W22 STAT 362 R for Data Science

Assignment 4

Due: 10 Mar 11:59pm.

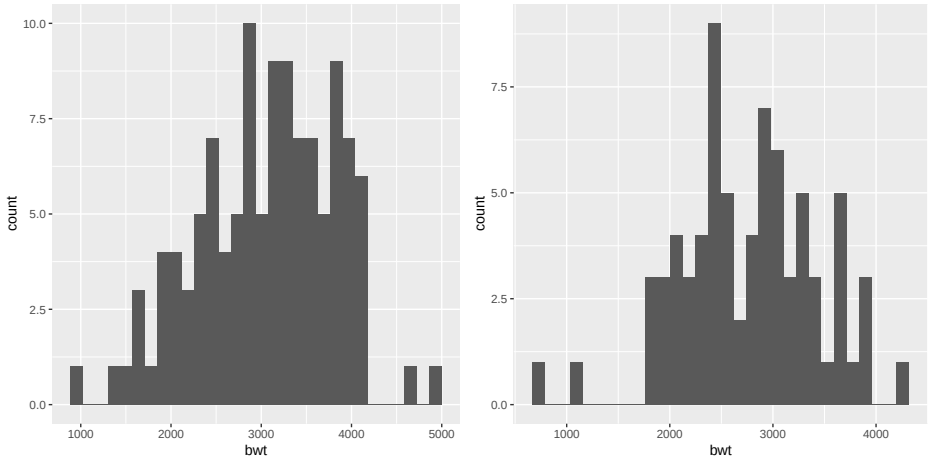
Instruction:

Q1 (Multiple graphs): The function `ggarrange` in the package `ggpubr` can be used to organize multiple graphs in a single plot. For example,

```
library(ggpubr) # install this first
library(MASS)
library(tidyverse)
plot_no_smoke <- birthwt %>%
  filter(smoke == 0) %>%
  ggplot(aes(x = bwt)) +
  geom_histogram()

plot_smoke <- birthwt %>%
  filter(smoke == 1) %>%
  ggplot(aes(x = bwt)) +
  geom_histogram()

ggarrange(plot_no_smoke, plot_smoke)
```

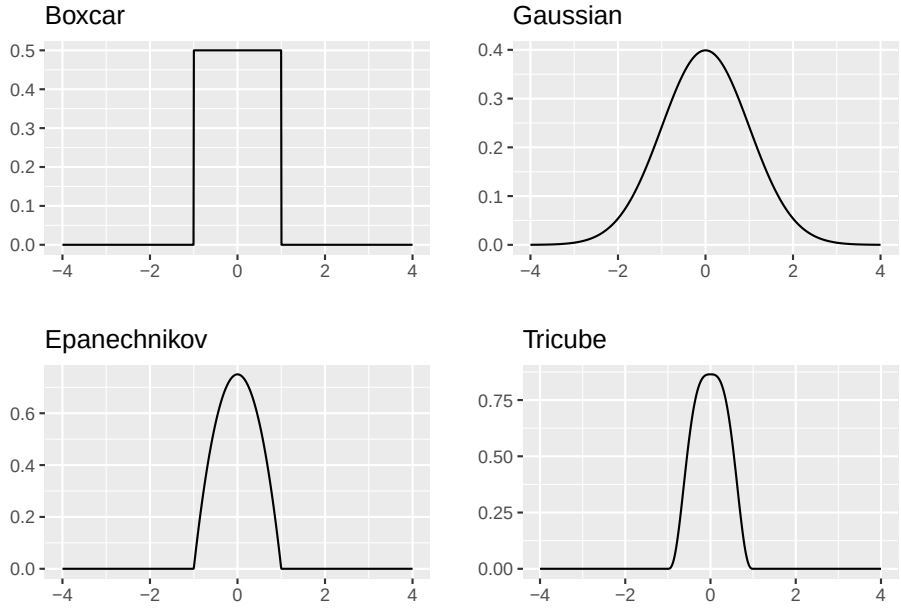


Recall that

$$\begin{aligned}
\text{the boxcar kernel:} \quad & K(x) = \frac{1}{2} I(|x| \leq 1) \\
\text{the Gaussian kernel:} \quad & K(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2} \\
\text{the Epanechnikov kernel:} \quad & K(x) = \frac{3}{4}(1 - x^2) I(|x| \leq 1) \\
\text{the tricube kernel:} \quad & K(x) = \frac{70}{81}(1 - |x|^3)^3 I(|x| \leq 1),
\end{aligned}$$

where $I(|x| \leq 1) = 1$ if $|x| \leq 1$ and equals 0 otherwise.

Use `ggarrnage` to create the following plot.



Q2: The specifications for a certain kind of ribbon call for a mean breaking strength of 185 pounds. If five pieces randomly selected from different rolls have breaking strengths of $171.6, 191.8, 178.3, 184.9$, and 189.1 pounds, test the null hypothesis $\mu = 185$ pounds against the alternative hypothesis $\mu < 185$ pounds at the 0.05 level of significance.

Hint: use `t.test()` and set `alternative = "less"` (see `?t.test`).

Q3: To study the durability of a new paint for white center lines, a highway department painted test strips across heavily traveled roads in eight different locations, and electronic counters showed that they deteriorated after having been crossed by (to the nearest hundred) 142,600, 167,800, 136,500, 108,300, 126,400, 133,700, 162,000, and 149,400 cars. Construct a 95% confidence interval for the average amount of traffic (car crossings) that this paint can withstand before it deteriorates.

Hint: use `t.test()`.

Q4: In a random sample, 35 of 400 persons given a flu vaccine experienced some discomfort. Construct a 95 confidence interval for the true proportion of persons who will experience some discomfort from the vaccine.

Hint: use `prop.test()`.

Q5: Determine, on the basis of the sample data shown in the following table, whether the true proportion of shoppers favoring detergent A over detergent B is the same in all three cities:

	number favoring detergent A	number favoring detergent B
City C	232	168
City D	260	240
City E	197	203

Hint: use `prop.test()`.

Q6-8 (k-NN): Download the two datasets `iris_train.csv` and `iris_test.csv` from onQ (onQ -> Content -> Datasets). Import them to R.

Q6: Perform the min-max normalization on the two datasets `iris_train.csv` and `iris_test.csv`.

Q7(a): Perform the k-nearest neighbour classification using `knn` from the package `class` with `k = 3`.

Q7(b): Find out the testing accuracy.

Q8: Type `?knn` and read the documentation for `knn()`. What is the use of `prob` in the function? Now, set the argument `prob = TRUE` and redo Q7(a).