# Informatics II, Spring 2025, Exercise 1

Publication of exercise: February 24, 2025
Publication of solution: March 3, 2025
Exercise classes: March 3 - March 7, 2025

**Learning Goal**

- practice C programming on strings and arrays.

## Task 1

A string can be compressed by replacing a (sub)sequence of consecutive identical character by the length of the sequence and the character.

For example, the compression version of the string"AAABBAAAA" is "3A2B4A", where "3A" stands for three consecutive "A"s, "2B" for two consecutive "B"s and "4A" for four consecutive "A"s.

1.1: What are the compressed versions for strings "XXXXXXXX", "ABCDEF" and "XXXXYYYY"?

1.2: Given a string of $n$ characters, what is the minimum number and the maximum number of characters that are compressed?

1.3: Write the C function `void compression(char string[], int n)` in C that takes a string with $n$ characters as input and prints the compressed version.

## Task 2

Consider an array $A$ with $n$ integers and an integer $t$. The task is to find if there exist two integers in $A$ whose sum is equal to $t$.

2.1: Write a pseudocode algorithm that returns 1 if the sum of two integers in $A$ is equal to $t$, returns 0 otherwise. Determine and explain the number of sum operation in your solution.

2.2: Write the C function `int T(int A[], int n, int t)` that returns 1 if there exist two integers in $A$ whose sum is equal to $t$, returns 0 otherwise.

## Task 3

Assume that integers of the array $A$ in Task 2 are sorted in an ascending order. The task is to find if there exist two integers in $A$ whose sum is equal to $t$.

3.1: Write a pseudocode algorithm that returns 1 if there exist two integers in $A$ whose sum is equal to $t$, returns 0 otherwise. Determine and explain the number of accesses made to the integers of array $A$ in your solution. Can you reduce the number of accesses to make your solution more efficient?

3.2: Write the C function `int TSort(int A[], int n, int t)` that returns 1 if there exist two integers in $A$ whose sum is equal to $t$, returns 0 otherwise.

# Task 4

A subarray is a sequence of contiguous elements of an array. Write a C function `int zeroSubarray(int A[], int n)` that takes an array $A$ of $n$ integers and returns 1 if it is possible to find a subarray where the sum over the integers in the subarray is equal to zero. Otherwise, the function returns 0.