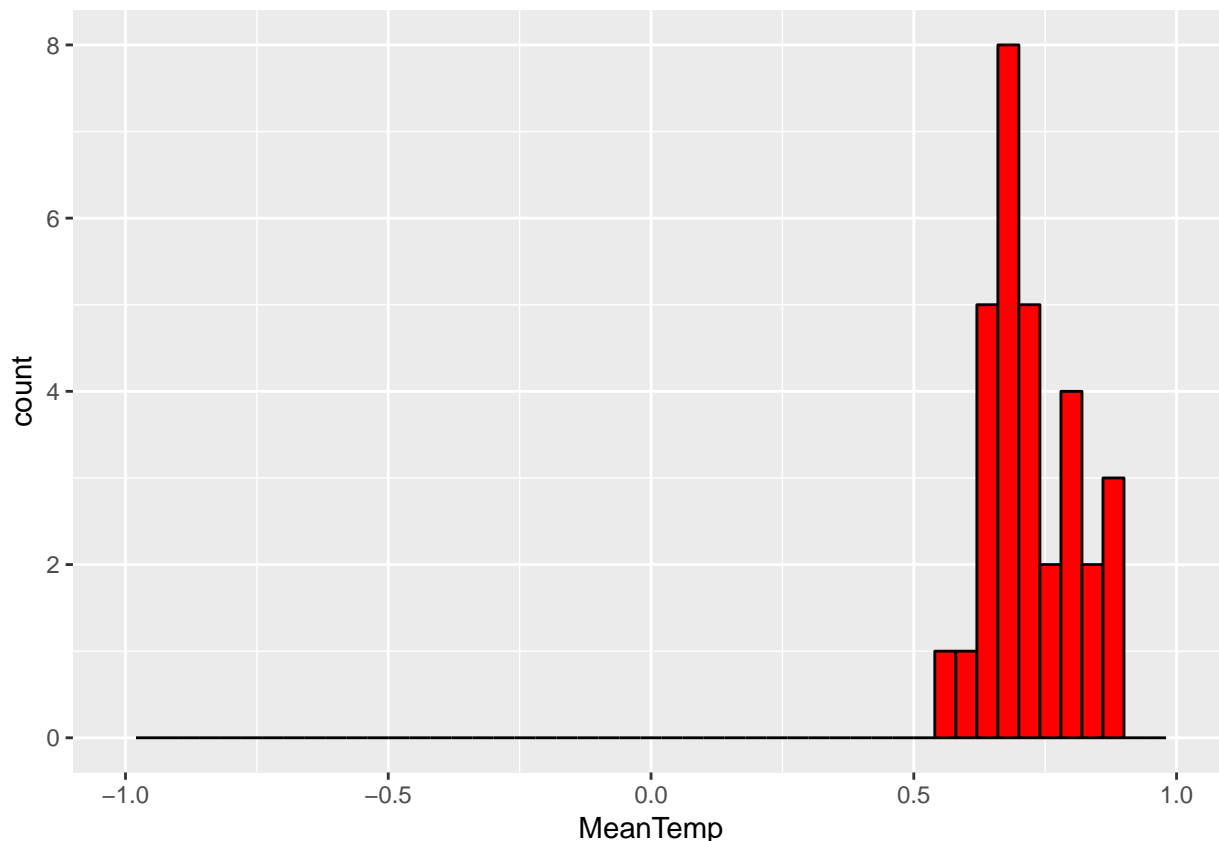
I wanted to see the table of means for the years. I do not use it anywhere else

```
x <- filter(NHsummerTemp, between(Year, 1951, 1980))
table(x$MeanTemp)
```

```
##
##  -0.3 -0.26 -0.24 -0.22 -0.21  -0.2 -0.19 -0.18 -0.17 -0.14 -0.13 -0.12
##     1     1     1     2     1     2     2     1     1     3     2     2
## -0.11  -0.1 -0.09 -0.08 -0.07 -0.06 -0.05 -0.04 -0.03 -0.02     0  0.01
##     1     1     3     2     4     2     2     4     1     1     2     2
##  0.02  0.03  0.04  0.05  0.06  0.07  0.08  0.09   0.1  0.11  0.12  0.13
##     2     3     2     4     5     4     1     2     1     2     3     2
##  0.14  0.16  0.17  0.18   0.2  0.21  0.23
##     2     4     2     4     1     1     1
```

`theme_set()` Sets the theme for ggplot for the entire session. You can also set the theme at the geom_

This plots all the histograms on one canvass. `ggplot()` creates a canvas. You can add data and aesthetics (`aes`) here or set them in the geometric, i.e., `geom_histogram`.

```
theme_set(theme_bw())
ggplot()  +
    geom_histogram(data = filter(NHsummerTemp, between(Year, 1951, 1980)), mapping = aes(MeanTemp),
                   binwidth = 0.04, fill = "light gray", color = "black", alpha = .2) +
    geom_histogram(data = filter(NHsummerTemp, between(Year, 1983, 1993)), mapping = aes(MeanTemp),
                   binwidth = 0.04, fill = "yellow", color = "black", alpha = .5) +
    geom_histogram(data = filter(NHsummerTemp, between(Year, 1994, 2004)), mapping = aes(MeanTemp),
                   binwidth = 0.04, fill = "orange", color = "black", alpha = .7) +
    geom_histogram(data = filter(NHsummerTemp, between(Year, 2005, 2015)), mapping = aes(MeanTemp),
```

```
                binwidth = 0.04, fill = "red", color = "black", alpha = .9) +
    xlim(-1, 1)
```

Warning: Removed 1 rows containing non-finite values (stat_bin).
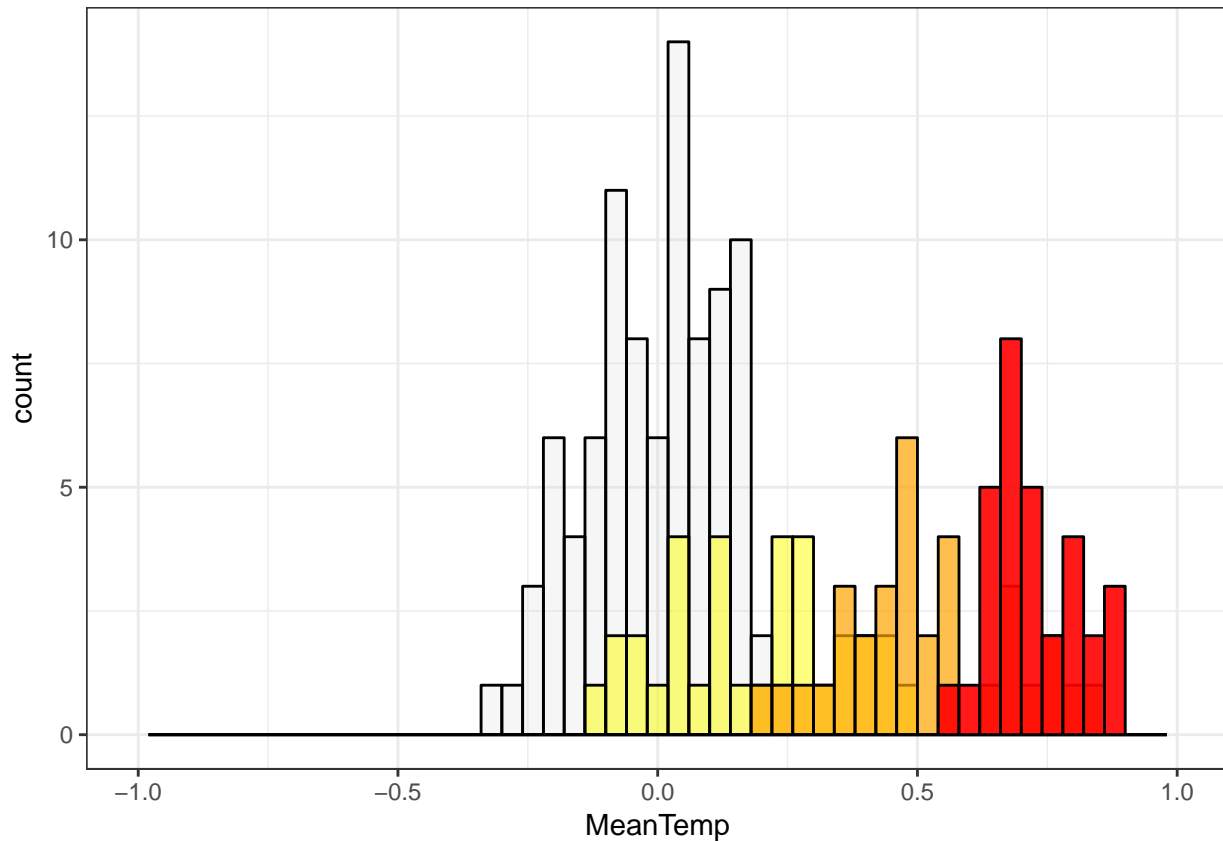
This package require ImageMagick on your system. gganimate github site

`df` is used as the data source for the histograms used in the animation. The first `geom_histogram` uses a different data source. This is the base plot.

```
df <- filter(NHsummerTemp, between(Year, 1983, 2015))
p <- ggplot(data = df, mapping = aes(MeanTemp))  +
    geom_histogram(data = filter(NHsummerTemp, between(Year, 1951, 1980)), mapping = aes(MeanTemp),
                binwidth = 0.04, fill = "light gray", color = "black", alpha = .2) +
    geom_histogram(aes(frame = Group, fill = Group),binwidth = 0.04, color = "black") +
    xlim(-1, 1)

gganimate(p, interval = 1.5)
```

`"nhtemp.gif"` creates the animated gif in your working directory. I added the gif to the markdown file to be rendered on the html. Can also be rendered in a presentation.!
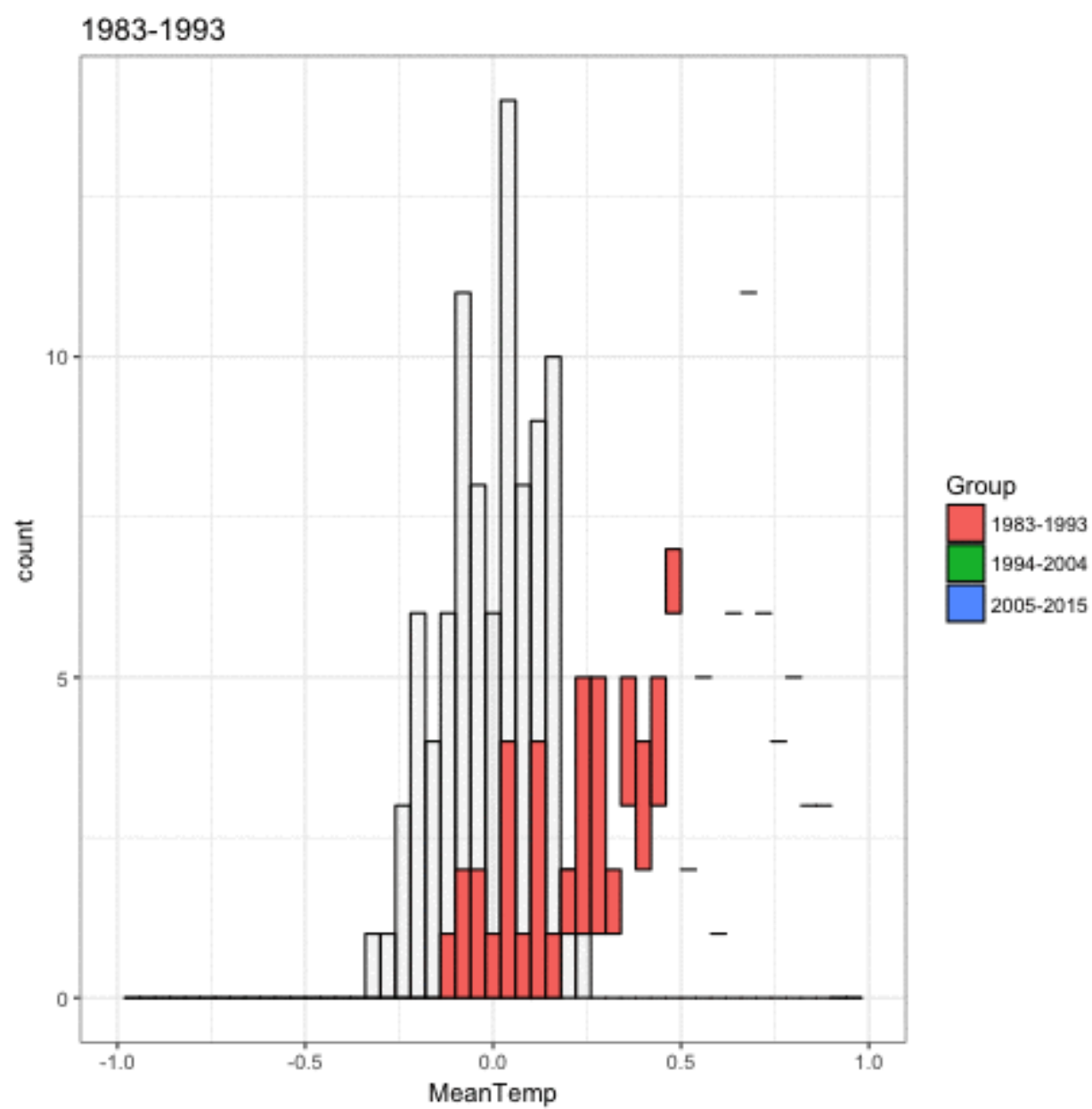
Figure 1: Northern Hemisphere Temps