

Recommender System Using Wide & Deep Technique and Side Information

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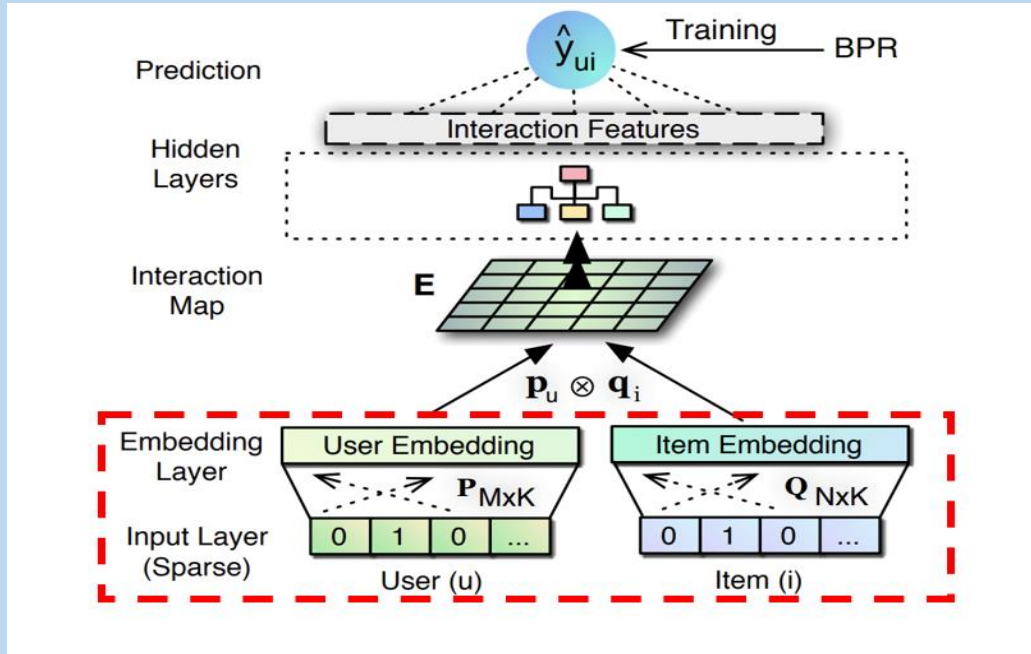
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1. Backgrounds



NETFLIX

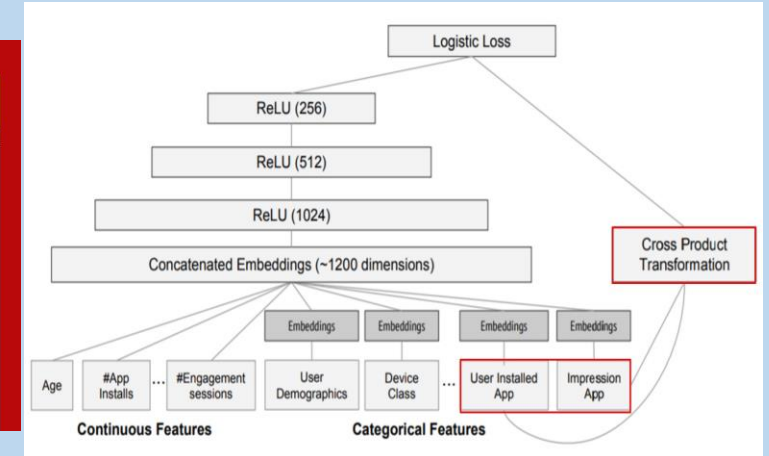
NetfliX Prize **COMPLETED**

Home Rules Leaderboard Update

Leaderboard

Showing Test Score. [Click here to show quiz score](#)

Rank	Team Name	Best Test Score	% Improvement	Best Submit Time
Grand Prize - RMSE = 0.8567 - Winning Team: Bellicor's Pragmatic Chaos				
1	Bellicor's Pragmatic Chaos	0.8567	10.06	2009-07-26 18:18:28
2	The Lindeber	0.8567	10.06	2009-07-26 18:38:22
3	Grand Prize Team	0.8582	9.90	2009-07-10 21:24:40
4	Opera Solutions and Vandelay United	0.8588	9.84	2009-07-10 01:12:31
5	Vandelay Industries I	0.8591	9.81	2009-07-10 00:32:20
6	Pragmatic Theory	0.8594	9.77	2009-06-24 12:08:56
7	Bellicor in BioChaos	0.8601	9.70	2009-05-13 08:14:09
8	Dacia	0.8612	9.59	2009-07-24 17:18:43
9	Feed52	0.8622	9.48	2009-07-12 13:11:51
10	BioChaos	0.8623	9.47	2009-04-07 12:33:59
11	Opera Solutions	0.8623	9.47	2009-07-24 00:34:07
12	Bellicor	0.8624	9.46	2009-07-26 17:19:11



1. 기존의 ONCF는 user-id, item-id, rating 정보만을 사용
→ Side-information을 활용하지 않음

2. Side-information을 활용한 추천시스템 성능의 우수함
ex) Netflix Prize, Wide and Deep, DeepFM 등

Side-information이 포함된 Interaction map 을 생성하여 풍부한 정보를 활용할 수 있도록 함

2. Data(Movielens dataset)

	UserID	MovieID	Rating	Timestamp
0	1	1193	5	978300760
1	1	661	3	978302109
2	1	914	3	978301968
3	1	3408	4	978300275
4	1	2355	5	978824291
...
1000204	6040	1091	1	956716541
1000205	6040	1094	5	956704887
1000206	6040	562	5	956704746
1000207	6040	1096	4	956715648
1000208	6040	1097	4	956715569

1000209 rows × 4 columns



유저가 평점을 남긴 영화가 100개가 넘는 유저만 남겨서 데이터 축소

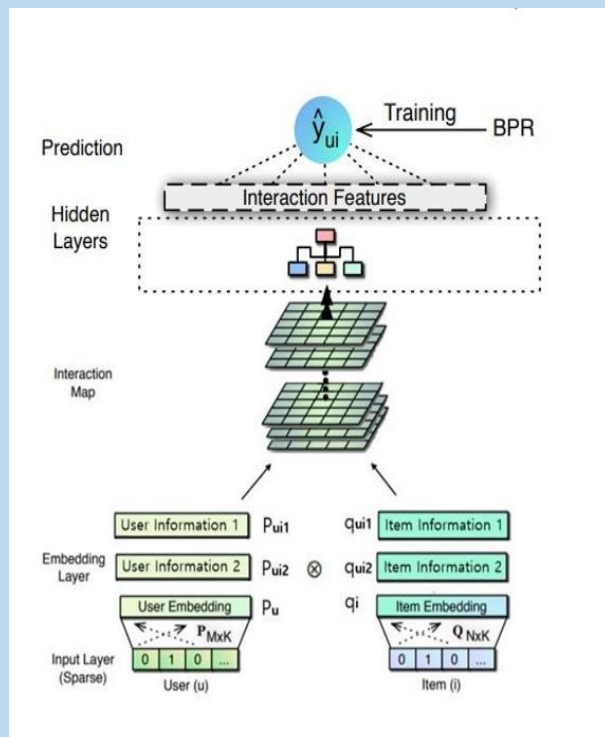
	UserID	MovieID	Rating	Timestamp
0	0	642	5	977578609
1	0	1300	3	977579058
2	0	3866	5	977577763
3	0	3724	5	977578197
4	0	2922	5	977578197
...
103154	656	352	1	974480241
103155	656	2701	3	974480468
103156	656	3509	4	974480677
103157	656	2890	3	974480624
103158	656	1959	3	974480275

103159 rows × 4 columns

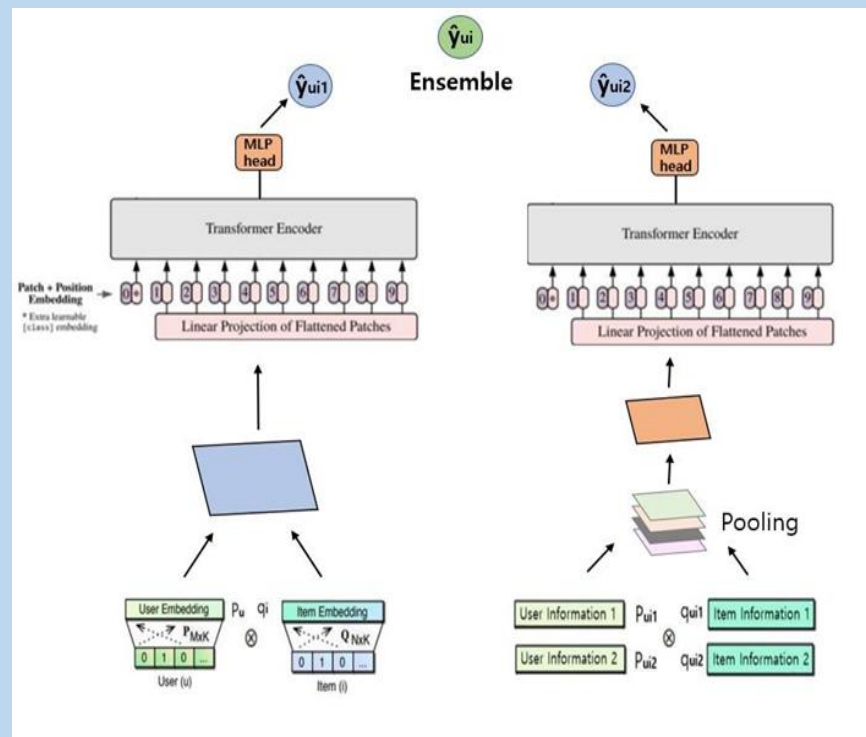
Users	Movies	Ratings
1. UserID	1. MovieID	1. UserID
2. Gender	2. Title	2. MovieID
3. Age	3. Genres	3. Rating
4. Occupation		4. Timestamp
5. Zip-code		

출처: <http://files.grouplens.org/datasets/movielens/ml-1m.zip>

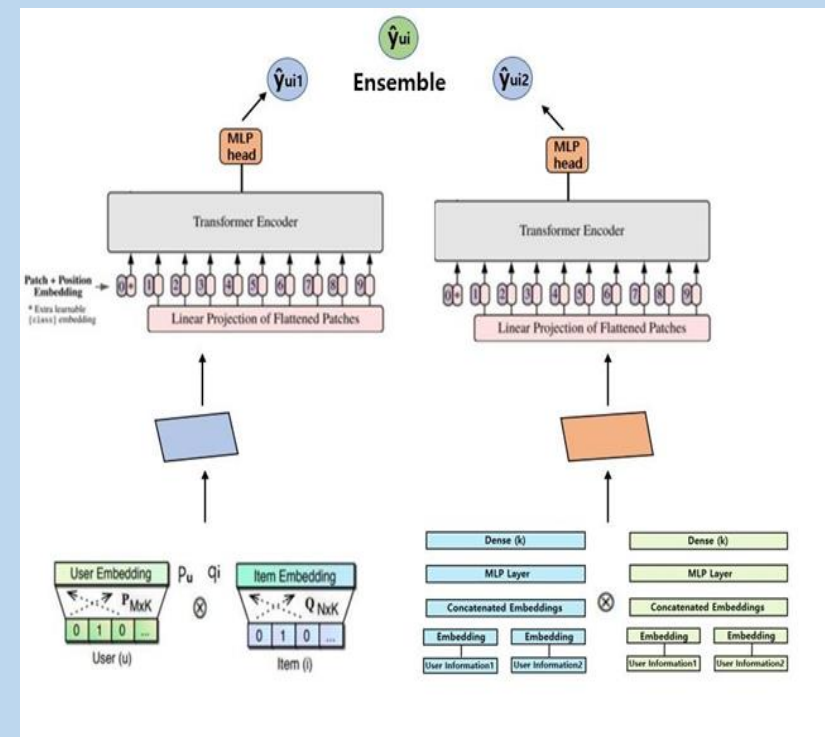
3. Drawbacks



Method1

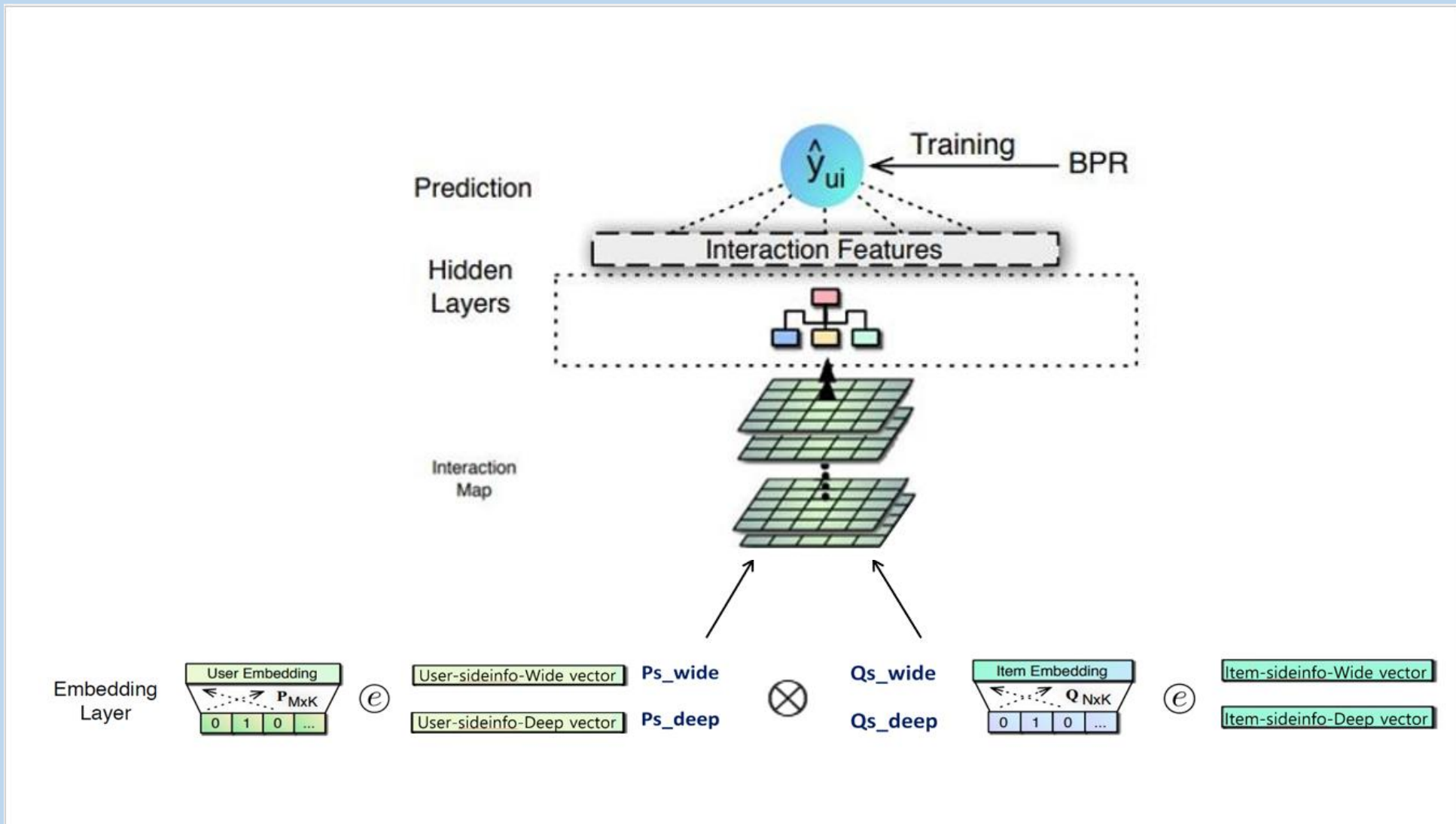


Method2

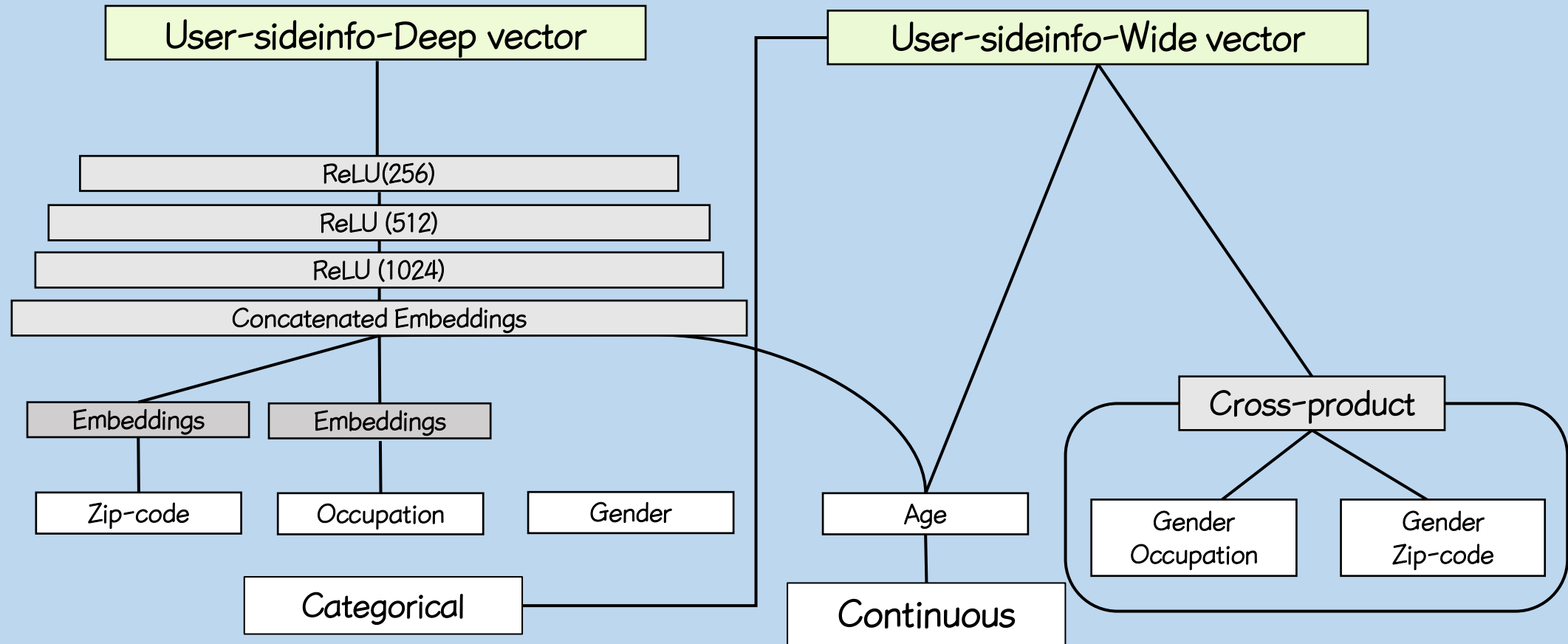


Method3

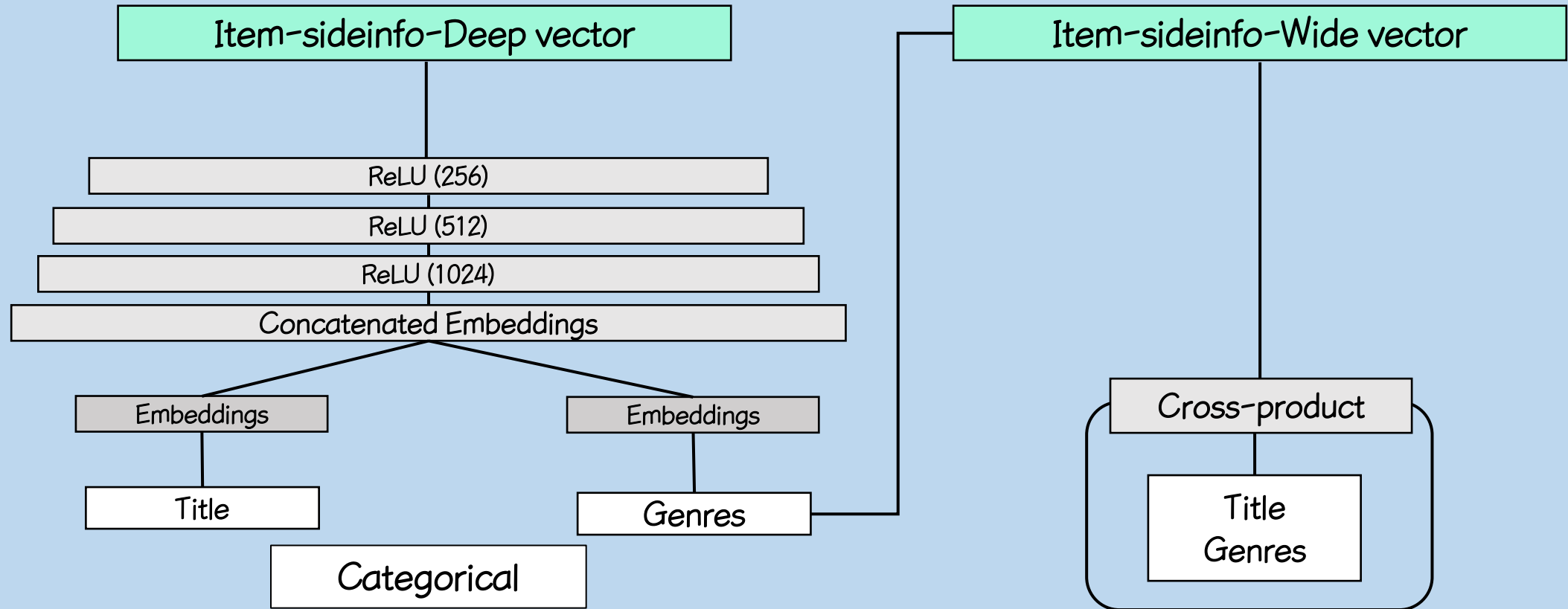
4. Architecture



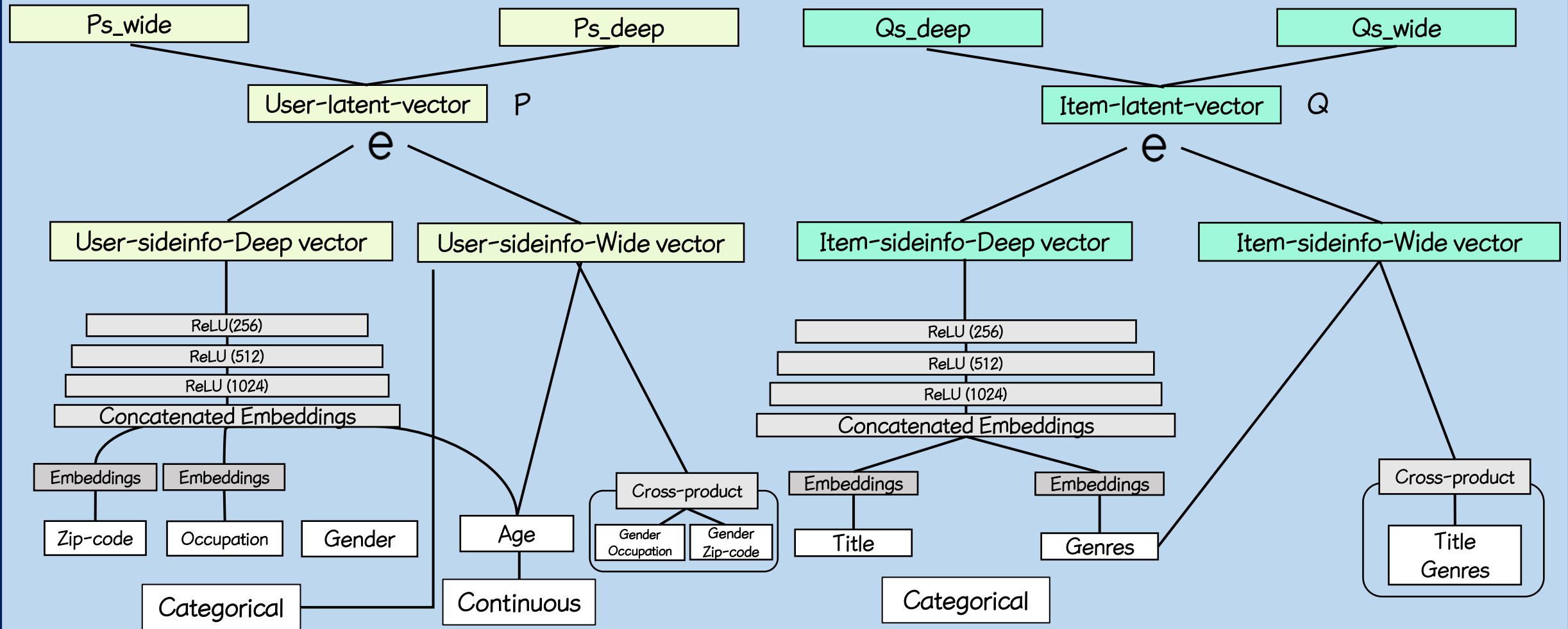
4. Architecture(User-Sideinfo)



4. Architecture(Item_SideInfo)



4. Architecture(Element-wised vectors)



5. Training

Epoch : 100

Batch_size: 512

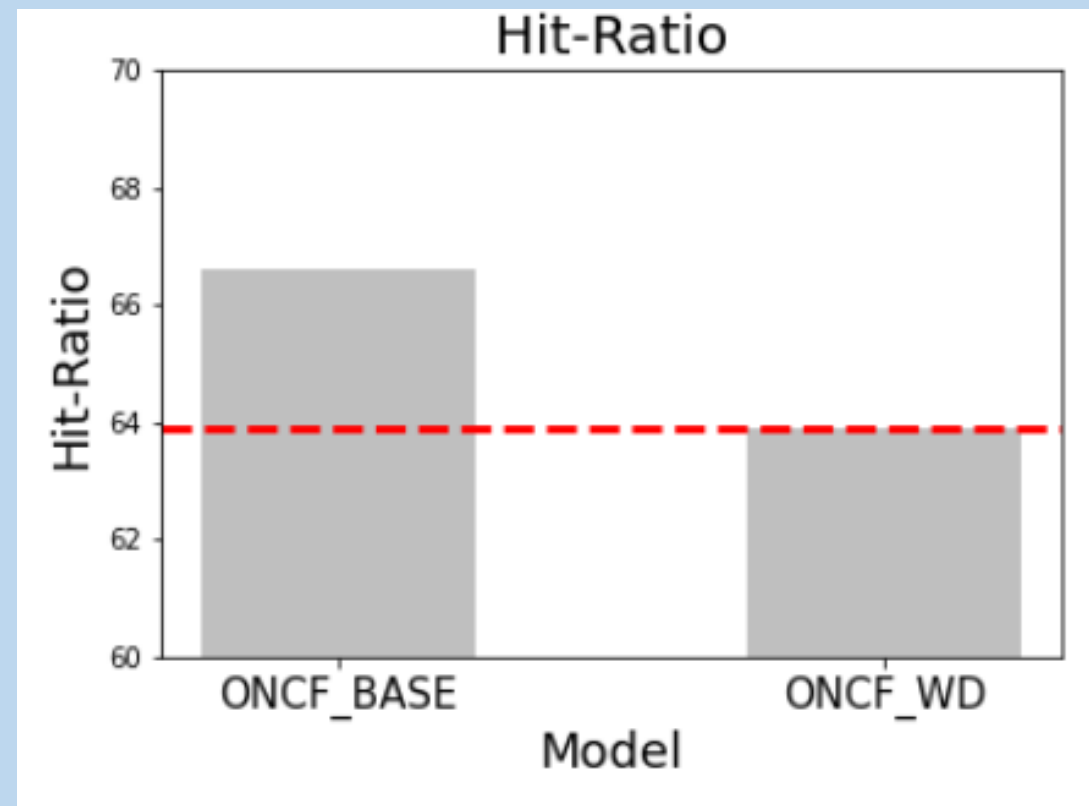
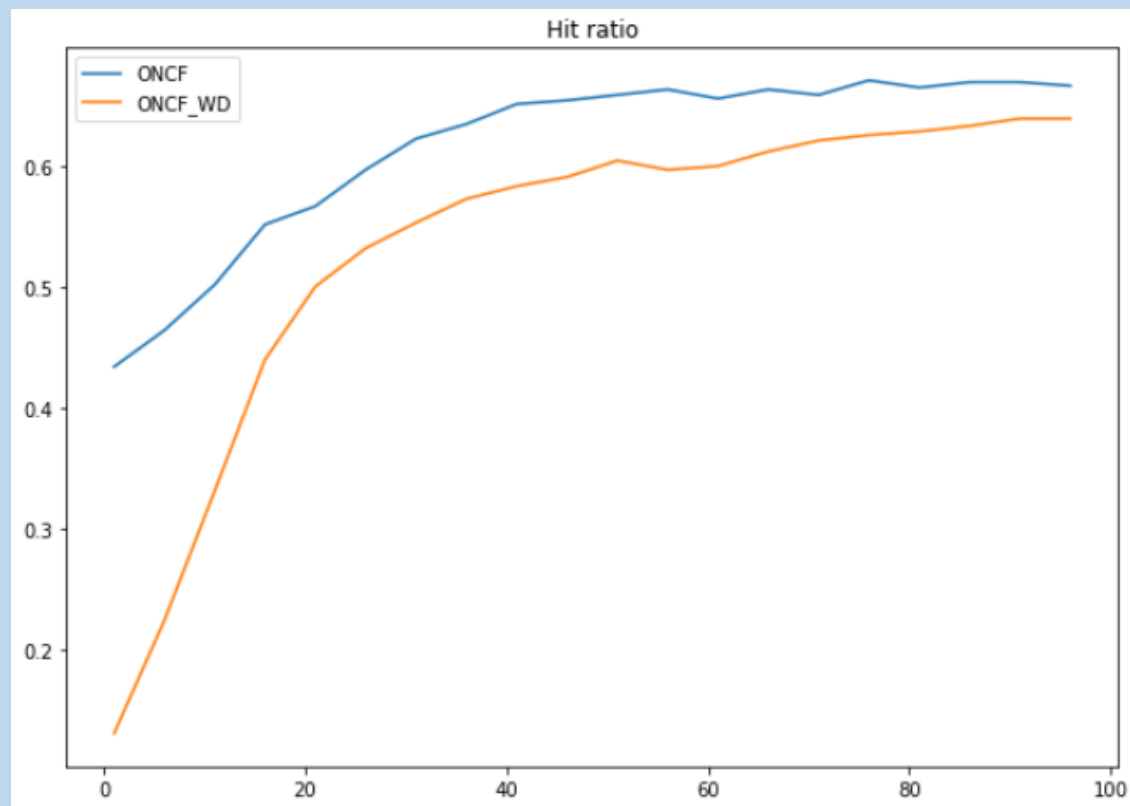
Loss Function: BCEWithLogitsLoss

Optimizer: Adam

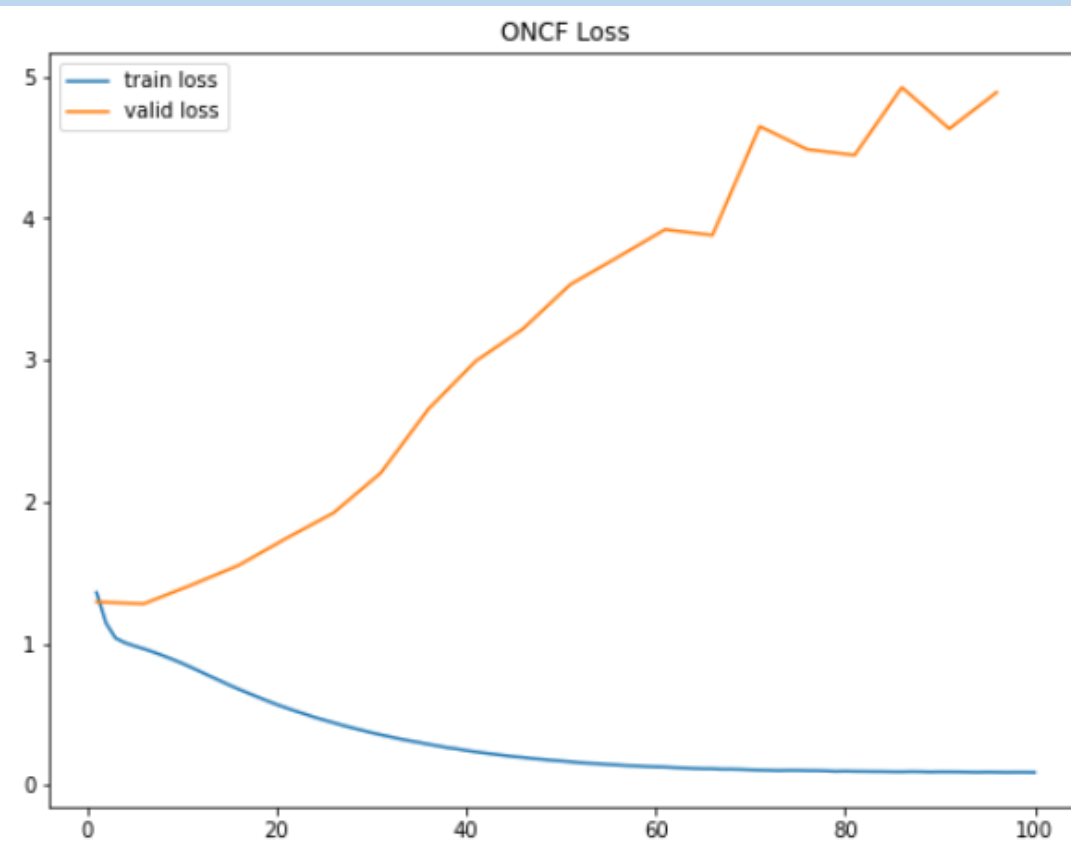
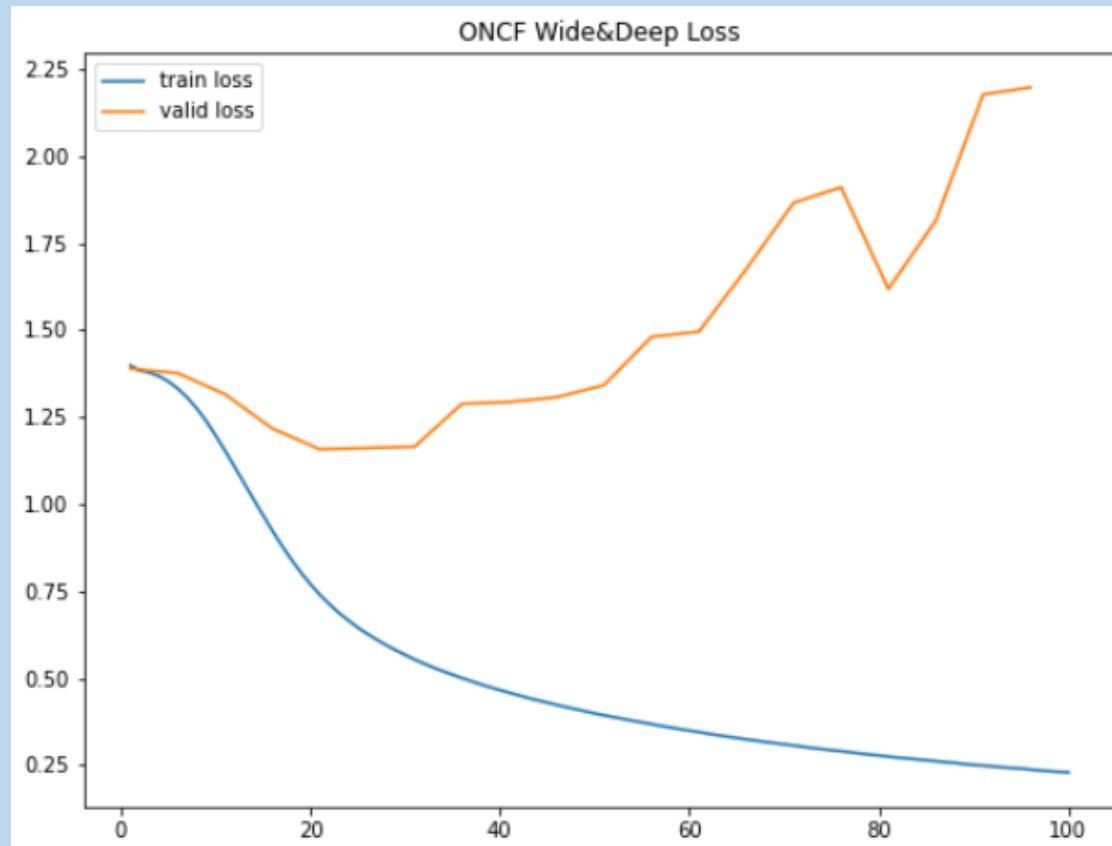
Learning rate: 0.001

Embedding size: 16

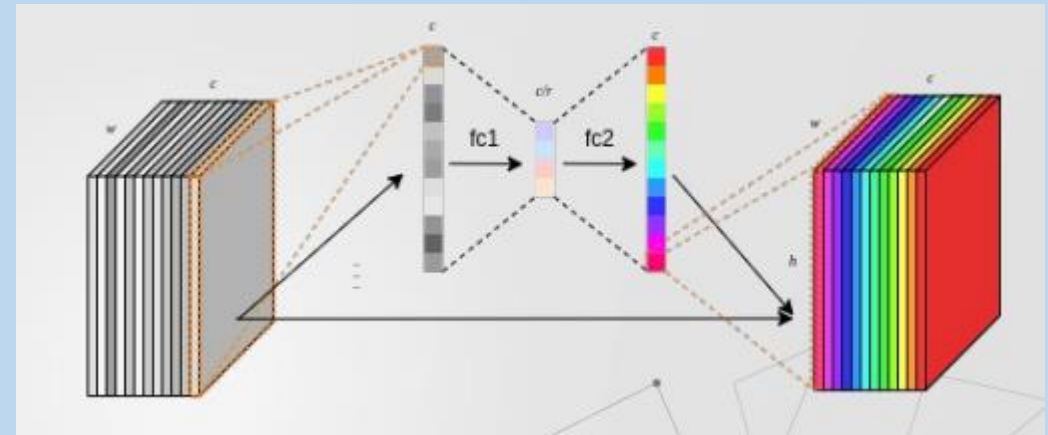
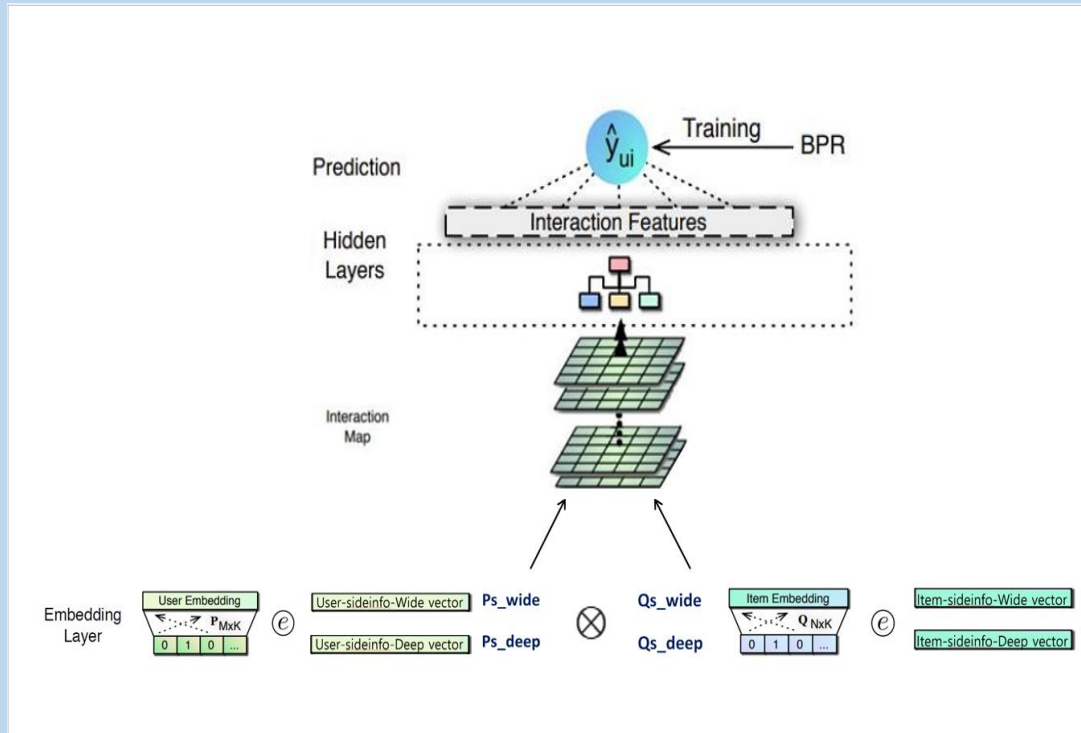
6. Results



6. Results



7. Improvements # Channel Attention



Channel Attention

- Interaction Map부분에서 Channel Attention을 사용하여 채널의 관계를 파악하고, 특정 채널을 강조하는 효과를 추가적으로 시행 해 볼 계획

8. References

- Neural Collaborative Filtering(NCF)
- Outer Product-based Neural Collaborative Filtering (ONCF)
- Wide & Deep Learning for Recommender Systems
- Attention Is All You Need (Transformer)
- An Image is Worth 16x16 Words: Transformers for Image Recognition at Scale (Vision Transformer)
- A Deep Learning Based Recommender System Using Visual Information
- 채널 강조와 공간 강조의 결합을 이용한 딥 러닝 기반의 초해상도 방법 (Channel Attention, Spatial Attention)

Thank You