SCHOOL OF ADVANCED TECHNOLOGY

ICT - Applications & Programming
Computer Engineering Technology – Computing Science

Numerical Computing – CST8233

Term: Fall 2024

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Assignment #1: CSV Files and Series

Objectives
In this assignment, you will be challenged to complete three tasks, involving
- Reading, modifying and saving CSV (Comma-Separated Value) files, and
- Performing calculations involving series.

Grades:
7% of your final course mark

Deadline
October 10th, 2024 before 11:59 PM.

Tasks

Task 1: CSV Files (12 marks)

CSV files are commonly encountered. They store data in a "plain-text" format, often, *but not always*, using commas to separate values.

You have been given a file named "**assignment1.csv**", which contains a variety of data about cereals. To earn marks, you must write a script that does the following:

- (3 marks) Read the "assignment1.csv" file and
    - Save it as a dataframe named "**CerealsDF**"
    - Display the structure of "**CerealsDF**" using str() function and examine the variables and their classes
    - Display the first ten rows of "**CerealsDF**"

- (3 marks) The second line in "**CerealsDF**" represents the data type of each column.
    - Delete this line from the dataframe
    - Print the number of rows and columns in the data frame
    - Add a new column named "totalcarbo" that shows the total of both carbo and sugars columns

- (3 marks) The "type" column shows the type, i.e., hot or cold, of the cereal and "mfr" column shows the manufacturer of the cereal.
    - Find how many cereals are hot. Use subset() function
    - Find how many unique manufacturers are mentioned in the dataframe. Use unique() function
    - Extract all cereals that are manufactured by Kellogg's ("K"). Call this dataframe as "cereals_K" and print it

- (3 marks) To examine the total value of each type, we need to look at the values of two or more columns.
  - Extract all cereals that have less than or equal 90 calories AND have more than 2 units of fat
  - Save this subset as a CSV file on your desk. Use wirte.csv() function

Task II: Vectors, Functions, Series (12 marks)

You are given the following discrete data that represent the following function:

$$f(x) = \cos 0.5x \times e^{0.1x}$$

x	π	6.678	3π	12.961	5π	19.244	7π
$f(x)$	0	-1.921	0	3.584	0	-6.718	0

- Write an R function that implement the Interpolation formula shown in the class. Call this function MyIntCal().

- What is degree of the interpolating function?

- You should have seven Lagrange polynomials, L1, L2, …, L7. Create a 4x2 figure and plot each of these polynomials in one subfigure. Add the final interpolating function in the last subfigure. Save this figure as MyIntFig.pdf

- Use the built in function poly.calc() to find the interpolating function and call it pf_x.

- Find the value of $f(15)$ using MyIntCal() and pf_x.

- Find the value of $f(24)$ using MyIntCal() and pf_x.