## Homework 6 Report

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(1%)請比較有無 normalize 的差別。並說明如何 normalize.
 答:

將原先模型中 Output 的 rating,以 0-1 標準化及 z-score 標準化,並與原先模型精度做比較,結果如下表。

(使用的模型為 embedding dimension=32,且僅考慮 id 跟 rating)

if normalize	Public score	Private score
0-1 標準化	0.9260	0.9234
z-score 標準化	0.8653	0.8653
無	0.8516	0.8437

可以發現結果並無改善,甚至變差,但收斂速度有略為提升,推測應為原先 rating 的分佈應無偏差過大的值,所以並沒有無法收斂的情形,normalize 對於提升精度則無幫助。

2. (1%)比較不同的 embedding dimension 的結果。 答:

Embedding dimension	Public score	Private score
16	0.8530	0.8447
32	0.8516	0.8437
64	0.8537	0.8455

128	0.8890	0.8832

結果顯示當維度提升時,對 loss 的改善效果不大,甚至可能因維度過高,而 造成 overfitting,反而使得 loss 提高

3. (1%)比較有無 bias 的結果。

答:

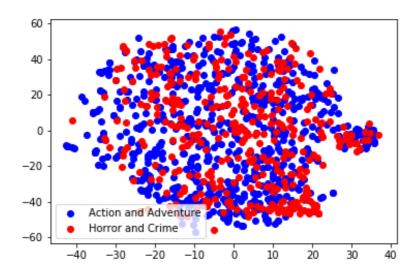
模型以 embedding dimension=32,僅考慮 id 跟 rating 的情況下進行比較,結果如下表。

if consider bias	Public score	Private score
有	0.8516	0.8437
無	0.8530	0.8462

在考慮 bias 的情況下,是會對 loss 有些微的改善,可推得訓練模型時仍有一些未考慮到的 feature,或是資料存有 noise,透過增加 bias 項可以改善這些未考慮/未排除的情況。

4. (1%)請試著將 movie 的 embedding 用 tsne 降維後,將 movie category 當 作 label 來作圖。

答:



利用表現最好的模型(loss = 0.8516/0.8437)中的 embedding,降維後取直覺認為應為類似分類的為同一群,並設定另一類別為對照組,如「Action 跟 Adventure」對比「Horror 跟 Crime」。

5. (1%)試著使用除了 rating 以外的 feature, 並說明你的作法和結果,結果好壞不會影響評分。

## 答:

原先僅考慮 User ID 跟 Movie ID 進行 embedding,讓模型自己透過 rating 去解決各使用者及電影間的特徵關係。於本題欲嘗試增加 "Genres"特徵,並 同樣透過 embedding 轉換成向量,藉由 keras.layers.concatenate 結合,後 續則改接上 DNN 的結構(如圖一),訓練方式維持不變,再與原先利用 MF 方式實作的精度作比較,結果如下表。

Input_12 (InputLayer)	Layer (type)	Output Shape	Param #	Connected to
Input_14 (InputLayer)	input_12 (InputLayer)	(None, 1)	0	
embedding_22 (Embedding)         (None, 1, 32)         193280         input_12[0][0]           embedding_24 (Embedding)         (None, 1, 32)         126464         input_14[0][0]           embedding_25 (Embedding)         (None, 1, 32)         126464         input_14[0][0]           reshape_22 (Reshape)         (None, 32)         0         embedding_22[0][0]           reshape_24 (Reshape)         (None, 32)         0         embedding_22[0][0]           dropout_12 (Dropout)         (None, 32)         0         reshape_22[0][0]           dropout_13 (Dropout)         (None, 32)         0         reshape_24[0][0]           dropout_14 (Dropout)         (None, 32)         0         reshape_24[0][0]           dropout_14 (Dropout)         (None, 1)         6840         input_12[0][0]           embedding_23 (Embedding)         (None, 1, 1)         3952         input_13[0][0]           concatenate_2 (Concatenate)         (None, 96)         0         dropout_13[0][0]           reshape_23 (Reshape)         (None, 1)         0         embedding_26[0][0]           reshape_24 (Reshape)         (None, 1)         0         embedding_26[0][0]           reshape_25 (Reshape)         (None, 1)         0         concatenate_2 (20[0][0]           reshape_26 (Reshape)         <	input_13 (InputLayer)	(None, 1)	0	
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	Total params: 506,377 Trainable params: 506,377			

圖一

	Public	Private
原先 MF	0.8516	0.8437
DNN (考慮 Genres)	0.9124	0.9069