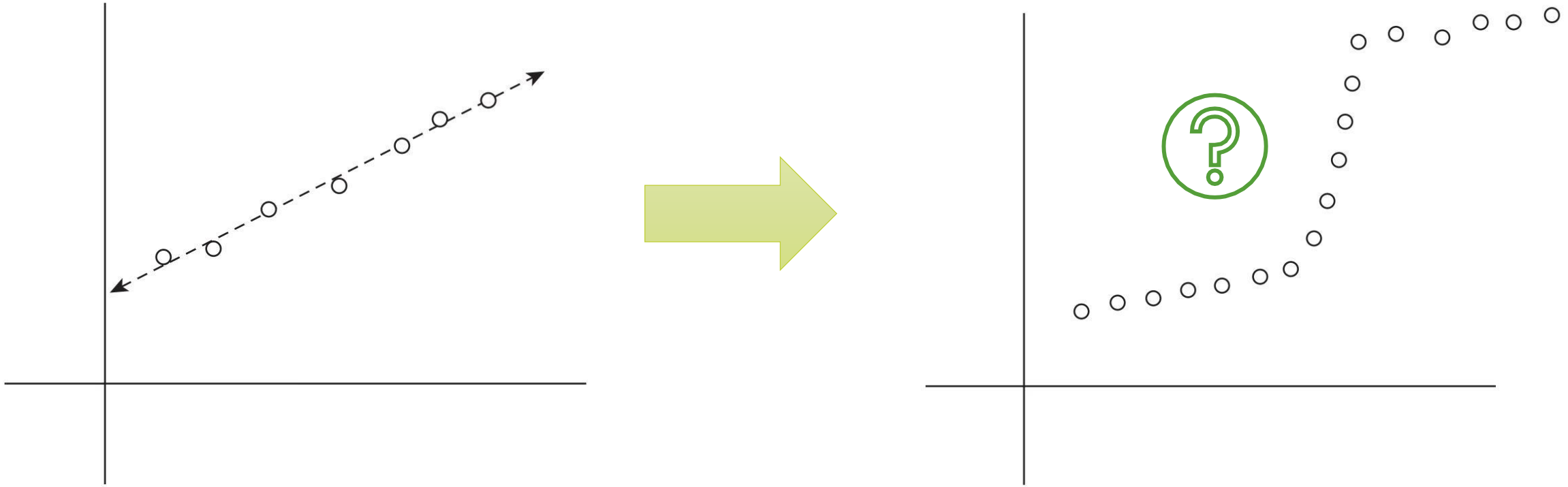
Segmented Least Squares

Algorithm Design

Karlo Delić

Motivation

- extending the notion of best line fit from one to several
- applications

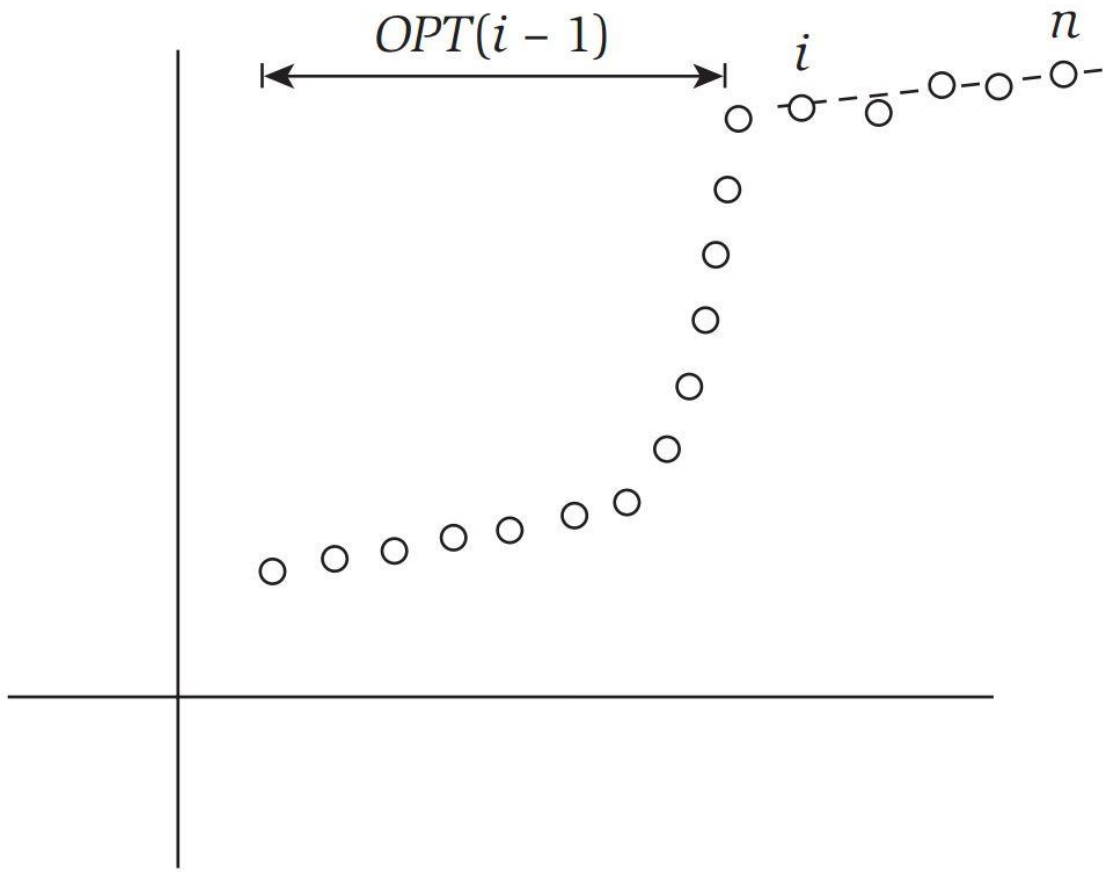


Problem outline

- adding a line: cost C
- square error of each line: cost $e_{i,j}$

Why dynamic programming?

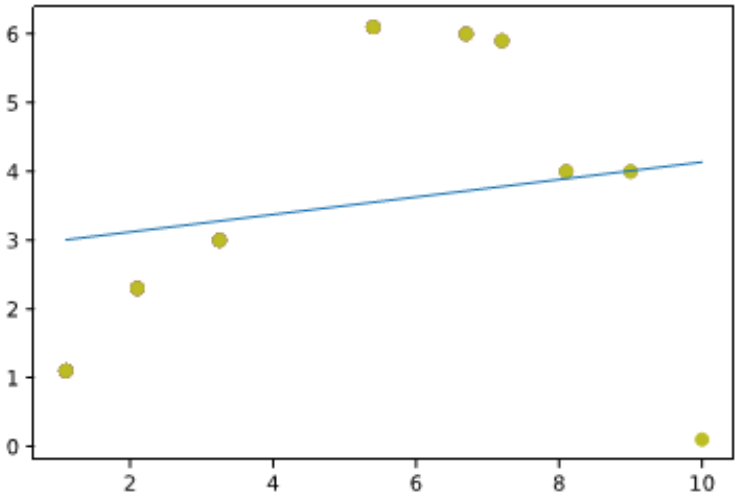
- greedy, d&c?
- natural sets of subproblems
- $\mathrm{OPT}(n) = e_{i,n} + C + \mathrm{OPT}(i-1)$



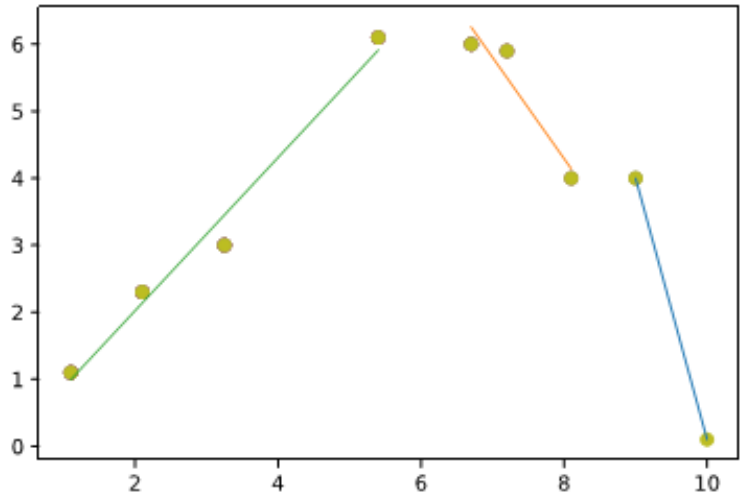
Solution and complexity

- $\mathrm{OPT}(j) = \min(e_{i,j} + C + \mathrm{OPT}(i-1))|_{1 \le i \le j}$
- quadratic time complexity: $O(n^2)$

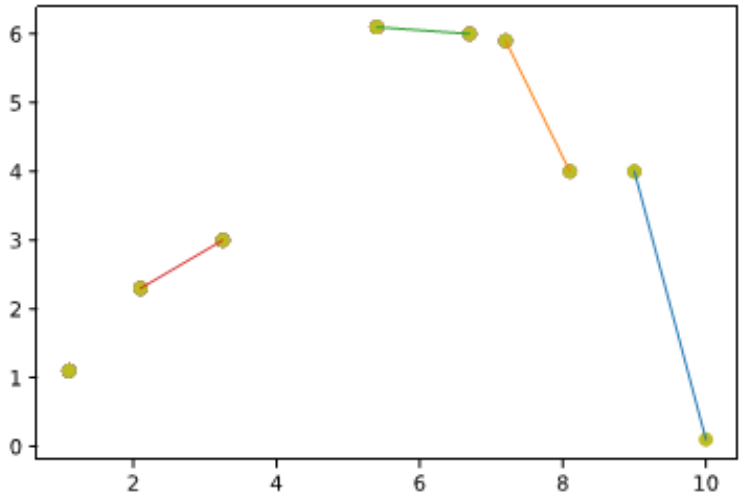
$C = 50.0$



$C = 1.0$



$C = 0.0$



Recap, closing thoughts and questions

Literature

[1] Jon Kleinberg & Éva Tardos, *Algorithm Design*, London: Pearson, 2006