CS111 – Introduction to C Programming
Fall 2025
Programming Assignment #7 (3%)
Due: ~~Friday October 31~~, Wednesday November 3, 2025 (23:59)
Strings and Functions

Objectives

In this programming assignment, you will work with string variables, which are arrays of characters, and learn how to create C functions.

Part I: Pratice with Using a Two Dimension Array

Solve Programming Project 7 on p. 179 of the text, which is restated below:

Write a program that reads a 5 × 5 array of integers and then prints the row sums and the column sums:

```
Enter row 1: 8 3 9 0 10
Enter row 2: 3 5 17 1 1
Enter row 3: 2 8 6 23 1
Enter row 4: 15 7 3 2 9
Enter row 5: 6 14 2 6 0
Row totals: 30 27 40 36 28
Column totals: 34 37 37 32 21
```

Once the program is completed, add a header documentation section and inline comments to explain how the program works. (This is called "proper documentation" below.) Submit the program as **`pa7p1`**.

Part II: Bubble Sorting Function

In this part of the assignment, you will revisit Bubble Sort that was studied in the previous assignment but implement it as a C function. Specifically, the function should have two input parameters, **`a[]`** and **`n`**, which represent the array to be sorted and the size of the array, respectively.

```
void function bubble_sort(int a[], int n)
```

The funciton should be called from the main function, which provide inputs to **`bubble_sort()`** using two integer arrays of length 5 and 10, twice. The two arrays should be initialized in **`main()`** before they are used in the function call to **`bubble_sort()`**. The caller **`main()`** should print out array contents before and after the sorting opertion. Once your program works, make sure that it is properly documented and name it as **`p7p2.c`**.

Part III: Palindrome recognition

A palindrome word is one that is spelled the same forward and backward independently of the case such as "madam", "Bob", "Kayak", etc. Write a C function called **`isPalindrome()`** to be tested with the following **`main()`** function.

```c
#include <stdio.h>
#include <string.h>
// Use this main to test your isPalindrome function
int main() {
    char *testStrings[] = {
        "Madam",              // Palindrome (case-insensitive)
        "racecar",            // Palindrome
        "Hello",              // Not a palindrome
        "12321",              // Numeric palindrome
        "12345",              // Not a palindrome
        "",                   // Empty string (considered palindrome)
        NULL                  // NULL (not a palindrome)
    };

    int numTests = sizeof(testStrings) / sizeof(testStrings[0]);

    // Run tests
    for (int i = 0; i < numTests; i++) {
        char *str = testStrings[i];

        printf("Test %d: ", i + 1);
        if (str == NULL) {
            printf("Input: NULL ");
        } else {
            printf("Input: \"%s\" ", str);
        }

        if (isPalindrome(str)) {
            printf("-> IS a palindrome\n");
        } else {
            printf("-> is NOT a palindrome\n");
        }
    }
    return 0;
}
```

Once your program is debugged and tested. Make sure that it is properly documented and name it as **`p7p3.c`**.

Marking and Assignment Submission

This programming assignment is worth a total of 3% with 1% for each part. Submit **`pa7p1.c`** **`pa7p2.c`** and **`pa7p3.c`** as well as the zipped folder of the three files, called **`pa7.zip`**, as four separate files through Blackboard. Be prepared to explain to a TA in the next lab session about your solution to this assignment.

Notes: Please work on the homework independently. The university has a zero-tolerance policy on plagiarism. Regarding the use of AI to assist you in completing assignments, please refer to "AI Policy" on course Blackboard.