



## Algorithms and Datastructures Summer Term 2021 Exercise Sheet 12

### Exercise 1: Knuth-Morris-Pratt Algorithm

Consider the pattern  $P = BBABAB$  and the text  $T = ABBABBABABBABABBA$ .

- Compute the array  $S$  of the Knuth-Morris-Pratt algorithm.
- Use the Knuth-Morris-Pratt algorithm to find all appearances of  $P$  in  $T$ . Document the steps analogously to the lecture.

### Exercise 2: Rabin-Karp Algorithm

Let  $T$  be a given text of length  $n$  and let  $P_1, \dots, P_k$  be  $k$  patterns, each of length exactly  $m$ . The goal is to know if there is at least one pattern in the text, that is, we want to answer *True* if there exists at least one index  $i \in \{1, \dots, k\}$  such that  $P_i \in T$ , and answer *False* if for any  $i \in \{1, \dots, k\}$ ,  $P_i \notin T$ . It is easy to solve this problem in  $O(k(n + m))$  by running the Rabin-Karp algorithm once for each pattern. Give an algorithm (based on Rabin-Karp) that requires only  $O(n + km)$ .