Buyer-Seller Matching: Global and Local Similarity Measures

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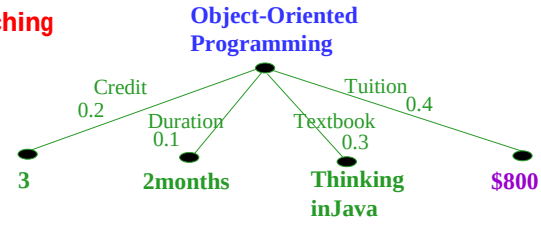
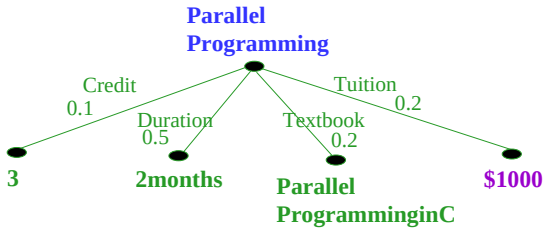
A buyer-seller matching problem



(a) A learner tree.



(b) A course provider tree.

Motivation 1

Match "Object-Oriented Programming" and "Parallel Programming" (inner nodes)

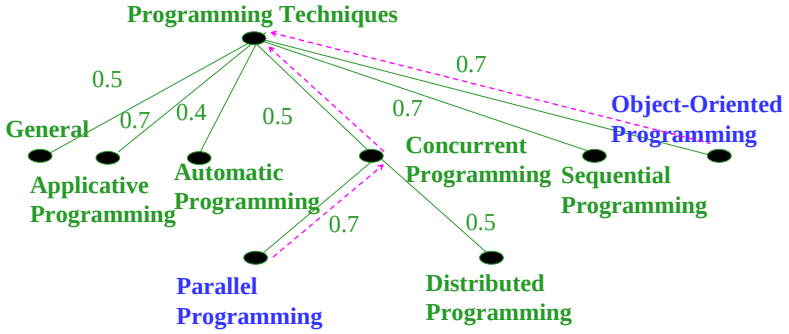
Solution

- Global Similarity — Inner Node Similarity (Class-Oriented)
  - Inner nodes are labeled by classes whose partial subsumption order is represented as a background taxonomy tree (see example on the right)
  - Three factors are considered
    - Shortest path length
    - Weights
    - Depth difference

$$TS(c_1, c_2) = (1 - \frac{N_s}{N_t}) * M * G^{|d_{c_1} - d_{c_2}|}$$

Example

Taxonomy tree for "Programming Techniques" (ACM Computing Classification System)



Motivation 2

Match "$Prefer $800, up to $950" and "$Down to $900, prefer $1000" (leaf nodes).

Solution

- Local Similarity — Leaf Node Similarity (Type-Oriented)
  - Leaf nodes can be typed and each type be associated with a local, special-purpose similarity measure
  - Example types: price, date, currency, and address
- Date similarity measure (e.g., Nov 3, 2004 vs. May 21, 2005)

$$DS(d_1, d_2) = \begin{cases} 0.0 & \text{if } |d_1 - d_2| \geq 365, \\ 1 - \frac{|d_1 - d_2|}{365} & \text{otherwise.} \end{cases}$$

- Range similarity measure (exemplified for prices)
  - From asymmetry to symmetry

"Buyer": $r_1 = \langle B_{pref}, B_{max}]$ "Seller": $r_2 = [S_{min}, S_{pref} \rangle$

B_{pref}:Buyer's preferred price B_{max}:Buyer's maximum price

S_{min}:Seller's minimum price S_{pref}:Seller's preferred price

$$Sim_{<>}(r_1, r_2) = \frac{B_{max} - S_{min}}{\max\{ \text{MAX}, B_{max} \} - \min\{ \text{MIN}, S_{min} \}}$$

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