



HARPY AEROSPACE INTERNSHIP



AIOT PROJECT

RECOMMENDATION SYSTEM

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BTECH- AIDS

Collaborative Filtering Model:

Outputs:

```
Downloading and preparing dataset 4.70 MiB (download: 4.70 MiB, generated: 32.41 MiB, total: 37.10 MiB) to /root/tensorflow_datasets/movielens/100k-ratings
DI Completed...: 100% 1/1 [00:03<00:00, 3.11s/ url]
DI Size...: 100% 4/4 [00:03<00:00, 2.46s/ MiB]
Extraction completed...: 100% 23/23 [00:03<00:00, 3.21s/ file]

Dataset movielens downloaded and prepared to /root/tensorflow_datasets/movielens/100k-ratings/0.1.1. Subsequent calls will reuse this data.
Downloading and preparing dataset 4.70 MiB (download: 4.70 MiB, generated: 150.35 KiB, total: 4.84 MiB) to /root/tensorflow_datasets/movielens/100k-movie-embeddings
DI Completed...: 100% 1/1 [00:00<00:00, 13.82 url/s]
DI Size...: 100% 4924029/4924029 [00:00<00:00, 92796050.23 MiB/s]
Extraction completed...: 0/0 [00:00<?, ? file/s]
```

```
Epoch 1/5
157/157 [=====] - 15s 78ms/step - loss: -3.8649 - val_loss: -23.5530
Epoch 2/5
157/157 [=====] - 3s 18ms/step - loss: -336.5868 - val_loss: -1110.0411
Epoch 3/5
157/157 [=====] - 3s 19ms/step - loss: -3343.7412 - val_loss: -6412.3154
Epoch 4/5
157/157 [=====] - 2s 11ms/step - loss: -10964.7852 - val_loss: -16158.1348
Epoch 5/5
157/157 [=====] - 2s 9ms/step - loss: -22636.4824 - val_loss: -29479.5996
```

```
1/1 [=====] - 0s 219ms/step
Predicted rating for user b'138' and movie b'357' is [[1.]]
```

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16/16 [=====] - 0s 2ms/step
16/16 [=====] - 0s 2ms/step
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16/16 [=====] - 0s 3ms/step
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16/16 [=====] - 0s 3ms/step
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16/16 [=====] - 0s 3ms/step
16/16 [=====] - 0s 3ms/step
```

Collaborative Filtering (CF) is one of the most common techniques used in recommendation systems. It works by leveraging the past behavior and preferences of users to predict their future likes. There are two main types of collaborative filtering: user-based and item-based.

User-Based Collaborative Filtering

In user-based CF, the system recommends items to a user based on the items liked by similar users. Here's a step-by-step explanation:

1. **Data Collection:**

- Collect user-item interaction data (e.g., ratings, clicks, purchases).

2. **Similarity Calculation:**

- Calculate the similarity between users. Common similarity metrics include Pearson correlation and cosine similarity.
- For instance, if users AAA and BBB have rated several movies similarly, they are considered similar.

3. **Neighborhood Selection:**

- Select a subset of similar users (neighbors) for the target user.
- This can be the top-N most similar users.

4. **Prediction:**

- Predict the rating a user might give to an item by considering the ratings given by their neighbors.
- The prediction can be calculated as a weighted average of the ratings from similar users, where the weights are the similarity scores.

5. **Recommendation:**

- Recommend items to the user based on the highest predicted ratings.

Softmax Deep Neural Network Model

Outputs:

Model: "model"

Layer (type)	Output Shape	Param #	Connected to
input_3 (InputLayer)	[(None, 1)]	0	[]
input_4 (InputLayer)	[(None, 1)]	0	[]
embedding_6 (Embedding)	(None, 1, 150)	141450	['input_3[0][0]']
embedding_7 (Embedding)	(None, 1, 150)	249600	['input_4[0][0]']
reshape (Reshape)	(None, 150)	0	['embedding_6[0][0]']
reshape_1 (Reshape)	(None, 150)	0	['embedding_7[0][0]']
concatenate (Concatenate)	(None, 300)	0	['reshape[0][0]', 'reshape_1[0][0]']
dropout (Dropout)	(None, 300)	0	['concatenate[0][0]']
dense (Dense)	(None, 32)	9632	['dropout[0][0]']
activation (Activation)	(None, 32)	0	['dense[0][0]']
dropout_1 (Dropout)	(None, 32)	0	['activation[0][0]']
dense_1 (Dense)	(None, 16)	528	['dropout_1[0][0]']
activation_1 (Activation)	(None, 16)	0	['dense_1[0][0]']
dropout_2 (Dropout)	(None, 16)	0	['activation_1[0][0]']
dense_2 (Dense)	(None, 9)	153	['dropout_2[0][0]']
activation_2 (Activation)	(None, 9)	0	['dense_2[0][0]']

=====
Total params: 401363 (1.53 MB)
Trainable params: 401363 (1.53 MB)

```
Epoch 1/70 [=====] - 7s 4ms/step - loss: 0.8105 - accuracy: 0.0608 - val_loss: 0.5279 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 2/70 [=====] - 3s 4ms/step - loss: 0.5365 - accuracy: 0.0610 - val_loss: 0.5144 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 3/70 [=====] - 3s 4ms/step - loss: 0.5282 - accuracy: 0.0609 - val_loss: 0.5115 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 4/70 [=====] - 4s 5ms/step - loss: 0.5242 - accuracy: 0.0609 - val_loss: 0.5106 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 5/70 [=====] - 3s 4ms/step - loss: 0.5221 - accuracy: 0.0609 - val_loss: 0.5093 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 6/70 [=====] - 3s 4ms/step - loss: 0.5206 - accuracy: 0.0609 - val_loss: 0.5084 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 7/70 [=====] - 3s 4ms/step - loss: 0.5191 - accuracy: 0.0609 - val_loss: 0.5076 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 8/70 [=====] - 4s 5ms/step - loss: 0.5176 - accuracy: 0.0609 - val_loss: 0.5069 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 9/70 [=====] - 3s 4ms/step - loss: 0.5164 - accuracy: 0.0609 - val_loss: 0.5061 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 10/70 [=====] - 3s 4ms/step - loss: 0.5148 - accuracy: 0.0609 - val_loss: 0.5044 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 11/70 [=====] - 3s 4ms/step - loss: 0.5134 - accuracy: 0.0609 - val_loss: 0.5029 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 12/70 [=====] - 3s 5ms/step - loss: 0.5117 - accuracy: 0.0609 - val_loss: 0.5010 - val_accuracy: 0.0617 - lr: 0.0100
Epoch 13/70 [=====]
```

```

Enter user id
35
Enter number of movies to be recommended:
6

Movie seen by the User:
['Air Bud (1997)',
 'Air Force One (1997)',
 'Conspiracy Theory (1997)',
 'Contact (1997)',
 'Cop Land (1997)',
 'Excess Baggage (1997)',
 'Fire Down Below (1997)',
 'G.I. Jane (1997)',
 'Game, The (1997)',
 'George of the Jungle (1997)',
 'Jungle2Jungle (1997)',
 'Kiss the Girls (1997)',
 'Kolya (1996)',
 'Kull the Conqueror (1997)',
 'Mimic (1997)',
 'Money Talks (1997)',
 'Mother (1996)',
 'Murder at 1600 (1997)',
 'Peacemaker, The (1997)',
 'Saint, The (1997)',
 'Spawn (1997)',
 'Thousand Acres, A (1997)',
 'Volcano (1997)']

52/52 [=====] - 0s 3ms/step
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Top 6 Movie recommendations for the User 35 are:
['Beans of Egypt, Maine, The (1994)',
 'Indiana Jones and the Last Crusade (1989)',
 'Jaws (1975)',
 'Contempt (Mépris, Le) (1963)',
 'Men of Means (1998)',
 'Ghost in the Shell (Kokaku kidotai) (1995)']

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A Softmax deep neural network model is a type of neural network used primarily for classification tasks where the goal is to assign an input to one of several classes. The Softmax function, often used in the output layer, converts the raw output scores (logits) from the network into probabilities that sum up to one.

Input Layer: This layer receives the raw input data (e.g., images, text, numerical features).

Hidden Layers: These layers consist of neurons that perform various transformations on the input data. Each neuron in a hidden layer applies a weighted sum of the inputs, adds a bias term, and passes the result through an activation function (e.g., ReLU, sigmoid, tanh). The purpose of hidden layers is to capture complex patterns and interactions in the data.

Output Layer: The final layer consists of neurons corresponding to the number of classes in the classification task. Each neuron in the output layer produces a score (logit) for each class.



Thank
You