TEM: Tree-enhanced Embedding Model for Explainable Recommendation

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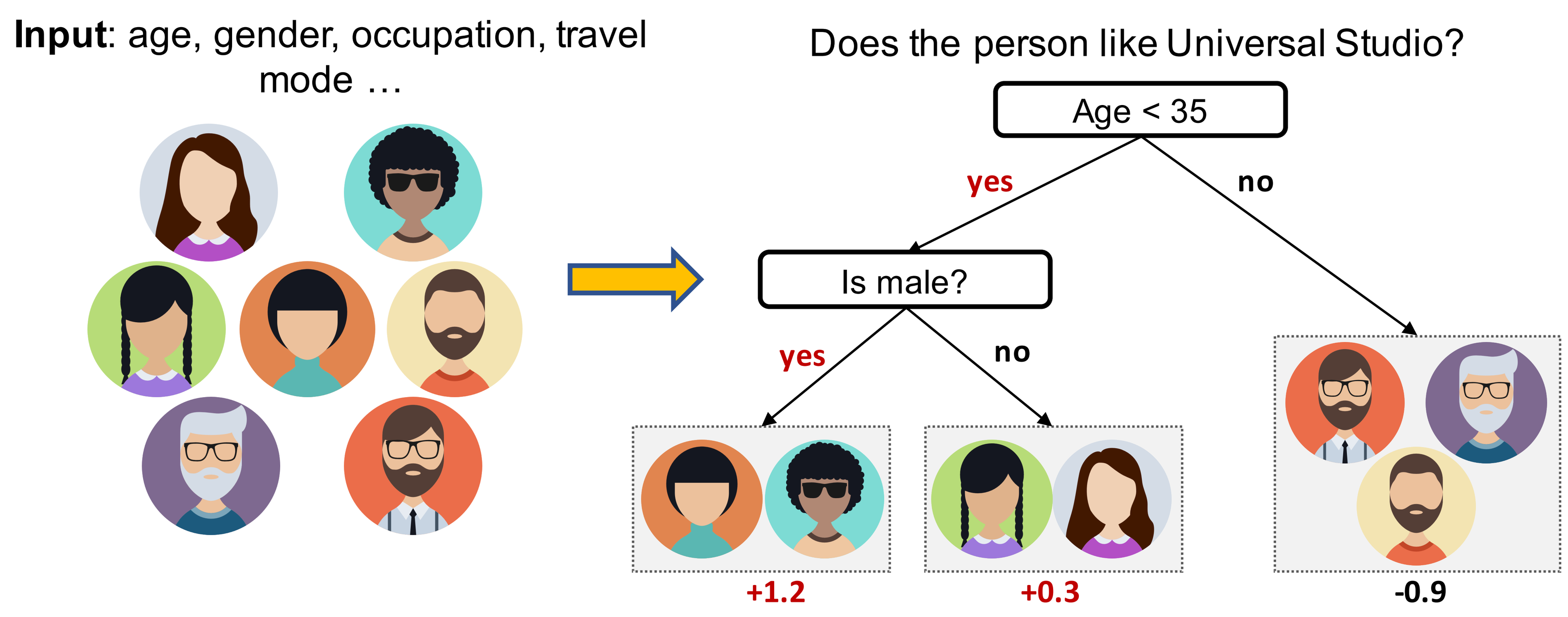
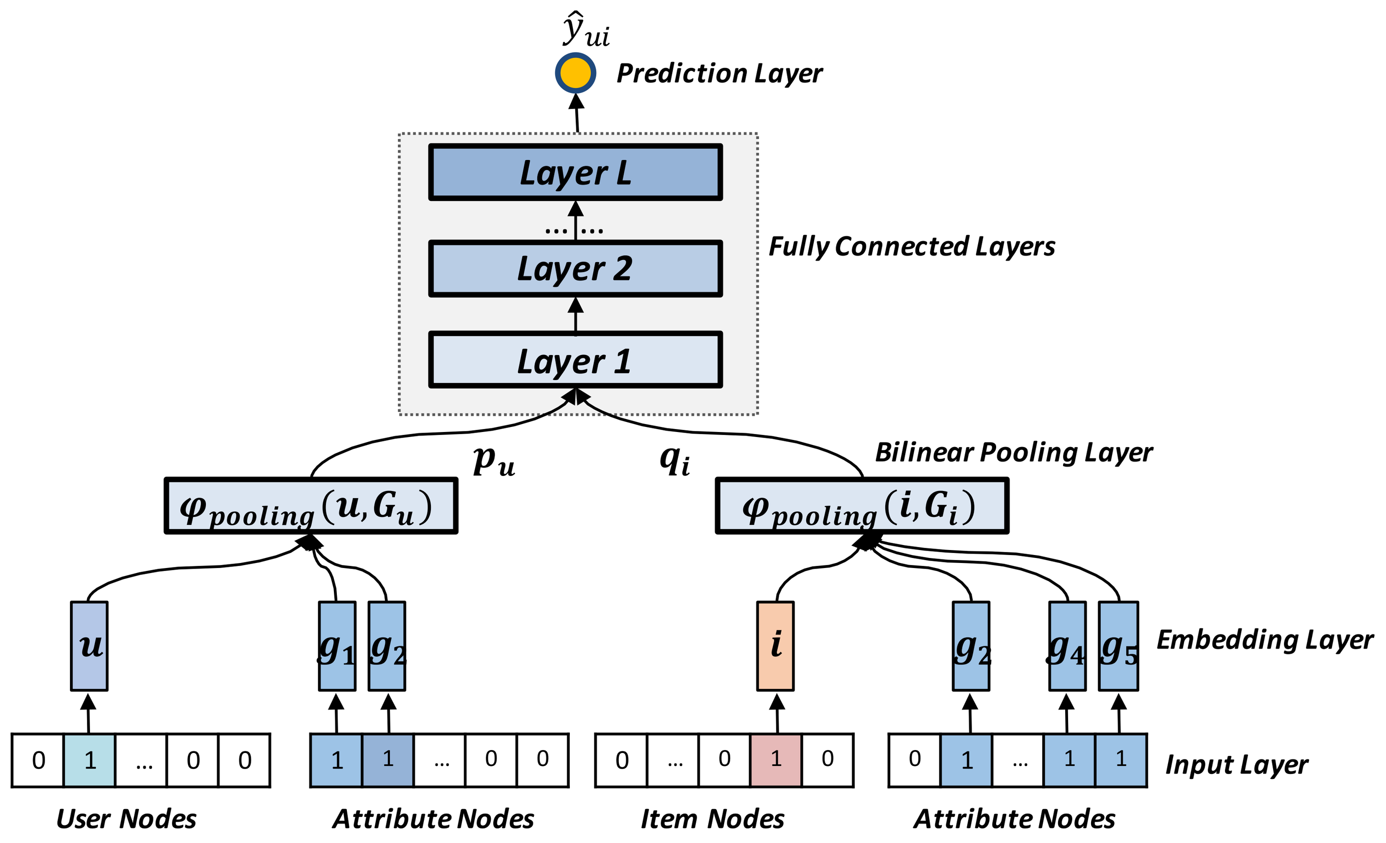
Background

- Tree-based models are easily explainable, but they have limited representation power.



prediction score in each leaf node

- Neural recommendation methods (e.g., NCF and NFM) operate as a black-box, very expressive yet hardly understood by end users.

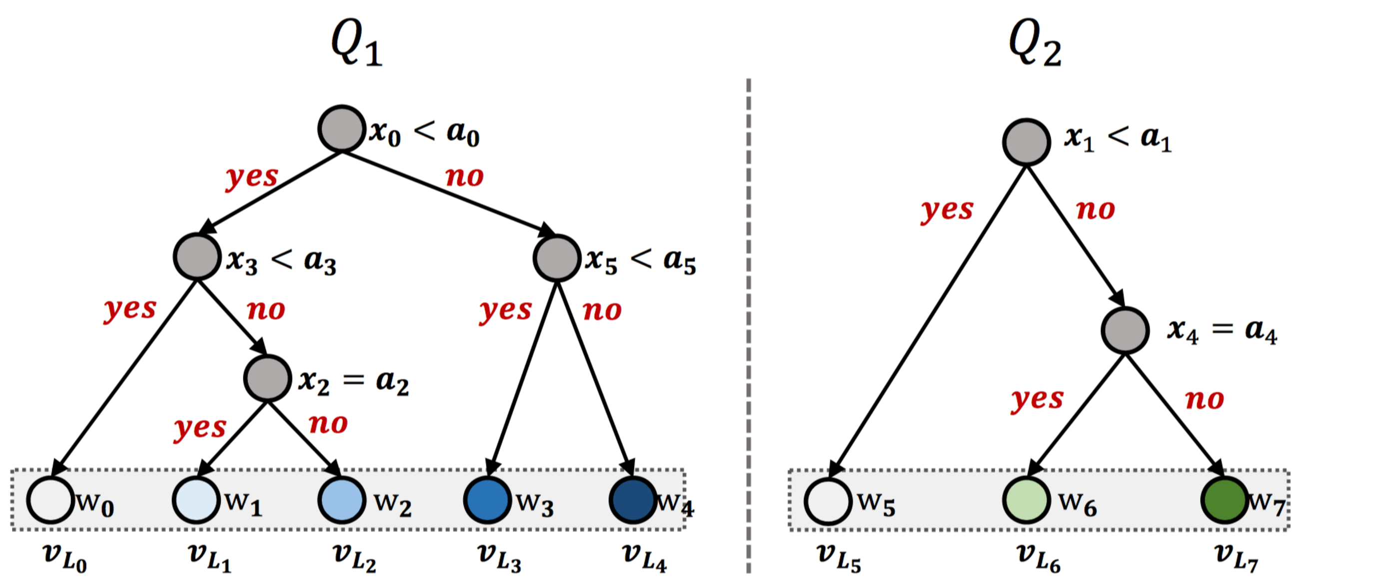


Jerry: {luxury travel, art lover} *Marina Bay Sands: {luxury travel, family travel, nightlife}*

- Promising applications
  - Recommender systems provide sound reasons on why the product is suitable choice.
  - Injecting explainability, recommendations will assist merchants to make informed decisions.

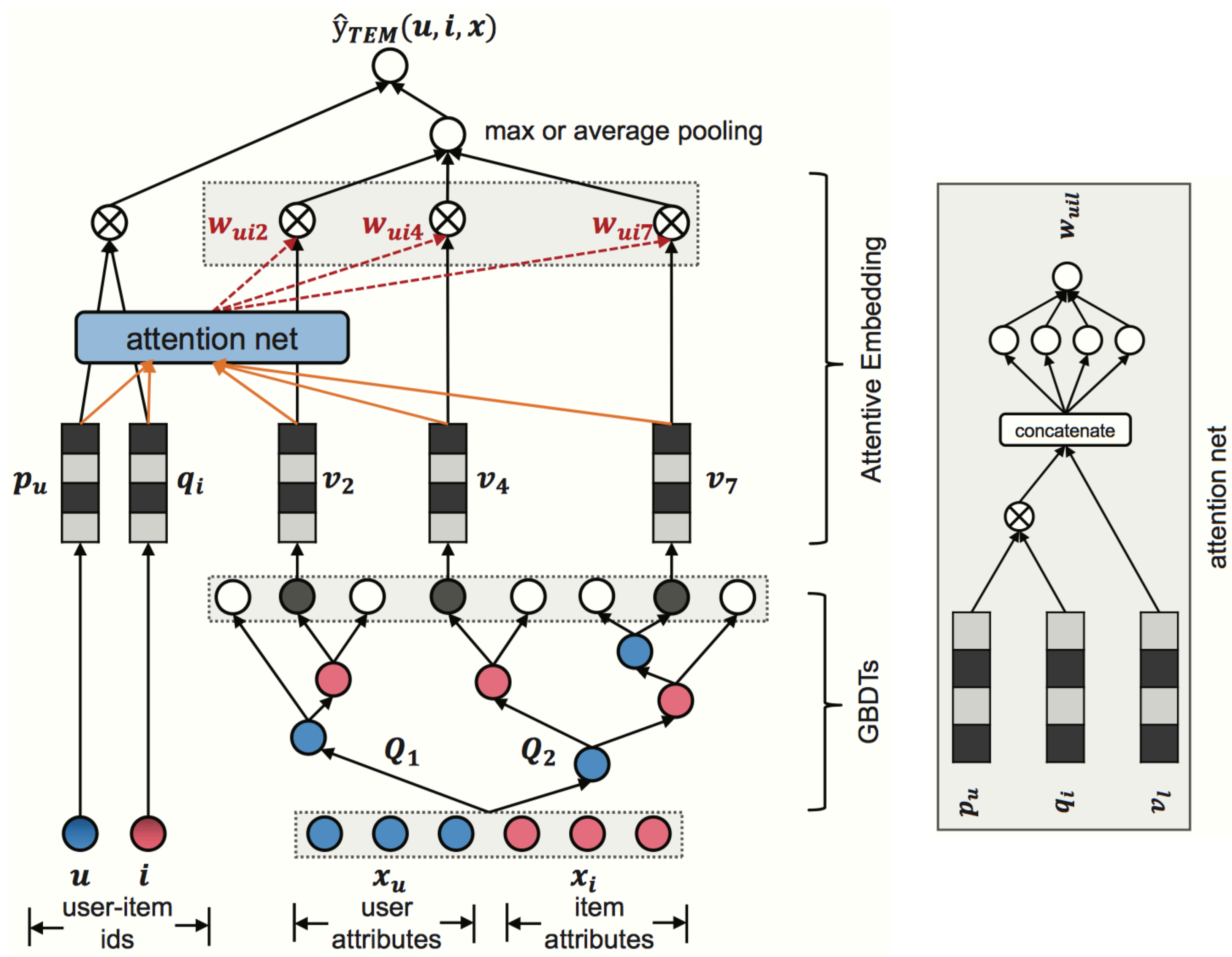
Explainable Recommendation

- We first employ a tree-based model to learn explicit decision rules (aka. cross features) from the rich side information



$x_0 \leftarrow$ *Age* $a_0 \leftarrow 18$	$x_1 \leftarrow$ *Expert Level* $a_1 \leftarrow 4$	$x_2 \leftarrow$ *Restaurant Tag* $a_2 \leftarrow$ *French*
$x_3 \leftarrow$ *Country* $a_3 \leftarrow$ *France*	$x_4 \leftarrow$ *Traveler Style* $a_4 \leftarrow$ *Luxury Traveler*	$x_5 \leftarrow$ *Price* $a_5 \leftarrow$ *$$$$*

- We next design an embedding model that can select the most predictive cross features based on the user-item attention scores.



Experimental results

>> Dataset Statistics

- **TripAdvisor**
- Attraction Recommendation in London
- Restaurant Recommendation in New York City

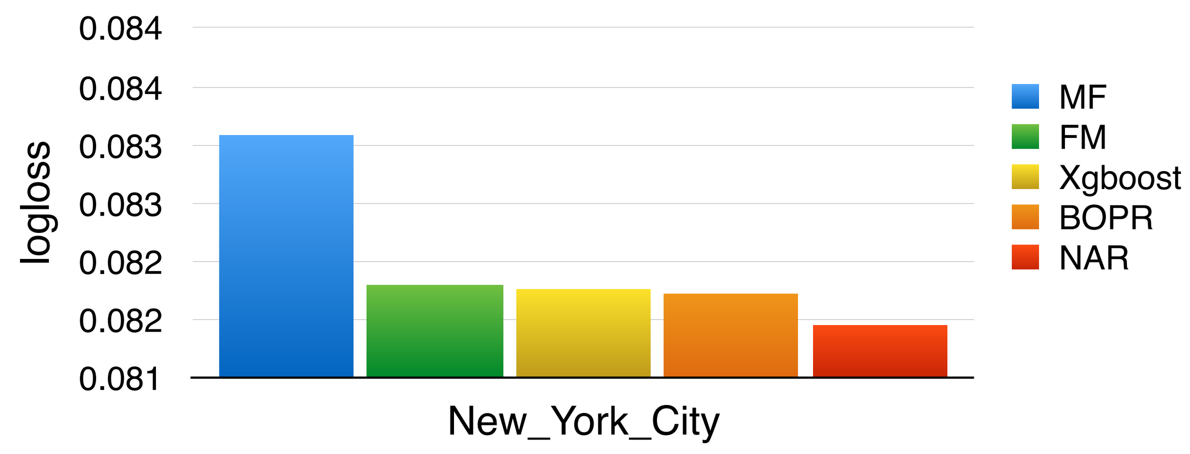
Table 2: Statistics of the datasets.

Dataset	User#	User Feature#	Item#	Item Feature#	Interaction#
LON-A	16,315	3,230	953	4,731	136,978
NYC-R	15,232	3,230	6,258	10,411	129,964

Table 3: Statistics of the side information, where the dimension of each feature is shown in parentheses.

Side Information	Features (Category#)
LON-A/NYC-R User Feature	Age (6), Gender (2), Expert Level (6), Traveler Styles (18), Country (126), City (3,072)
LON-A Attraction Feature	Attributes (89), Tags (4,635), Rating (7)
NYC-R Restaurant Feature	Attributes (100), Tags (10,301), Price (3), Rating (7)

>> Restaurant Recommendation



>> Restaurant Recommendation

- <City: Florida, Style: Nightlife Seeker, Age: 50-64> will visit <Per Se>
- <City: SanFrans, Style: Family Travel, Age: 65+> will visit <Gabriel Kreuther>

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