

# Theory of Computation

## Homework 1: due 8 April 2025

You are to write a program that implements the Baker-Bird two-dimensional pattern matching algorithm. To do that, you need to implement

- the Aho-Corasick algorithm and
- the Knuth-Morris-Pratt algorithm.

Assume that  $\Sigma = \{a, \dots, z, A, \dots, Z, 0, \dots, 9\}$  and  $m \leq n \leq 100$ . You may use an array implementation for branching in the Aho-Corasick algorithm. In the Baker-Bird algorithm, you are to use  $O(|\Sigma|m^2 + n)$  extra space, not  $O(|\Sigma|m^2 + n^2)$ .

Constraints:

- Input: The first line of the input file contains  $m$  and  $n$ . The following  $m$  lines contain an  $m \times m$  pattern, one row in a line. The following  $n$  lines contain an  $n \times n$  text, one row in a line.
- Output: The positions of occurrences in row major order
- Check the correctness of your program by a checker program. A checker program gets the input and output of your Baker-Bird program as its input and checks whether the output is correct or not.

Report:

- Explain how your checker program works in your report.
- Run your program with your own inputs
- Hand in your report, programs, and an example running (with at least two inputs).
- Write down the environment you run your program.
- Write comments appropriately in your program.