10 Feb 2025 — Algorithms — Week 07

Recap: Edit distance
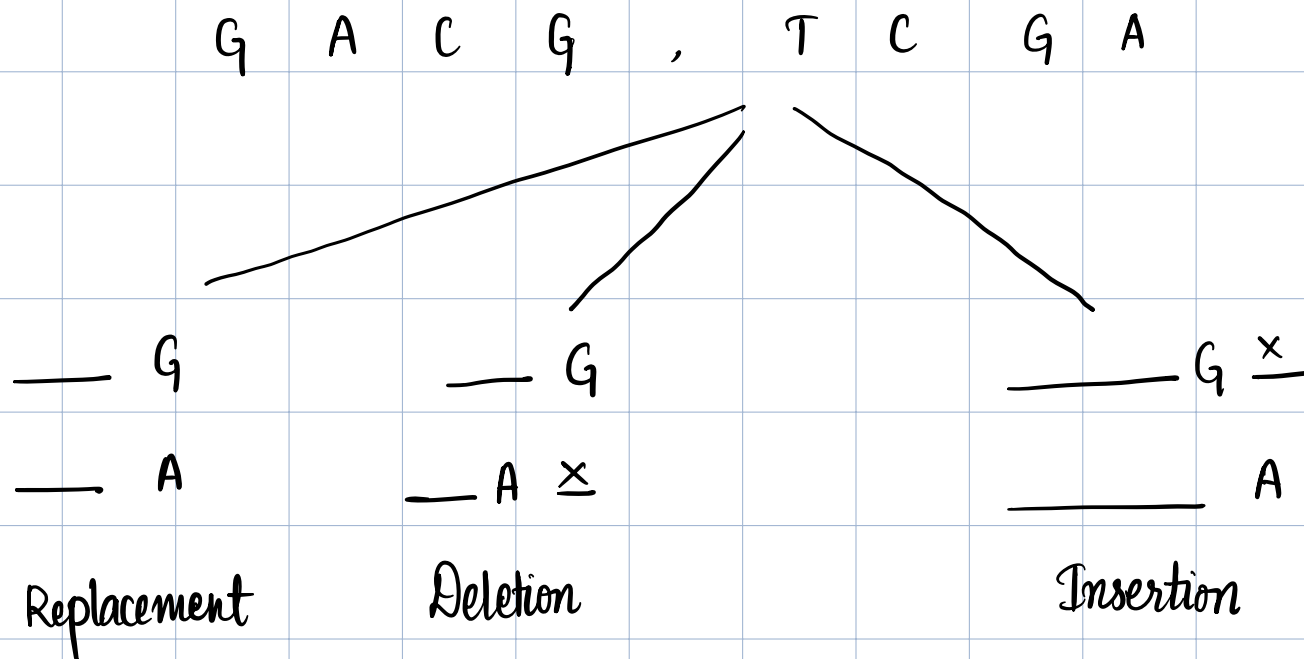
If $S_1[i] = S_2[j]$ ⤳ already aligned

$$D(i,j) = D(i-1, j-1)$$

G	A	C	G	T	,	T	C	G	A	T

G	A	C	G	—	T	G	A	C	G	—
T	—	C	G	A	T	T	—	C	G	A

If $S[i] \neq S[j]$, $D[i,j] = 1 + \min\left(D[i, j-1], D[i-1, j], D[i-1, j-1]\right)$

G A C G , T C G A

—— G   —— G   ——— G ×

—— A   — A ×   ——— A

Replacement   Deletion   Insertion

* Tabular computation

* Traceback : use pointers

Find length ℓ : $\dfrac{P(\ell)}{\ell}$ is maximized. } Greedy approach

Greedy algorithms are often optimal but be careful about correctness.

i	1	2	3	4
$P(i)$	1	14	24	25

$n = 24$

→ How bad is this greedy algorithm.

Practice problems ~ B

1) Specification:

→ find the smallest common supersequence of two strings

Let $S[i]$ = max # of activities that you can attend

in first i days

$8, 3, 1, 7, 4$

$S[1] = 8$

$S[2] = 8$

$S[3] = 9$

$S[4] = 15$

$S[5] = 15$

MATCHES   MATE   ACHES
                  ↑   ↑

P	R	A	N	J	A	L
A	R	N	A	V		

| P | A | R | A | N | J | A | L | V |