Model Comparison – Example 1

We have a data set with observations of four variables measuring advertising budgets and sales for a product in each of 200 markets (provided as part of the ISLR package; I think the data are made up):

- `sales` is a measure of sales volume in thousands of units
- `TV` is TV advertising budget
- `radio` is radio advertising budget
- `newspaper` is newspaper advertising budget

Below is R code for making plots displaying three separate simple linear regression fits to the data (the actual plots are on the other side of the page). In all three plots/models, `sales` is the response variable; the explanatory variable is different for each model.

```
library(readr) # for read_csv, which can read csv files from the internet
library(ggplot2) # for making plots
```

```
## Warning: package 'ggplot2' was built under R version 3.5.2
```

```
library(gridExtra) # for grid.arrange, which arranges the plots next to each other

Advertising <- read_csv("http://www.evanlray.com/data/islr/Advertising.csv")
```

```
## Warning: Missing column names filled in: 'X1' [1]
```

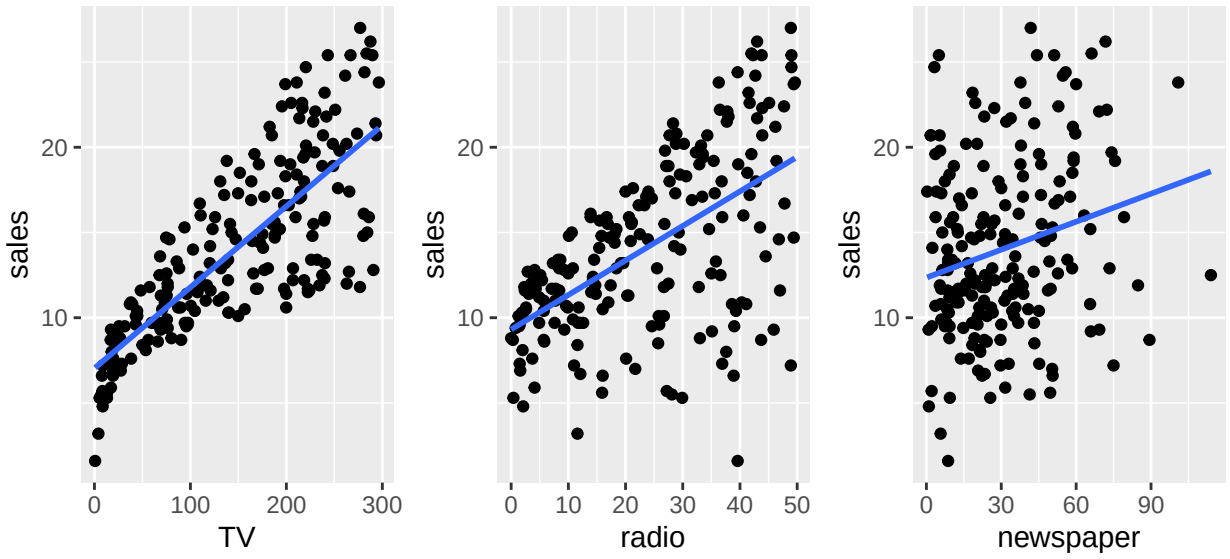
```
## Parsed with column specification:
## cols(
##   X1 = col_double(),
##   TV = col_double(),
##   radio = col_double(),
##   newspaper = col_double(),
##   sales = col_double()
## )
```

```
p1 <- ggplot(data = Advertising, mapping = aes(x = TV, y = sales)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE)

p2 <- ggplot(data = Advertising, mapping = aes(x = radio, y = sales)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE)

p3 <- ggplot(data = Advertising, mapping = aes(x = newspaper, y = sales)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE)

grid.arrange(p1, p2, p3, nrow = 1)
```



With your neighbors, discuss which of these models would you prefer to use for predicting sales and why.

Then answer the questions below:

Being as specific and concrete as possible, write down a rule for selecting your preferred model based only on *visual* characteristics of the plot. (That is, your rule should not involve any calculations of numeric quantities).

Being as specific and concrete as possible, write down a rule for selecting your preferred model based only on a *quantitative* summary of the data. You can describe how you would calculate your numeric summary of the data; if you'd like you can write down a formula.