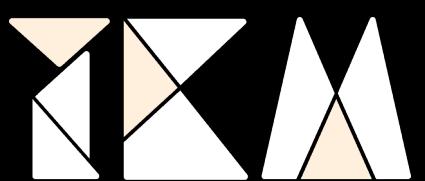


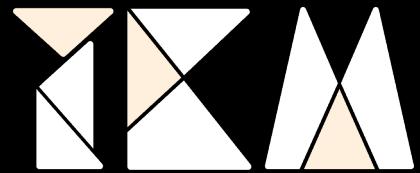
NCKU × IKM

個人進度報告

葉家任

@ 2022/09





# 進度一覽

01 序列推薦系統深度調查

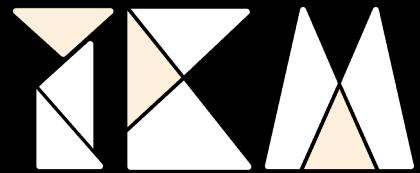
02 推薦系統廣度調查

03 其他 AI 領域調查

# 01

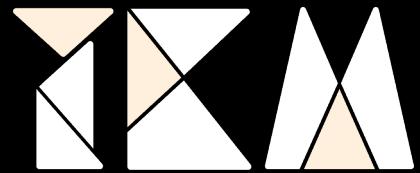
## 序列推薦系統 深度調查



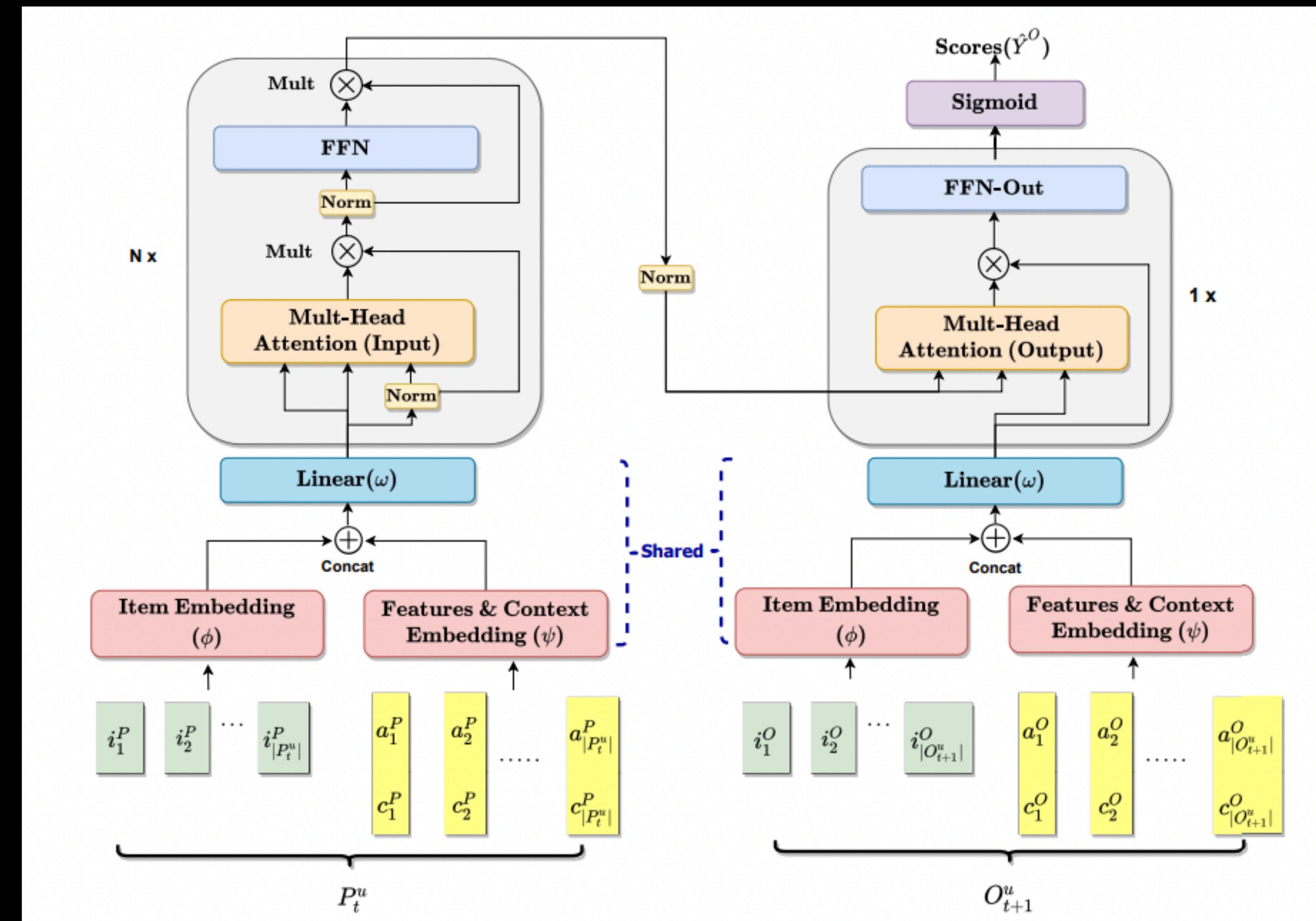


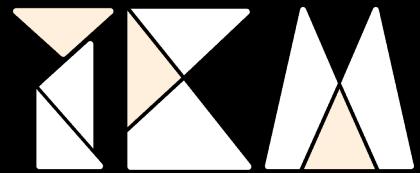
# 1-1 CARCA 模型

Context and Attribute-Aware Next-Item Recommendation via Cross-Attention

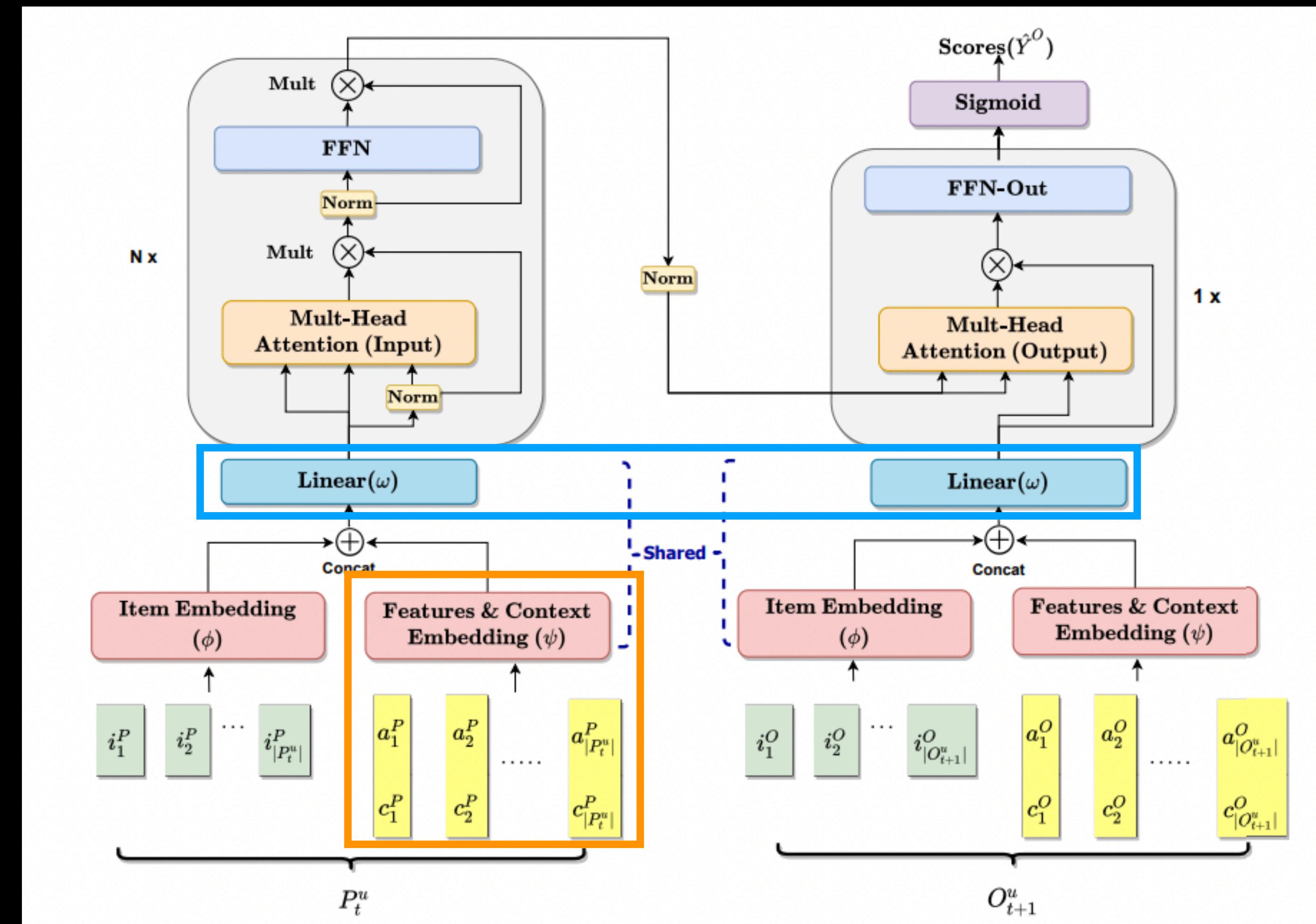


## 1-1-1 模型架構



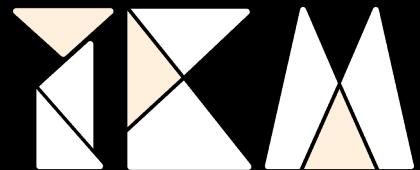


## 1-1-1 模型架構



Additional Linear layer

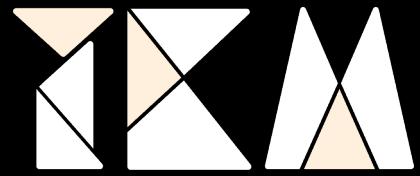
Image attribution(Generate from Resnet50) & time context



## 1-1-2 模型績效

Model	ATT	CXT	SEQ	Men		Fashion		Games		Beauty	
				HR@10	NDCG@10	HR@10	NDCG@10	HR@10	NDCG@10	HR@10	NDCG@10
Random				0.098	0.044	0.099	0.045	0.100	0.045	0.099	0.045
TopPop				0.415	0.269	0.407	0.262	0.519	0.314	0.451	0.261
EASE [22]				0.193	0.133	0.213	0.146	0.623	0.465	0.299	0.222
GraphRec [16]	✓			0.374	0.219	0.419	0.244	0.613	0.400	0.435	0.273
DeepFM [6]	✓	✓		0.334	0.237	0.283	0.185	0.736	0.494	0.464	0.266
SASRec [12]			✓	0.397	0.259	0.381	0.245	0.742	0.541	0.485	0.322
OAR [26]		✓	✓	0.355	0.225	0.340	0.214	0.704	0.496	0.485	0.329
TiSASRec [13]		✓	✓	0.333	0.194	0.384	0.234	0.748	0.533	0.492	0.333
BERT4Rec [23]			✓	0.315	0.193	0.328	0.209	0.705	0.509	0.478	0.318
SSE-SASRec [27]			✓	0.397	0.257	0.385	0.248	0.754	0.549	0.481	0.330
SSE-PT [28]			✓	0.397	0.258	0.381	0.246	0.748(0.775)	0.545(0.566)	0.443(0.502)	0.302(0.337)
$S^3$ Rec [36]	✓	✓		0.365	0.238	0.367	0.239	0.765	0.549	0.538	0.371
SASRec++ (Our extension)	✓	✓	✓	0.500	0.315	0.546	0.344	0.752	0.533	0.545	0.351
CARCA (w/o CA) (Ours)	✓	✓	✓	0.521	0.322	0.568	0.359	0.738	0.517	0.556	0.358
CARCA (Ours)	✓	✓	✓	0.550*	0.349*	0.591*	0.381*	0.782*	0.573*	0.579*	0.396
Improv. vs best published baseline (%)				38.65	35.87	53.71	53.24	2.20	4.38	7.70	6.74
Improv. vs SASRec++ (%)				10.09	10.79	8.25	10.67	3.96	7.64	6.31	12.95

(\*) Significantly outperforms the best baseline at the 0.01 levels.  
 Published results of SSE-PT are indicated in parentheses.



# 1-2 BiTVAE-Rec

My Thesis Model

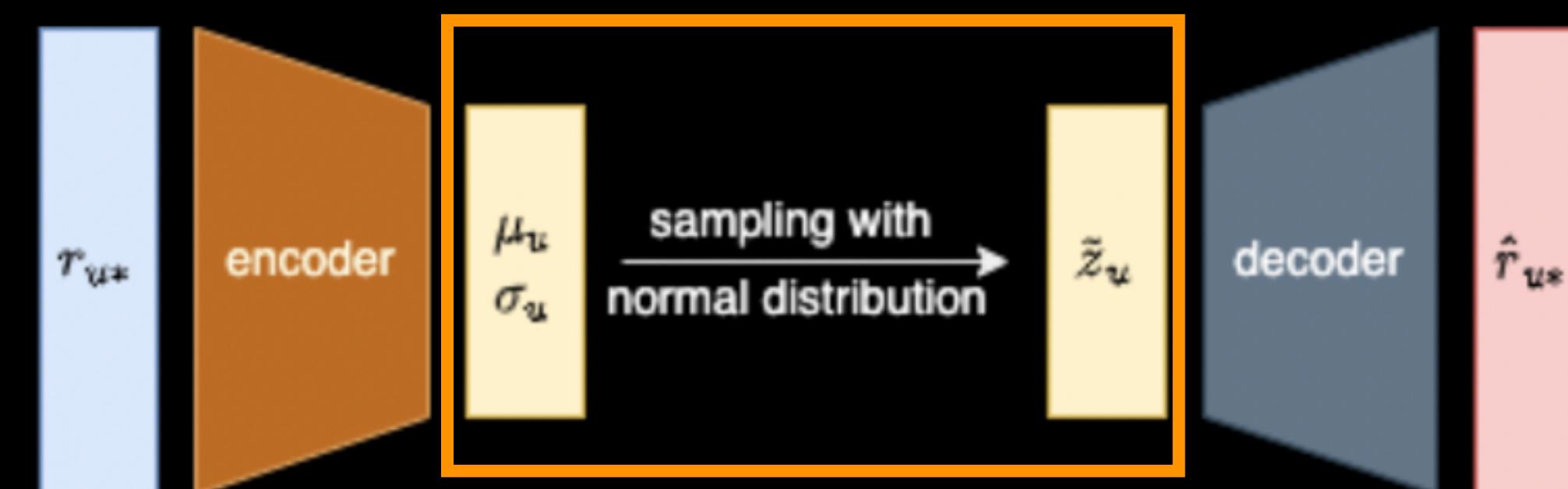
# 1-2-1 Motivation

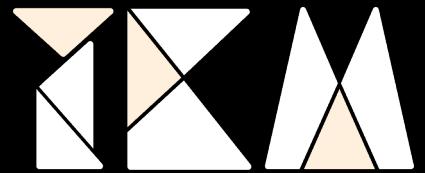
序列推薦模型與CF模型關注的維度不同

- 序列推薦模型關注購買商品的上下文關係
- CF模型 (VAECF, GCN...etc) 關注是用戶與商品的相似程度

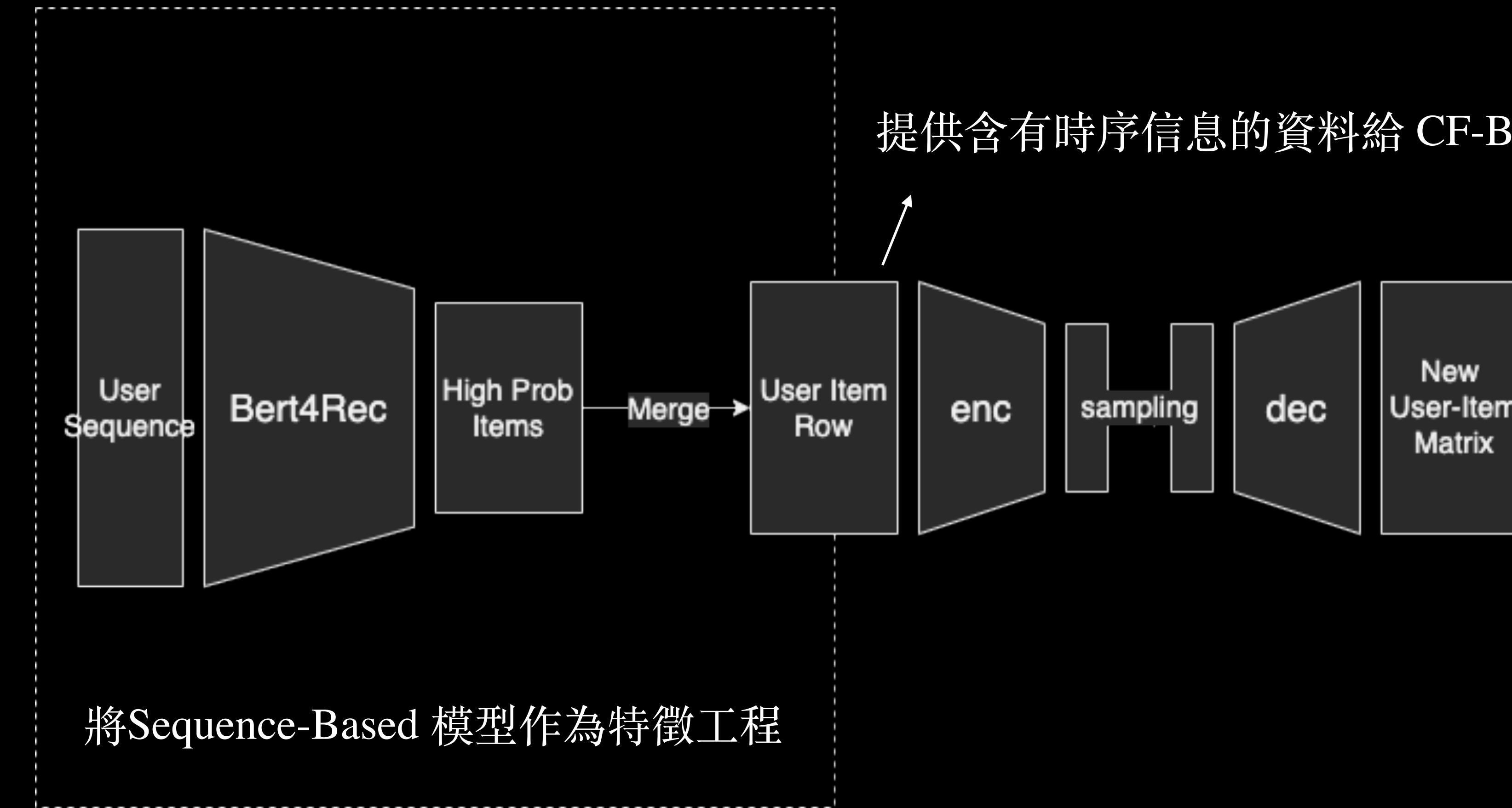
VAECF 透過 Variational Inference 得到了較抽樣分佈更貼近真實分佈的分佈

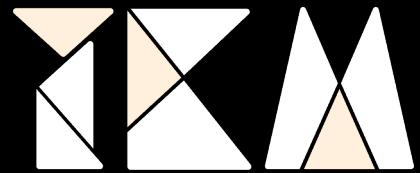
- 推測其 latent factor 具濃縮用戶與商品相似程度的資訊





## 1-2-2 構想(old)





# 1-2-2 構想(new)

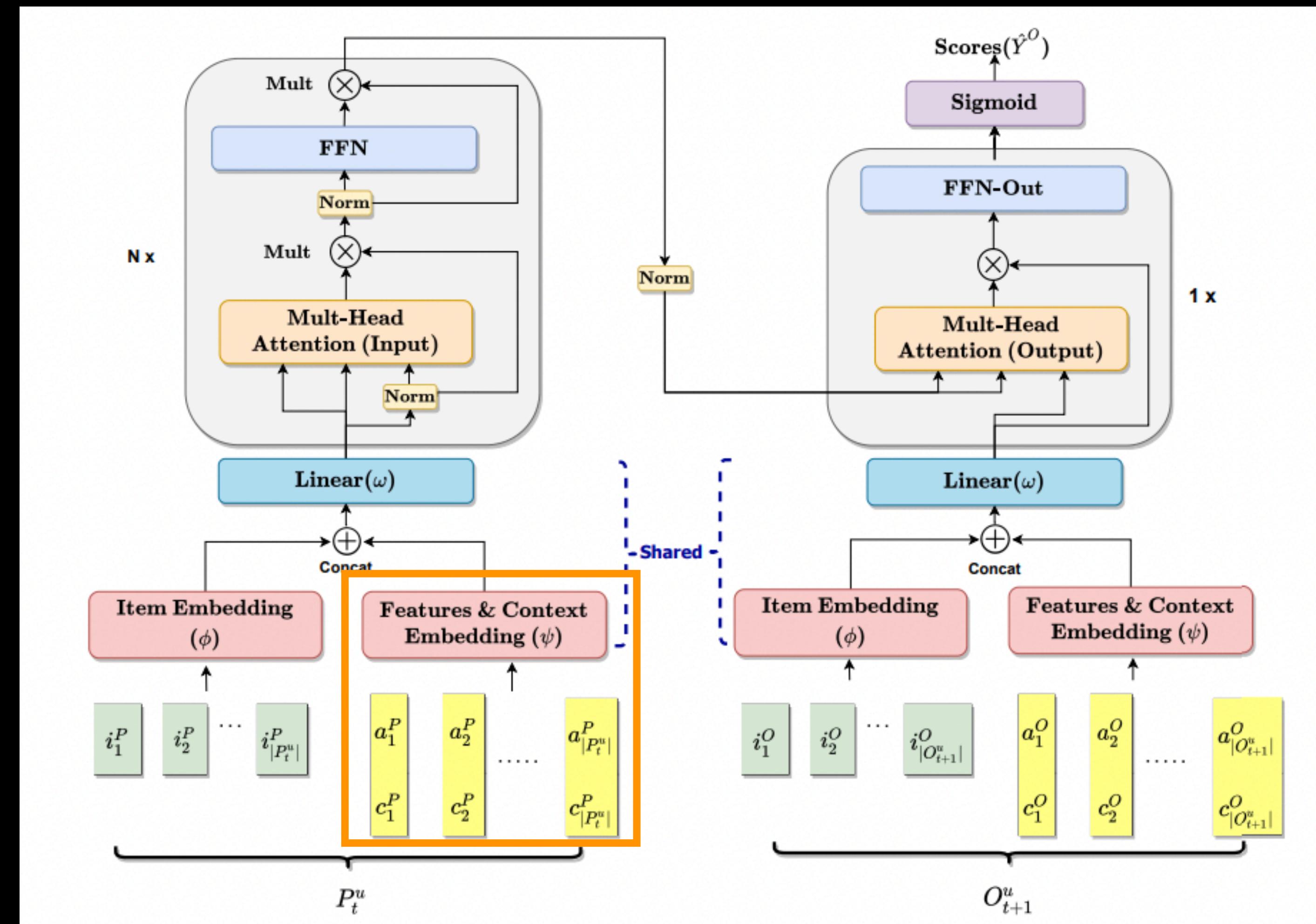
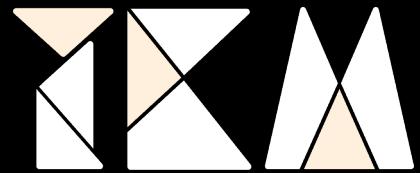
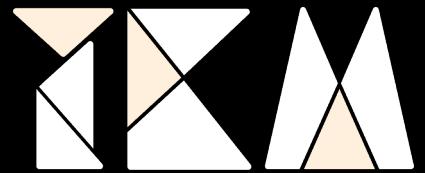


Image attribution VAE latent factor & time context

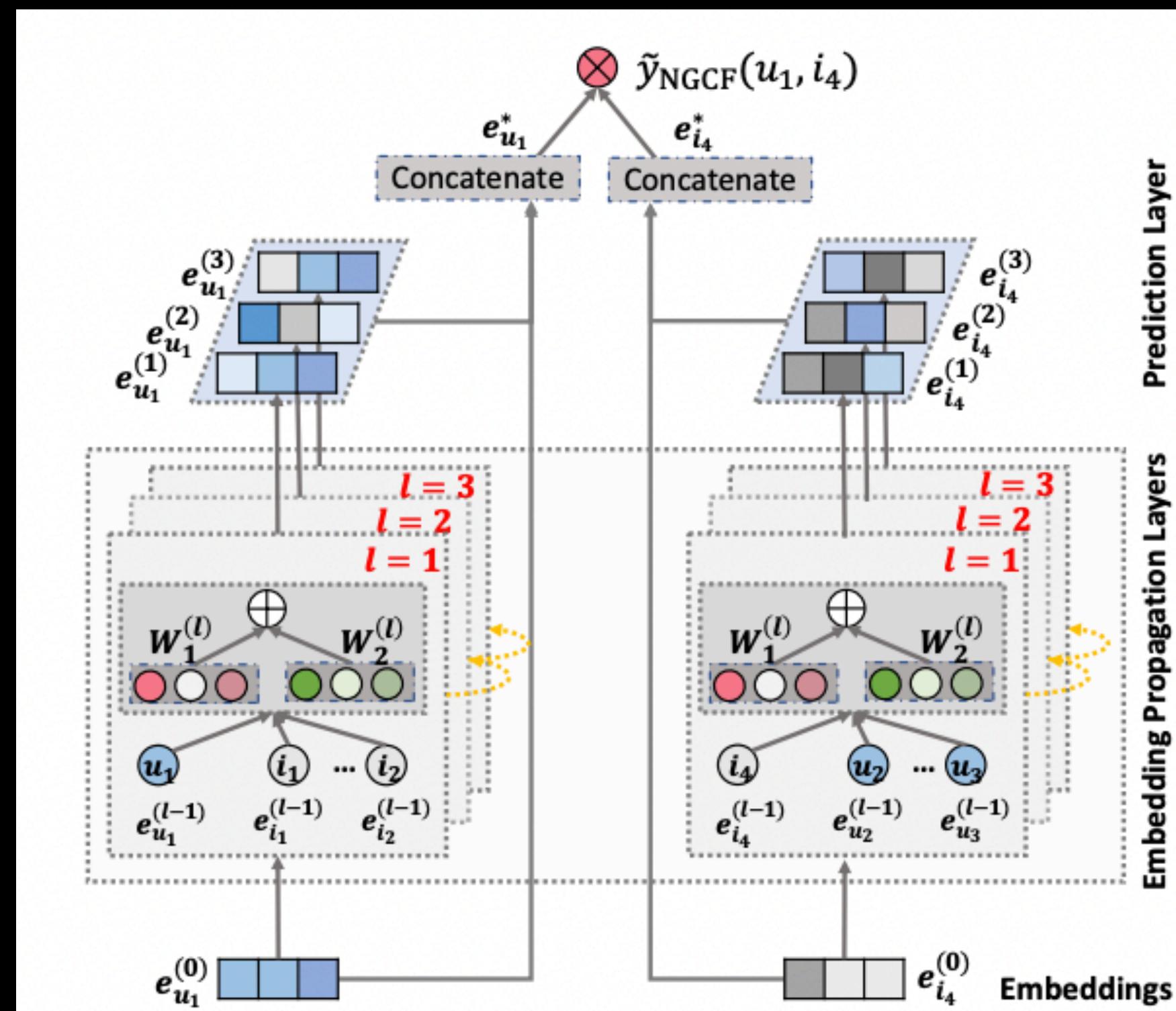


## 02 推薦系統廣度調查

NGCF, LightGCN, DeepFM

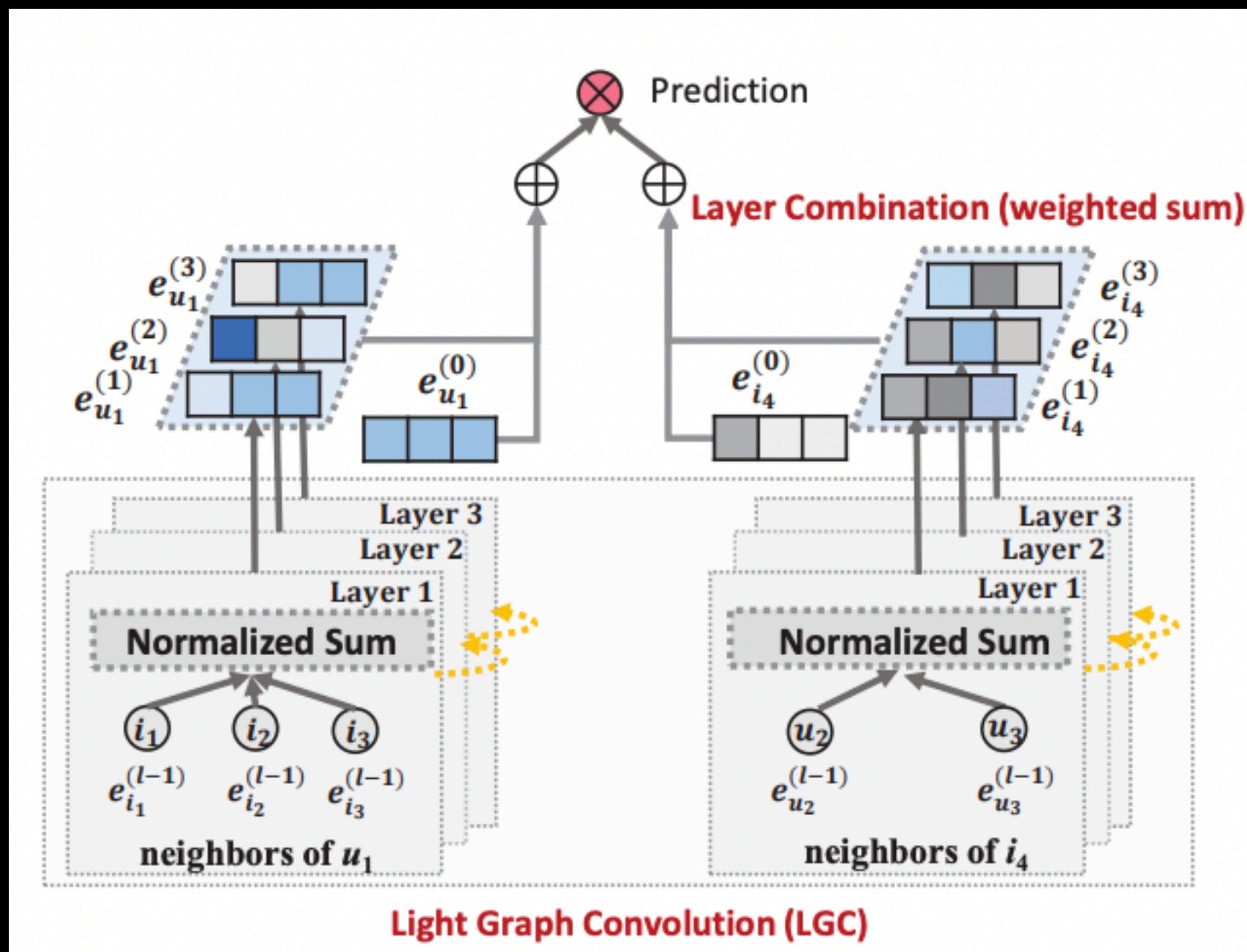


## 2-1 NGCF



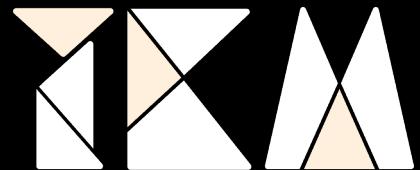
- NGCF 成功將 GCN 模型應用在推薦系統上
- 並且其除了將 Item 與 User 進行 Embedding，也可以針對來自 Item 或 User 的特徵轉變成 node 的權重

## 2-2 lightGCN



LightGCN 指出，NGCF 使用特徵權重與 non-linear activation 並無法有效提高準確度，並且增加了模型訓練的難度

因此該篇論文提出了簡化的模型結構(只需要用戶的交易紀錄)，並能以更好的效率達成更好的準確率



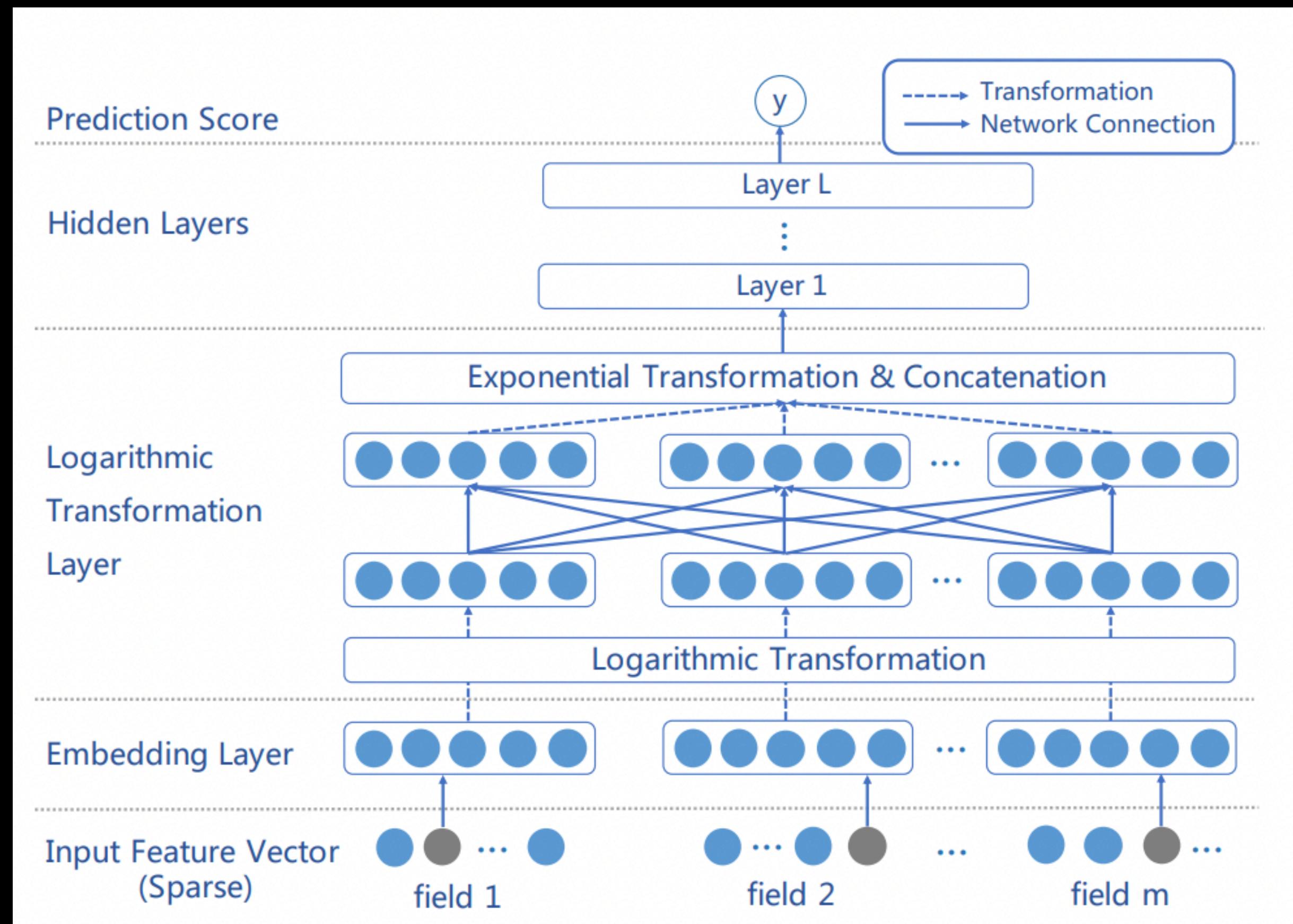
## + Compare with VAE & BiVAE

```
In [60]:  
0.3510064372794915 # vae  
0.36926231217818484 # bivae  
0.35 # light_recall
```

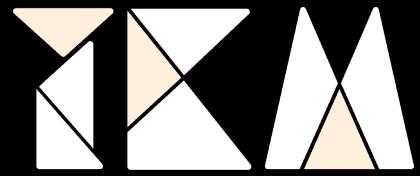
在 Movie Len 資料集上做的小實驗，在調參過後發現 lightGCN 效果並不能夠穩定打敗 VAECF (在目前測試出的最高分中也輸給 VAECF)

- 較少的 epoch 上，LightGCN 表現效果較好
- 較多的 epoch 上，VAECF 表現效果較好，同時 LightGCN 會隨著 epoch 越多準確定越低(Overfitting)
- 同樣的 epoch 下，LightGCN 的訓練速度比 VAECF 慢得多

# 2-3 Deep FM Series: AFN (AAAI'20)



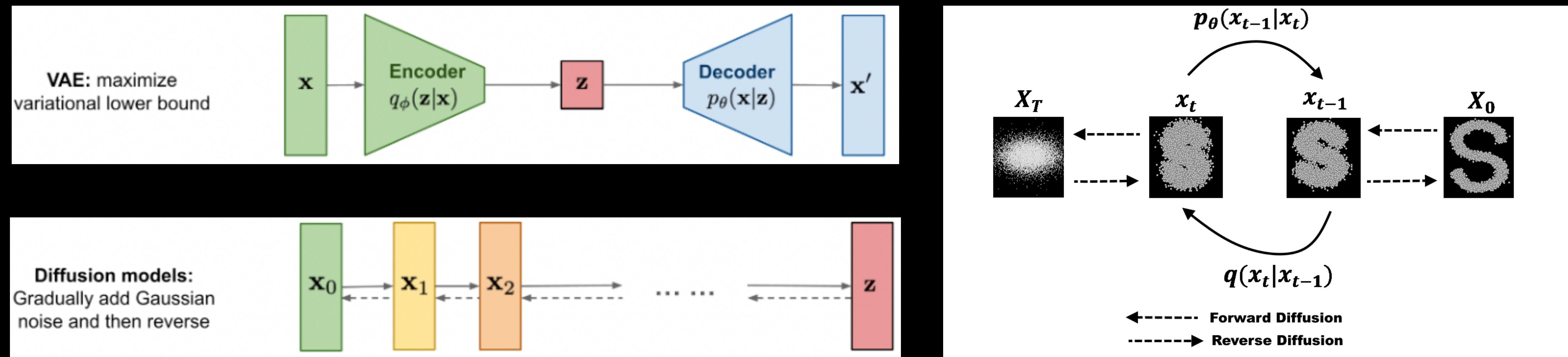
- Factorization-based methods 篩選特徵的重要性來增加預測的精準度
- 但一般的DeepFM 模型往往枚舉所有交叉特徵的影響，使得：
  - 計算成本龐大
  - 計算大量無關的特徵，可能產生 noisy 使得模型表現成果更差
- AFN 使用 **logarithmic transformation layer** 將每個特徵權重轉換成可學習的 係數 (coefficient)
  - 透過此方式即取得了更好的預測結果



## 03 其他 AI 領域調查

Diffusion Model, Dalle E, Midjourney & Stable Diffusion

# 3-1 Diffusion Model



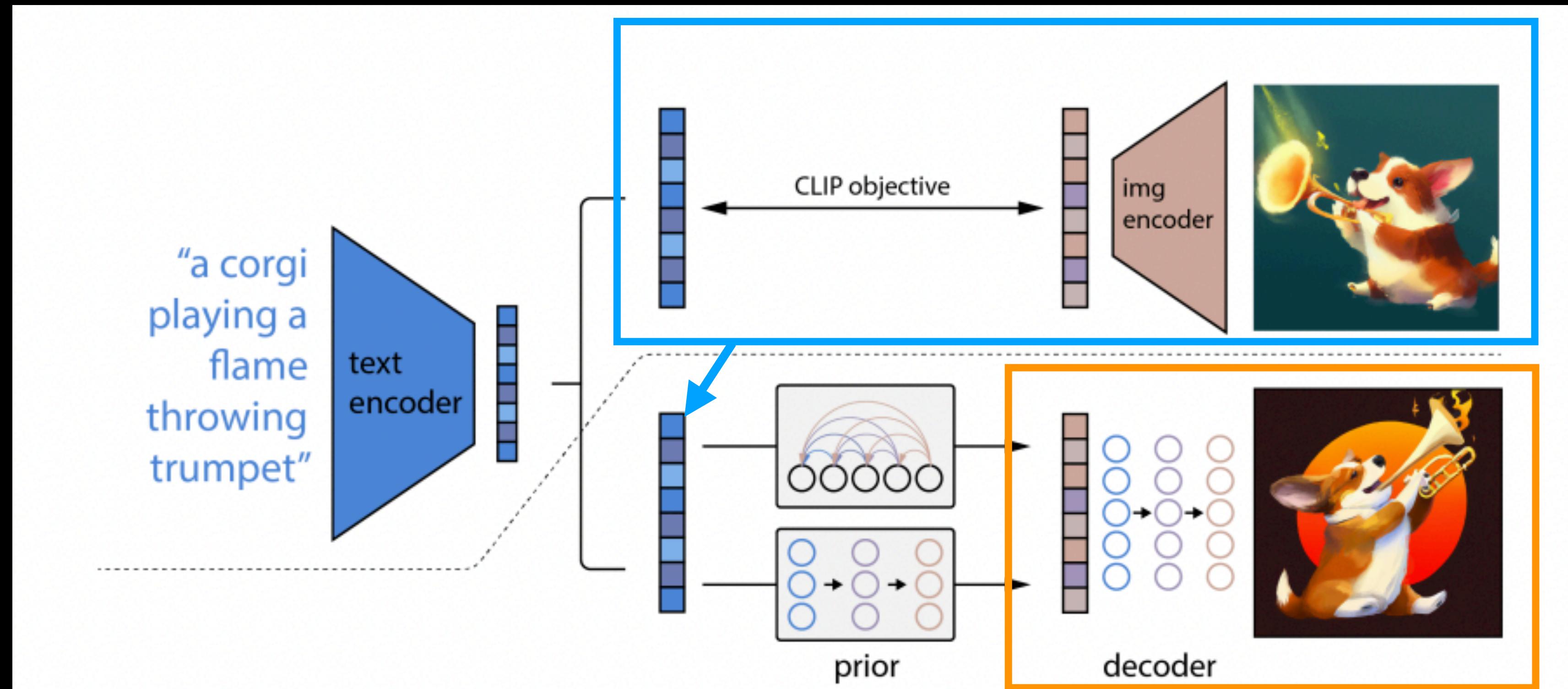
- Diffusion model 透過逐步添加高斯模糊，透過 markov chain 的方式一層層逐步正擴散與逆曠散，以期最後可由  $x_0$  推得 sample space ( $z$ )
- Loss function (ELBO) 與 Variational Inference 的概念與 VAE 相同，可以視為 VAE 的後繼模型

## 3-2 Dalle E. 2



- DALL·E 2 是一個 Open AI 的 Pretrained Model，可以根據自然語言的描述創建逼真的圖像和藝術

## 3-2 Dalle E. 2 (Studying)



- 透過 CLIP 模型學習 image 與 text 的embedding
- 透過 diffusion model 將 CLIP 的 text embedding 轉回圖片

## 3-3 Application of DALL E. 2: Midjourney



universe in a puddle



Soldier man in cyberpunk city none lights

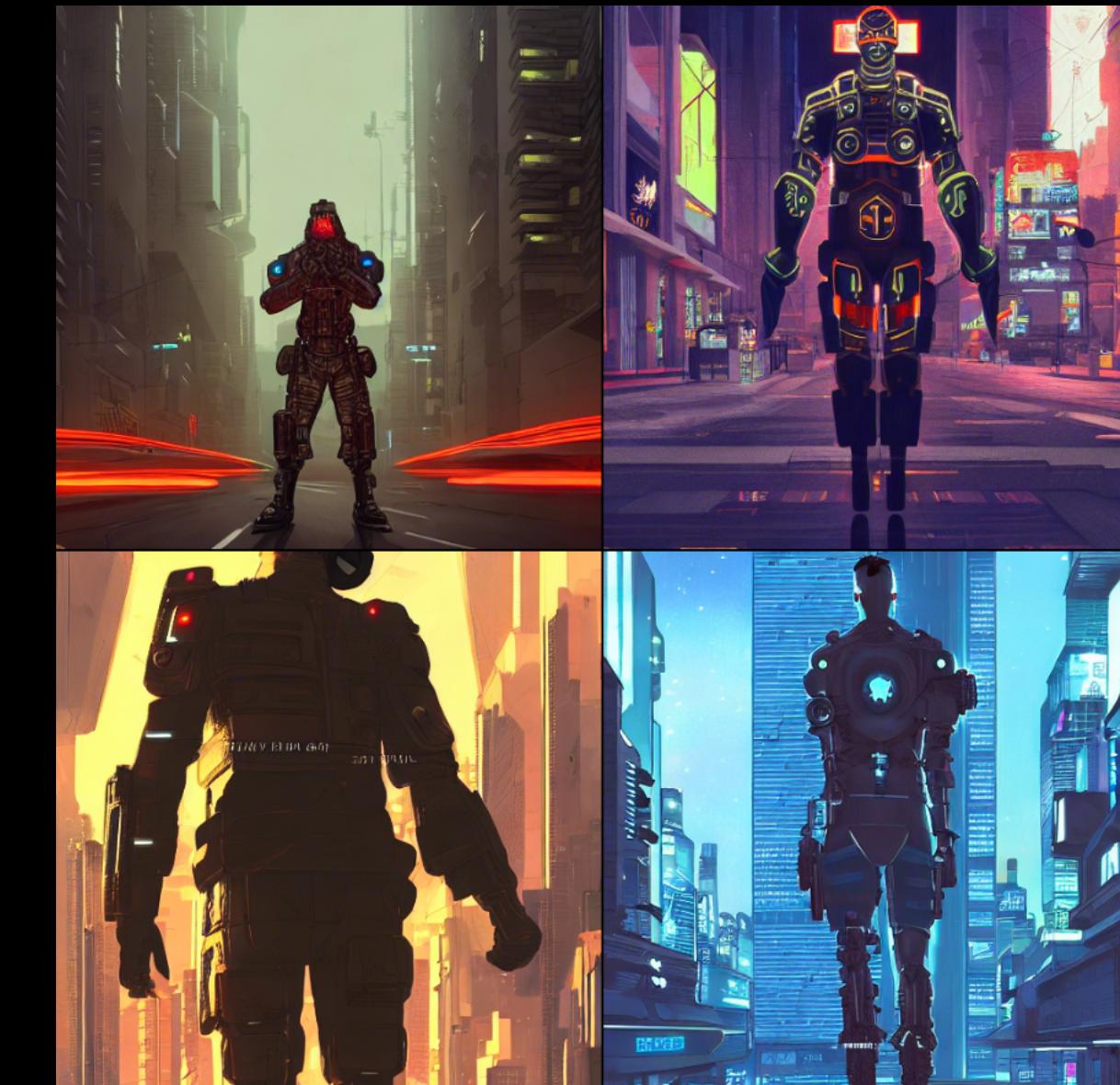


Granblue fantasy

# 3-3 Application of DALL E. 2: Stable Diffusion



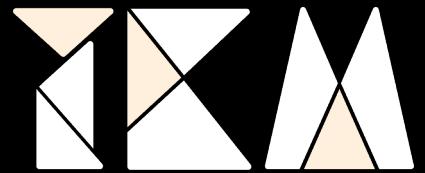
girl, smile, movie cover  
Nausicaä of the Valley of the Wind



Soldier man in cyberpunk city none lights



Granblue fantasy



# THANK YOU