University of Glasgow | School of Computing Science

CSC1103 Laboratory/Tutorial 8 9: Pointers and Strings

1. Sample statistics is an important field to understand the underlying data behavior and useful for various data analytics application such as understanding the demographics population of a country. There is two statistics information that is of paramount importance which is the sample mean and variance of the sample data. The arithmetic mean for a set of observation $x_1, x_2 \cdots x_N$ is calculated as

$$\bar{x} = \frac{1}{N}\sum_{i=1}^{N} x_i$$

where x_i is the i^{th} observation data and N is the number of observations also referred to sample size and $\bar{x}$ is the sample mean. The variance of the sample data is defined as

$$s_x^2 = \frac{1}{N-1}\left(\sum_{i=1}^{N} x_i^2 - N\bar{x}^2\right)$$

Design the algorithm and pseudocode using function and pointers notation to compute the following sample statistics for a group of data.

- Minimum and maximum value of the sample data (use shell sort algorithm to sort)
- The mean of the sample data
- The variance of the sample data

Write a C program for the above pseudocode and the program shall consist of the number of items N (minimum 30 values) and the individual values x_i .The program should compute and print out the sample statistics.

2. Redesign the algorithm and pseudocode for Lab/Tutorial 3 Question 2 on Caser Cipher cryptography using string pointer. Write the C program to implement the pseudocode.

3. Design an algorithm and pseudocode to read in two strings and compare the two strings using strcmp () function in the *string.h* C library. Hence also design your own algorithm and pseudocode of strcmp() function instead of using the strcmp() function in the standard C library. Write a C program to verify the two algorithms.