BMEG 3105 Lecture 4: Dynamic Programming 15th Sept, 2023

Previous knowledge

Data types: 1. Sequential data 2. Data matrix 3. Spatial data
4. Temporal data 5. Graph / networks
6. Text 7. Multi-modality data

Finding the best pairwise Alignment

Solution 1: Enumeration: List out all the possible alignments
↳ Easy but not practicable (too much alignments)

Solution 2: Dynamic Programming

Dynamic Programming

Step 1 Breaking down the problem
- making sub problems

Optimal Sequence alignment | Cheapest flight problem
→ Break it down base by base | → Break it down to diff. subtrip
ie. 1st F(G, –), F(–, G), F(G, G) | ie. 1st F(KAUST, Q), F(Q, CUHK)
2nd F(C, –), F(–, C), F(C, C) | 2nd F(KAUST, D), F(D, CUHK)
3rd F(–, A), F(C, –), S(C, A) | 3rd F(KAUST, G), F(G, CUHK)

Step 2 Calculating the alignment score
Step 3 Fill in the DP table
Step 4 Preserve the path
Step 5 Sum up the score
→ Optimal Alignment found!!!

By dynamic programming, problem size is reduced by 1-2pairs each time

What control the Final Alignment?
→ The scoring matrix