My grandfather says summers are getting hotter

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Week 2

Load Data

```
library(tidyverse)
# define the link to the data - you can try this in your browser too.  Note that the URL ends in .txt.
dataurl=https://data.giss.nasa.gov/tmp/gistemp/STATIONS/tmp_USW00014733_14_0_1/station.txt
#the next line tells the NASA site to create the temporary file
httr::GET("https://data.giss.nasa.gov/cgi-bin/gistemp/stdata_show_v4.cgi?id=USW00014733&ds=14&dt=1")
# the next lines download the data
temp=read_table(dataurl,
          skip=3, #skip the first line which has column names
          na="999.90", # tell R that 999.90 means missing in this dataset
          col_names = c("YEAR","JAN","FEB","MAR", # define column names
                        "APR","MAY","JUN","JUL",
                        "AUG","SEP","OCT","NOV",
                        "DEC","DJF","MAM","JJA",
                        "SON","metANN"))
# renaming is necessary becuase they used dashes ("-")
# in the column names and R doesn't like that.
```

How looks like

```
head(temp)
```

A tibble: 6 × 18

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	DJF	MAM	JJA	SON	metANN
<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>	<dbl>
1883	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.76	0.29	NA	NA	NA	NA	NA
1884	-8.55	-3.13	-1.67	4.15	11.32	19.08	18.35	19.77	18.32	10.74	2.86	-1.62	-3.80	4.60	19.07	10.64	7.63
1885	-6.86	-10.24	-6.83	4.39	11.91	15.86	20.98	18.11	15.31	9.63	4.45	-0.96	-6.24	3.16	18.32	9.80	6.26
1886	-5.81	-4.83	-0.34	8.04	11.76	17.22	19.84	19.30	17.01	10.88	2.90	-4.63	-3.87	6.49	18.79	10.26	7.92
1887	-5.87	-3.60	-2.39	4.42	17.21	19.52	24.43	20.46	15.36	9.03	3.70	-0.37	-4.70	6.41	21.47	9.36	8.14
1888	-7.66	-4.34	-3.13	4.14	12.56	18.67	20.49	20.36	15.36	7.58	4.90	-0.43	-4.12	4.52	19.84	9.28	7.38

Data processing and visualization

```
dat = temp[,7:9] # Extract column JJA

years = temp[,1] # Extract column years

row_mean = apply(dat,1,mean) # Find the mean value of JJA by row

JJA_mean = data.frame(row_mean) # change type to data frame

JJA_years = cbind(years,JJA_mean) # Combining year and mean
```

```
library(ggplot2)

ggplot(data = JJA_years, mapping = aes(x = YEAR, y = row_mean, group = 1))
+ geom_line()

+ geom_smooth()

+ labs(x = "Year", y = "Mean Summer Temperatures (C°)", title = "Mean Summer Temperatures in Buffalo, NY", subtitle = "Summer includes June, July, and August
    Data from the Global Historical Climate Network
    Blue line is a LOESS smooth", caption = "Data: NASA
    tag = "Fig. 1")

+ theme(axis.text.x = element_text(size = 20),axis.text.y = element_text(size = 20),title = element_text(size = 30))
```

Fig. 1

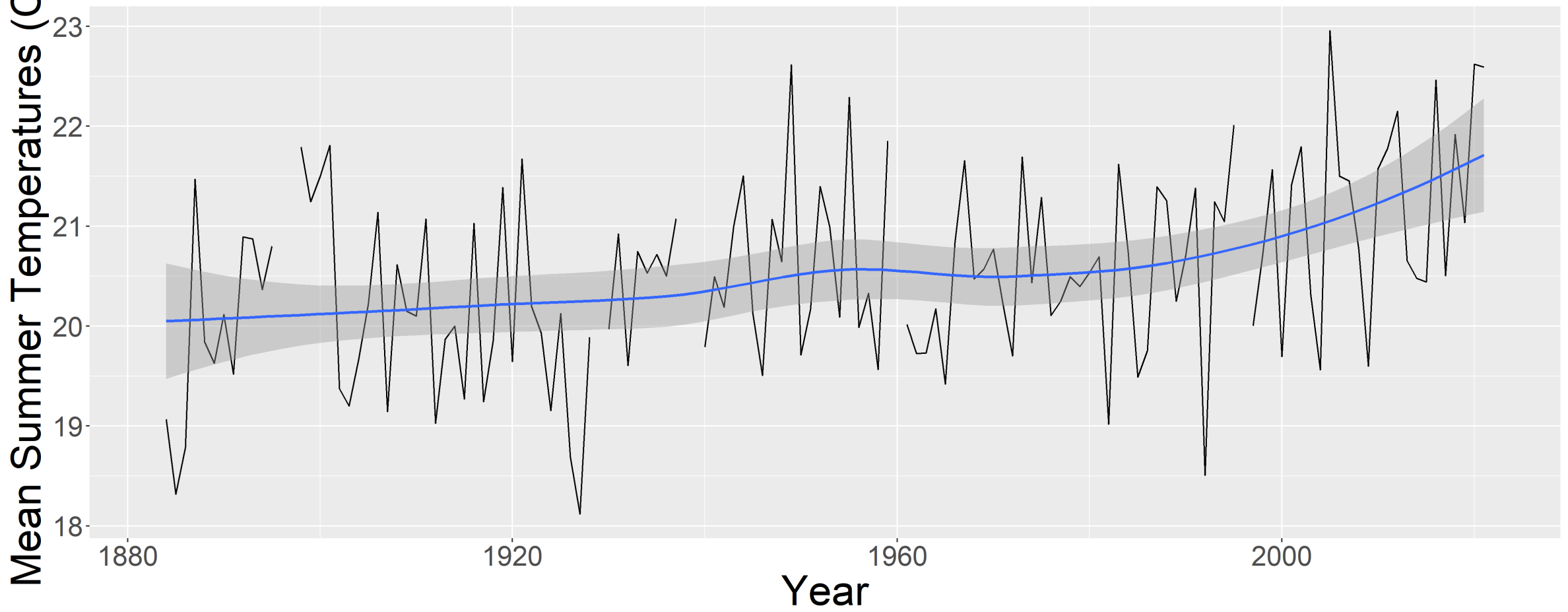
```
ggsave(
  filename = "Mean Summer Temperatures in Buffalo.png",
  width = 17,
height = 9,
units = "in",
dpi = 300)
```

Mean Summer Temperatures in Buffalo, NY

Summer includes June, July, and August

Data from the Global Historical Climate Network

Blue line is a LOESS smooth



Data: NASA