

# Eddy Diagram for the Matrix Chain Multiplication Problem: Parenthesizing $A_1 \dots A_j$ .

1 matrix  
base case

at least 2  
matrices.

Basic  
structure

can be same point. So the system is 2 or 3+ points

$$\text{Diagram } F(i, j) = \left| \cdot \right| \begin{array}{c} \text{(or)} \\ \text{can be equal} \quad \text{can be equal.} \\ \text{unique points} \end{array} = \text{All possible splittings of } i \dots j$$

$$\text{Diagram } F(i, j) = \left| \cdot \right| \text{Diagram } F(i, k) F(k+1, j) = \text{The whole eddy diagram.}$$

$$\Rightarrow F(i, j) = \begin{cases} i=j & \text{(Base case) } = 0_{\text{ops}} \\ i < j & F(i, k), F(k+1, j) \text{ (Recurrence)} \end{cases}$$

$(i \leq k < j)$ , pick the minimum

$$\Rightarrow F(i, j) = \begin{cases} 0, & i=j \\ \min_{i \leq k < j} (F(i, k) + F(k+1, j) + p_{i-1} p_k p_j) \end{cases}$$

(for problem specific)

= Modularization of recurrence