WST540: Exercise 5

Problem 1. Let $s = \texttt{solver}$ and $t = \texttt{lovely}$. Answer the following questions.

(i) Recall that, to compute the edit distance between s and t, we learned a dynamic programming algorithm which works by filling in a 2d array A, such that $A[i, j]$ ($0 \le i, j \le 6$) equals the edit distance between $s[1..i]$ and $t[1..j]$. Give the entire A in its final form.

(ii) Remember that each cell in A is *determined* by at least one other cell (where the notion of "determine" is as defined in Lecture 13). Give all the cells that can determine $A[3, 4]$. Repeat this for $A[2, 5]$ and $A[4, 3]$.

(iii) Give a trace for s and t that corresponds to an editing path that changes s to t with the minimum operations. Also explain what are these operations.

Problem 2. Let s and t be as defined in Problem 1. Suppose that we only want to verify whether the edit distance between s and t is greater than 1. Give the values of the cells of A that need to be computed by the algorithm in Lecture 14.

Problem 3. Let $s = \texttt{father}$ and $t = \texttt{feather}$. Answer the following questions for $q = 3$:

(i) List all the positional q-grams of s and t.

(ii) Let $d = 1$. Give the number of positional q-grams of t that d-match at least one positional q-gram of s. List those q-grams of t.

Problem 4. Let s be a string of length 6, and t a string of length 7. Fix $d = 2$ and $q = 2$. Let x be the number of positional q-grams of s that d-match at least one positional q-gram of t. Answer the following questions.

(i) If $x = 2$, can the edit distance of s and t be at most d? If not, explain why; otherwise, justify your answer with an example of s and t.

(ii) If $x = 3$, can the edit distance of s and t be at most d? If not, explain why; otherwise, justify your answer with an example of s and t.