The University of British Columbia

Irving K. Barber School of Sciences

DATA 101

Lab Assignment 8 2020W1

Demonstration. The TA will go through a set of examples with you.

In each question below, write out (or type) the required lines of R code, if needed, together with the answer to the question.

1. Consider the data in `ChickWeight`. Construct conditioning scatter plots that relate weight to time, for each chick, and use `groups=Diet` in order to distinguish the different diets by different colours on the graphs.

2. Write a function which will evaluate polynomials of the form

$$P(x) = a_n x^{n-1} + a_{n-1} x^{n-2} + \cdots + a_2 x^2 + a_1$$

   Your function should take x and the vector of polynomial coefficients as arguments and it should return the value of the evaluated polynomial. Name this function as you want.

3. Refer to the previous question. For moderate to large values of n, evaluation of a polynomial at x can be done more efficiently using `Horner's rule`

   (a) Set the initial $P(x)$ as $P \leftarrow a_n$

   (b) For $i = n-1, n-2, \cdots, 2, 1$, update

$$P = P * x + a_i \tag{1}$$

   That is

$$P = a_n x + a_{n-1}, \text{when } i = n-1$$

$$P = (a_n x + a_{n-1})x + a_{n-2}, \text{when } i = n-2$$

   (this time P on the right of equation 3b is equal to $a_n x + a_{n-1}$) Then we have

$$P = a_n x^2 + a_{n-1} x + a_{n-2}, \text{when } i = n-2$$

   and so on

$$P = a_n x^{n-1} + a_{n-1} x^{n-2} + \cdots + a_2 x^2 + a_1, \text{ when } i = 1$$

   (c) Return P. (This is the computed value of $P(x)$.)

   Write an R function which takes arguments x and a vector of polynomial coefficients and which returns the value of the polynomial evaluated at x. Call the resulting function `hornerpoly()`. Ensure that your function returns an appropriate vector of values when x is a vector.