A APPENDIX.

A.1 Manually defined entities type scoring table.

We score the candidate phrase by the manually defined entities type scoring table. In Table 1, there are 18 entity types and corresponding scores.

Table 1: Manually defined entities type scoring table.

Entity	Score	Entity	Score
Category	1.0	Quality	1.0
Category modifier	1.0	Proper noun	1.0
Brand	1.0	Prefix	0.75
Material	1.0	Suffix	0.75
Color	1.0	Unit	0.5
Efficacy	1.0	Time and Season	0.5
People	1.0	Symbol	0.25
Size	1.0	Number	0.25
Location	1.0	Common	0.1

A.2 The impact of hyper-parameters α and β.

We explore the impact of hyper-parameters α and β of **CC-GNN**. We change one hyper-parameter at a time and set the other hyper-parameter equals to 1.
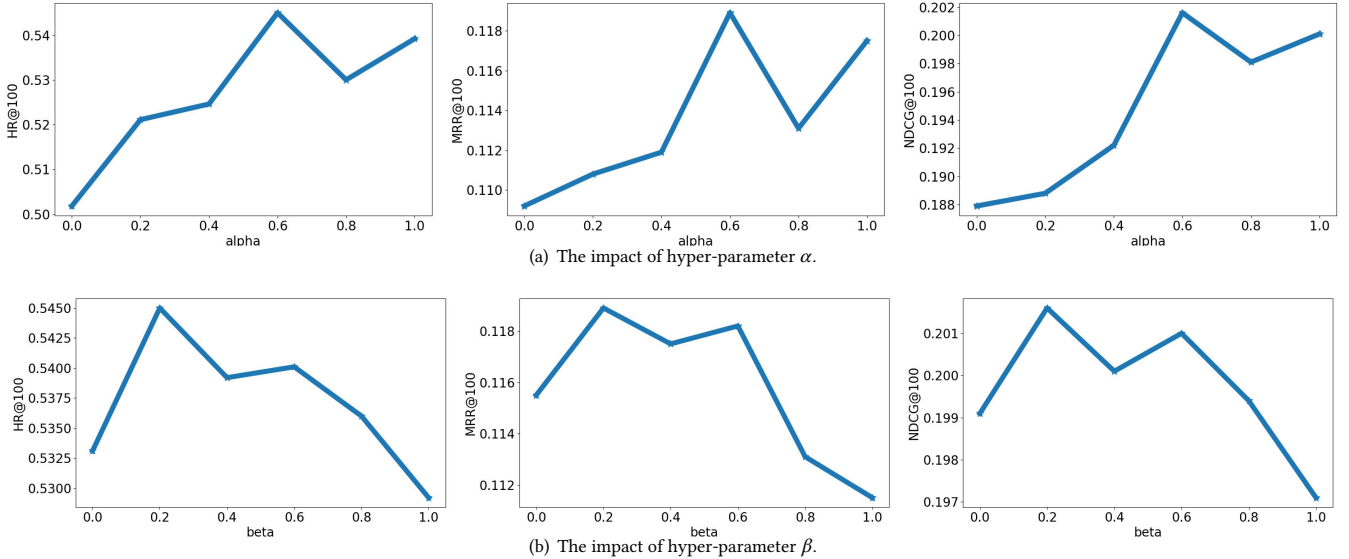

(a) The impact of hyper-parameter α.

(b) The impact of hyper-parameter β.

Figure 1: The impact of α and β on CC-GNN.

Results and Analysis. (1) The hyperparameter α controlls the $\mathcal{L}_{cl}$. The $HR@100$, $MRR@100$ and $NDCG@100$ is relatively stable and get best performance when $\alpha = 0.6$. (2) The hyperparameter β controls the $\mathcal{L}_{cl_c}$. **CC-GNN** gets best result when $\beta = 0.2$. As the β increases, the experimental effect decreases, which shows that $\mathcal{L}_{cl_c}$ may cause the performance of the head queries and warm items to decrease while improving the long tail queries and cold start items. β should be controlled.