Computer Science 3731/6906 **Fall 2018**

Assignment 4

Date due: October 12 (in class) See Assignment 2 for instructions for electronic submission.

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1. Write a Fortran integer function *CountSeq(A,k)* which finds, in an array $A[1:k]$ of integer numbers, the number of weakly increasing and decreasing sequences. For example, if A is [1,1,3,5,5,4,2,3], the result is 3. If all elements of A are equal, the result is zero.

   Write also a Fortran program which reads the data, invokes *CountSeq* and outputs the returned result.

2. Let an integer matrix $A[1:m, 1:n]$ contain nonnegative elements. Two nonzero elements are contiguous if they are adjacent to each other in the same row or the same column. A blob is defined as a group of all nonzero elements which are contiguous. Write an integer Fortran function *CountBlobs (A,m,n)* which finds and returns the number of blobs in a nonnegative integer matrix A.

   Write also a Fortran program which enters matrix A, invokes *CountBlobs* and prints the result.

   Hint: An example outline of *CountBlobs* is:

   count := 0
   while there is a positive element in A **do**
       count := *count* + 1
       change the element found to $-$*count*
       iteratively find the blob by finding positive elements which are contiguous to elements equal to $-$*count* and changing them to $-$*count*, until no new elements are added to the blob
   end while

   Example: In the matrix below, the positive elements are represented by an asterisks:

*	*	*	*	*	0	*	*	*
0	0	0	0	*	0	0	0	*
*	*	*	0	*	0	*	0	*
*	0	0	0	*	0	*	0	*
*	0	*	*	*	0	*	0	*
*	0	0	0	0	0	*	0	*
*	*	*	*	*	*	*	0	*
0	0	0	0	0	0	0	*	*
*	*	*	*	*	*	*	*	*

   There are 3 blobs in this matrix.