

# A Stacking and Transfer Learning with Diverse Similarity For Building Multilingual Session-based Recommendation Systems

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## Overall Architecture

In task1 and task2, we designed the 6 stage for building multilingual recommendation system, which is focused on Data Preprocessing, Candidate Generation, Construct Training Samples, Build Ranking Models, Feature Engineering and Blending.

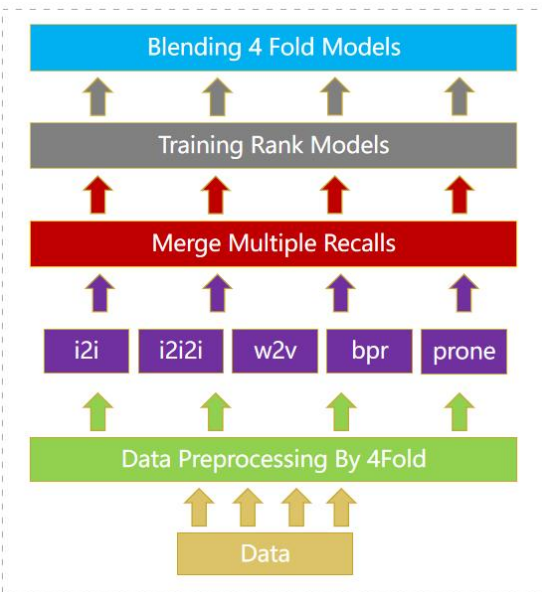


Figure 1: Solution Overall Architecture

## Candidate Generation Strategies

- Item to Item Similarity

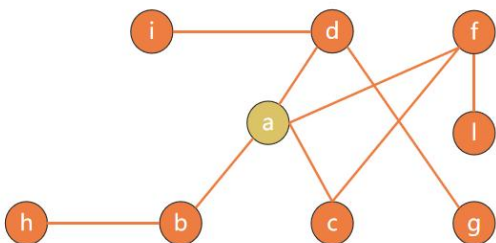


Figure 2: I2I Graph

$$I2I\_Sim(i, j) = \sum_{uc \in U_i \cap U_j} \frac{W_{pos}(i, j) * W_{sessions}(u) * W_{is\_last} * W_{is\_order}}{\sqrt{|i|} * \sqrt{|j|}}$$

$$W_{pos}(i, j) = \frac{1}{\log(|Pos_i - Pos_j| + 1)}$$

$$W_{sessions}(u) = \frac{1}{\log(|sessions| + 1)}$$

$$W_{is\_last} = \begin{cases} 1 & \text{if } is\_last \text{ is True} \\ 0.7 & \text{if } is\_last \text{ is False} \end{cases} \quad (1)$$

$$W_{is\_order} = \begin{cases} 1 & \text{if } is\_order \text{ is True} \\ 0.7 & \text{if } is\_order \text{ is False} \end{cases} \quad (2)$$

- Item to Item to Item Similarity

$$I2I2I\_Sim(i, j) = \sum_K I2I\_Sim(i, k) * I2I\_Sim(k, j)$$

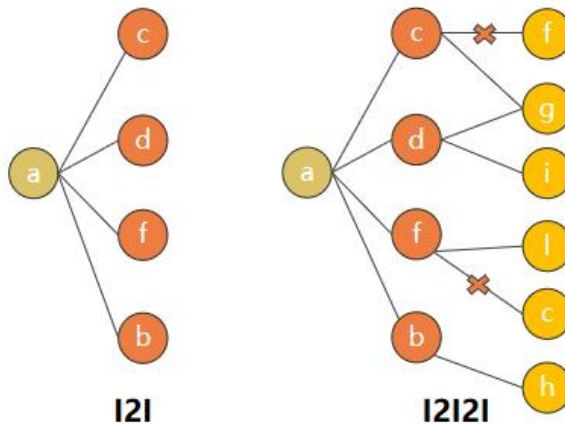


Figure 3: I2I2I similarity constructed by I2I similarity

- Three Embedding Similarities  
we used W2V, BPR, ProNe generated embeddings to re-rank i2i2i similarity.

## U2I2I modeling approach

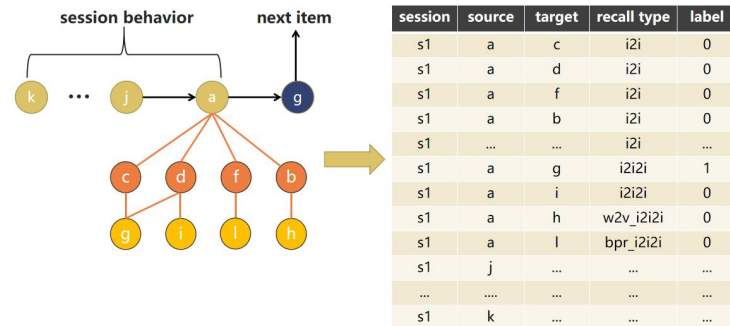


Figure 4: Construct Training Samples By U2I2I

## Stacking Features For Task1 & Task2

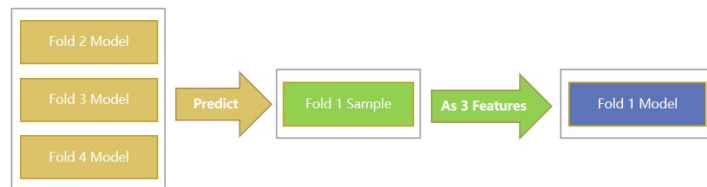


Figure 5: Fold 2,3,4 Models Predict Fold 1 Sample by Stacking  
Transfer Learning Features For Task2

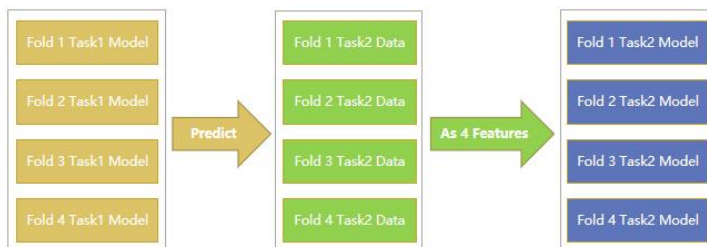


Figure 6: Task1 Patterns Transfer to Task2

## EXPERIMENTS

Task	Metric	Rank
Task1	MRR@100=0.41170	2nd
Task2	MRR@100=0.46578	2nd