① Catching Polygons

② Snow Blowing

$O(n)$

- after each cut, run LCS.
- $O(n) \cdot O(n^2) = O(n^3)$

▷ Can be done in $O(n^2)$.

Non-geometric version:

Longest square subsequence problem:

- Given a sequence $S$ of length $n$, compute a longest subsequence in the form of $X^2 = XX$, where $X$ is a subsequence of $S$.
- Ex. $S$ = ACTGTATCTGCT
  Solution: ACTGT·ACTGT

Geometric version:

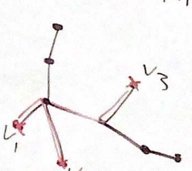
- Given a polygonal chain $P$ with $n$ vertices (2D or 3D), compute a subsequence $XY$ s.t. $X, Y$ are subchains of $P$, $d_{F,\text{ translation or rotation}}(X,Y) \le \varepsilon$.

AMS-MRC - Trees

Graph Theory

Given degree sequence

$D = \{4, 3, 2, 2, 1, 1, 1, 1, 1\}$

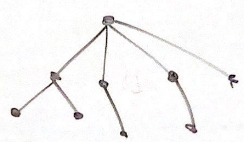



$r = 3$ $\quad rSW(v_1 v_2 v_3) = 4$

$k=2$

Q: which trees max. the number of verts $(u,v)$ with $d(u,v) < t$

A: Greedy trees



r-Stiener Weiner distance

Q: Give degree sequence which tree maximizes the number of k-tuples with $S.W \leq t$

① Catching Polygons

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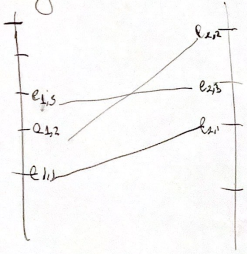
③ subchains

④ greedy trees

⑤ parametric graphs




# Parameteric MST

activation function
& is 1 if edge present

**Input:** $G_1 = (V, E, \mathcal{E}_1 : E \longrightarrow \mathbb{R})$, $\rho : E_{i,T} \rightarrow \{0, 1\}$

$G_2 = (V, E, \mathcal{E}_2 : E \longrightarrow \mathbb{R})$

$I_\lambda(G_1, G_2) := (V, E, \lambda \mathcal{E}_1 + (1-\lambda)\mathcal{E}_2)$

**Output:** Sequence of intervals over $\mathbb{R}$ ($[0,1]$).

$(-\infty, t_0), (t_0, t_1), (t_1, t_2), (t_3, t_4) \ldots (t_k, \infty)$

s.t. intervals contain all MST for $I_\lambda(G_1, G_2)$

- Shortest paths - direct case.
- Min Cut Max flow
-

Solves in

$O(mn\log(n))$

$O(pn^{2/3}\log^{O(1)}(n))$

where $p$ is # of trees on interval. ?

Q1: Which faster

Also known

$p$ is $O(m\sqrt[3]{n})$

$p$ is $\Omega(m \log n)$

Q3: Multiple parameters

i.e. 3 graphs.