

**Definition** (Algebraic definition Monotone Co-Design Problems). An MCDP is a tuple  $\langle \mathcal{A}, \mathbf{T}, \boldsymbol{\nu} \rangle$ , where:

1.  $\mathcal{A}$  is any set of atoms, to be used as labels.
2. The term  $\mathbf{T}$  in the  $\{\text{series}, \text{par}, \text{loop}\}$  algebra describes the structure of the graph:

$$\mathbf{T} \in \text{Terms}(\{\text{series}, \text{par}, \text{loop}\}, \mathcal{A}).$$

3. The *valuation*  $\boldsymbol{\nu}$  is a map  $\boldsymbol{\nu} : \mathcal{A} \rightarrow \mathbf{DP}$  that assigns a DP to each atom.