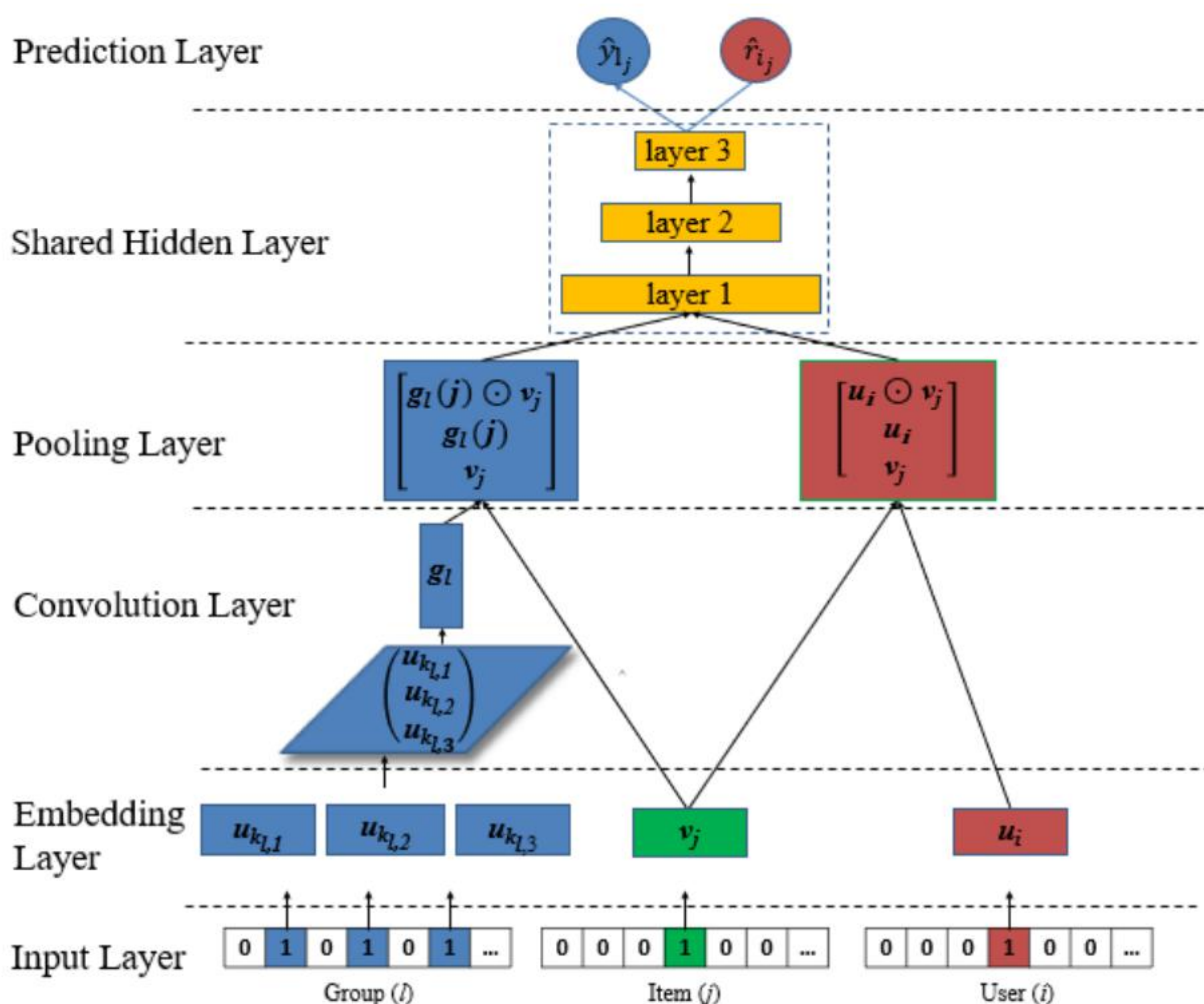
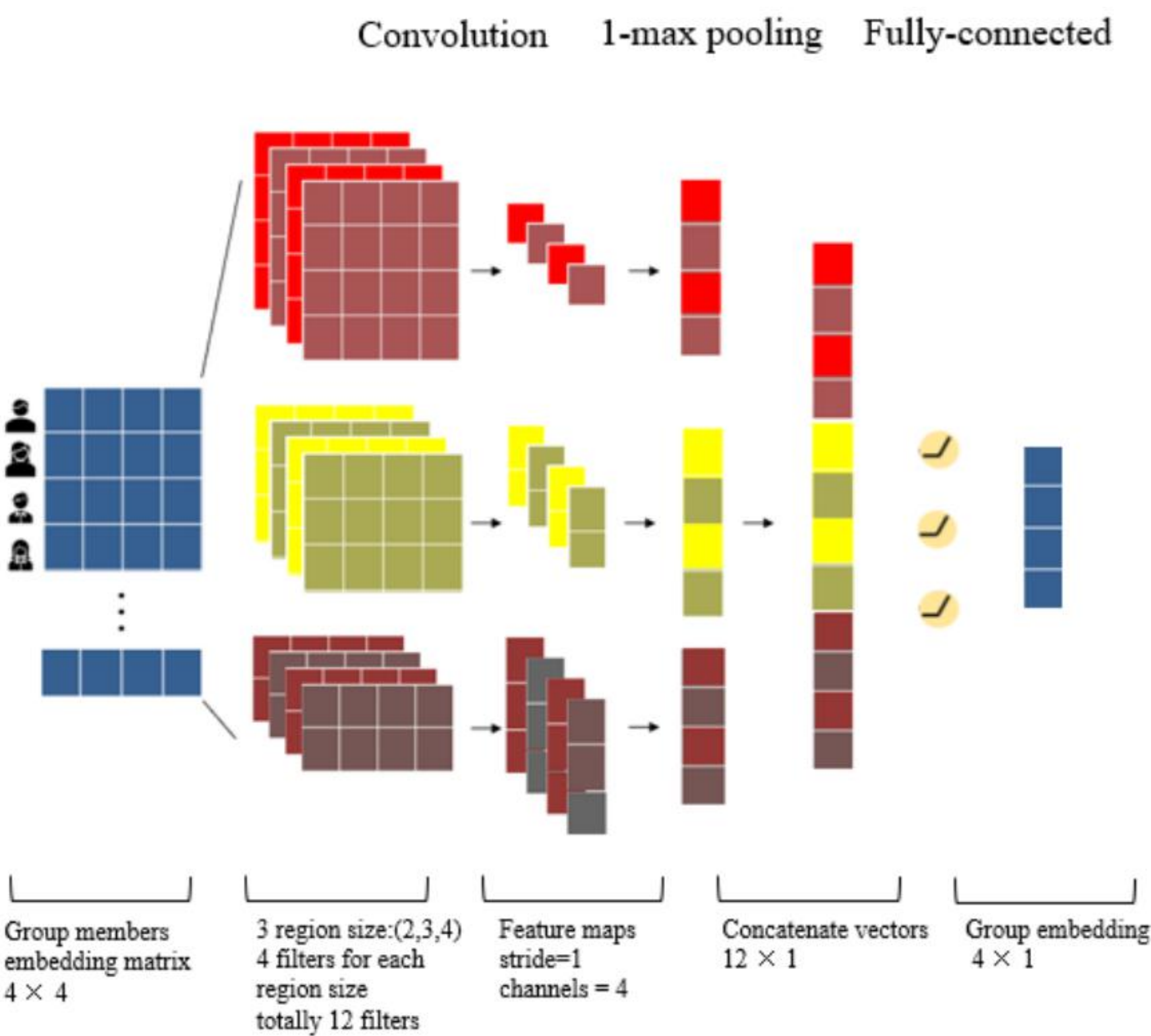


Overview

- 群组推荐问题的关键在于如何对组内各成员不同的偏好进行融合来适应所有成员的需求。
- 本文在AGREE模型的基础上重构了群组偏好融合模块并引入了卷积神经网络来提取群组成员的特征实现偏好融合。
- 改进后模型训练速度提高了14倍，因此称之为FastGR (Fast Group Recommendation)。



Main Steps



算法 1: AGREE 组内成员嵌入向量聚合^[1]

Input: Group inputs and item inputs^[1]

Output: Group embedding^[1]

```
1 for i=1 to batch_size do[1]
2   get members for each group;[1]
3   get interact items for each member;[1]
4   members_embeds = embedding_layer(members);[1]
5   item_embeds = embedding_layer(items);[1]
6   attention_score=attention_layer(concat(members_embeds, item_embeds));[1]
7   group_embeds = members_embeds × attention_score[1]
8 end for[1]
9 group_embeds = concat(group_embeds);[1]
10 return group_embeds;[1]
```

算法 2: FastGR 组内成员嵌入向量聚合^[2]

Input: Group inputs^[2]

Output: Group embedding^[2]

```
1 for i=1 to batch_size do[2]
2   get members for each group;[2]
3   padding members to fixed length;[2]
4   append members to members_list;[2]
5 end for[2]
6 members_matrix = embedding_layer(members_list);[2]
7 group_embeds = conv_layer(members_matrix);[2]
8 return group_embeds[2]
```

将组内的成员看作构成句子的词语，通过纵向拼接组内成员的嵌入向量 u_i 得到一个二维矩阵 $u_{1:n}$ 。

$$\mathbf{e}_0 = \phi_{pooling}(\mathbf{g}_l(j), \mathbf{v}_j) = \begin{bmatrix} \mathbf{g}_l(j) \odot \mathbf{v}_j \\ \mathbf{g}_l(j) \\ \mathbf{v}_j \end{bmatrix}$$

$$\mathbf{u}_{1:n} = \mathbf{u}_1 \oplus \mathbf{u}_2 \oplus \dots \oplus \mathbf{u}_n,$$

$$c_i = f(\mathbf{w} \cdot \mathbf{u}_{i:i+h-1} + \mathbf{b}),$$

$$\mathcal{L}_{group} = \sum_{(l,j,s) \in O'} (y_{ljs} - \hat{y}_{ljs})^2 = \sum_{(l,j,s) \in O'} (\hat{y}_{lj} - \hat{y}_k - 1)^2$$

Experiments

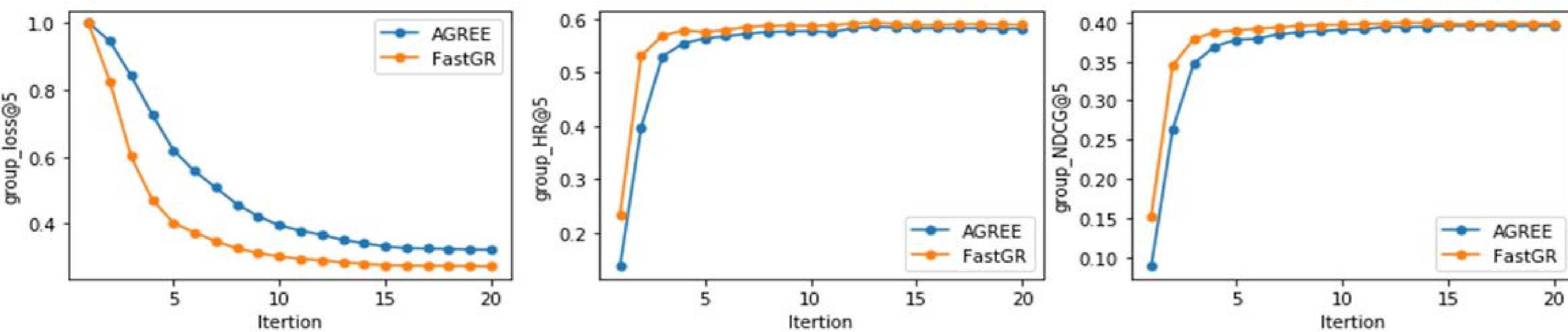


Fig. 3 Performance comparison on CAMRa2011^[1]

图 3 模型性能比较

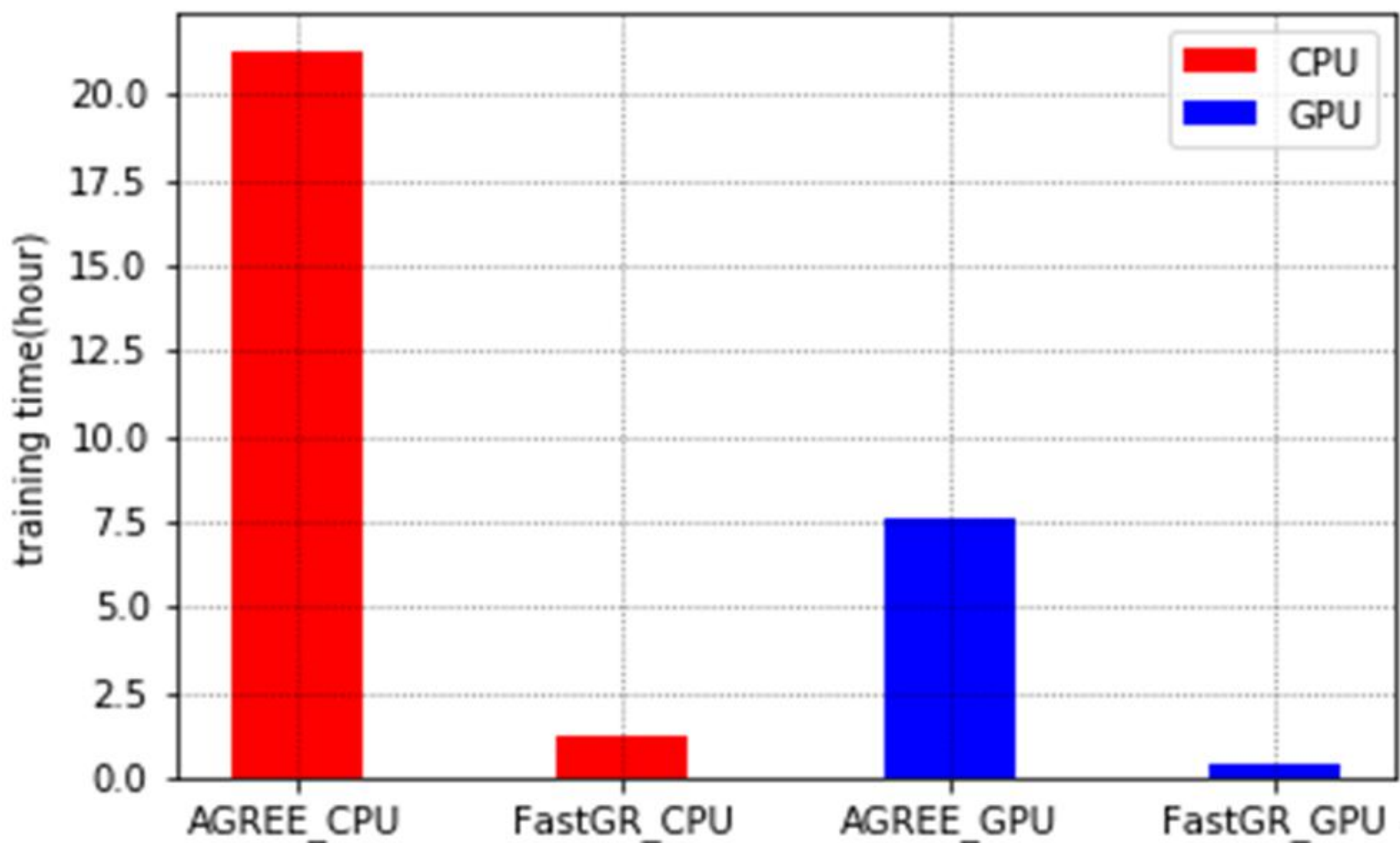


Table 1 The Performance Results on CAMRa2011

表 1 在 CAMRa2011 上的实验结果

模型	group_loss	Hit Ratio	NDCG
NCF	0.2905	0.5803	0.3896
GREE	0.2890	0.5883	0.3871
AGREE	0.2883	0.5883	0.3955
FastGR	0.2779	0.5931	0.3983

Table 2 Efficiency Results on CAMRa2011

表 2 在 CAMRa2011 上的训练与推理时间

模型	CPU	GPU	CPU	GPU
	Training	Training	Prediction	Prediction
	Time(h)	Time(h)	Time(s)	Time(s)
AGREE	22.27	7.615	25.0	47.1
FastGR	1.623	0.3555	15.1	14.8

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