```
import os
os.environ['CUDA_LAUNCH_BLOCKING'] = "1"

import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import torch
from torch.utils.data import DataLoader,Dataset
from sklearn.model_selection import train_test_split
from torch import nn
from torch.utils.data import default_collate
from torcheval.metrics import MulticlassAccuracy,Mean
import torch.nn.functional as F
from sklearn.preprocessing import LabelEncoder

from sen_ai.conv import *
from sen_ai.core import *
from sen_ai.learner import *
from sen_ai.activations import *
from sen_ai.training import *

Ratings_df = pd.read_csv("cleaned_100k/ratings.csv")
Movies_df=  pd.read_csv("cleaned_100k/movies.csv")
Users_df= pd.read_csv("cleaned_100k/users.csv")

Ratings_df
```

	UserID	MovieID	Rating	Timestamp
0	1	1	4.0	964982703
1	1	3	4.0	964981247
2	1	6	4.0	964982224
3	1	47	5.0	964983815
4	1	50	5.0	964982931
...	...	...	...	...
100831	610	166534	4.0	1493848402
100832	610	168248	5.0	1493850091
100833	610	168250	5.0	1494273047
100834	610	168252	5.0	1493846352
100835	610	170875	3.0	1493846415

```
[100836 rows x 4 columns]

Movies_df
```

	MovieID	Title	\
0	1	Toy Story (1995)	
1	2	Jumanji (1995)	
2	3	Grumpier Old Men (1995)	
3	4	Waiting to Exhale (1995)	
4	5	Father of the Bride Part II (1995)	
...	...	...	

```
9737   193581  Black Butler: Book of the Atlantic (2017)
9738   193583               No Game No Life: Zero (2017)
9739   193585                                 Flint (2017)
9740   193587        Bungo Stray Dogs: Dead Apple (2018)
9741   193609        Andrew Dice Clay: Dice Rules (1991)

                                          Genres  Action
Adventure  \
0     Adventure|Animation|Children|Comedy|Fantasy       0           1

1                     Adventure|Children|Fantasy       0           1

2                                Comedy|Romance       0           0

3                          Comedy|Drama|Romance       0           0

4                                       Comedy       0           0

...                                        ...     ...         ...

9737              Action|Animation|Comedy|Fantasy       1           0

9738                    Animation|Comedy|Fantasy       0           0

9739                                     Drama       0           0

9740                           Action|Animation       1           0

9741                                    Comedy       0           0


      Animation  Children's  Comedy  Crime  Documentary  ...  Fantasy
\
0             1           0       1      0            0  ...        1

1             0           0       0      0            0  ...        1

2             0           0       1      0            0  ...        0

3             0           0       1      0            0  ...        0

4             0           0       1      0            0  ...        0

...         ...         ...     ...    ...          ...  ...      ...

9737          1           0       1      0            0  ...        1

9738          1           0       1      0            0  ...        1

9739          0           0       0      0            0  ...        0
```

```
9740          1           0       0      0           0  ...         0

9741          0           0       1      0           0  ...         0


      Film-Noir  Horror  Musical  Mystery  Romance  Sci-Fi  Thriller
War  \
0             0       0        0        0        0       0          0
0
1             0       0        0        0        0       0          0
0
2             0       0        0        0        1       0          0
0
3             0       0        0        0        1       0          0
0
4             0       0        0        0        0       0          0
0
...         ...     ...      ...      ...      ...     ...        ...
...
9737          0       0        0        0        0       0          0
0
9738          0       0        0        0        0       0          0
0
9739          0       0        0        0        0       0          0
0
9740          0       0        0        0        0       0          0
0
9741          0       0        0        0        0       0          0
0

      Western
0           0
1           0
2           0
3           0
4           0
...       ...
9737        0
9738        0
9739        0
9740        0
9741        0

[9742 rows x 21 columns]

Users_df

      UserID  MovieID              tag   Timestamp
0          2    60756            funny  1445714994
1          2    60756   Highly quotable  1445714996
```

```
2          2    60756      will ferrell  1445714992
3          2    89774      Boxing story  1445715207
4          2    89774               MMA  1445715200
...      ...      ...               ...         ...
3678     606     7382         for katie  1171234019
3679     606     7936           austere  1173392334
3680     610     3265            gun fu  1493843984
3681     610     3265  heroic bloodshed  1493843978
3682     610   168248  Heroic Bloodshed  1493844270

[3683 rows x 4 columns]
```

```
class MovieDataset(Dataset):
    def __init__(self,users,movies,ratings):
        #super(MovieDataset,self).__init__()
        self.users = users
        self.rating = ratings
        self.movies = movies

    def __len__(self):
        return len(self.users)
    def __getitem__(self,i):
        return {'users':
torch.tensor(self.users.iloc[i],dtype=torch.long),'movies':
torch.tensor(self.movies.iloc[i],dtype=torch.long),'rating':torch.tens
or(self.rating[i],dtype=torch.float32)}

movies =  LabelEncoder()
Ratings_df['MovieID'] =  movies.fit_transform(Ratings_df['MovieID'])
users = LabelEncoder()
Ratings_df['UserID'] =  users.fit_transform(Ratings_df['UserID'])

movies.inverse_transform([363]),users.inverse_transform([600])
```

```
(array([419], dtype=int64), array([601], dtype=int64))
```

```
Ratings_df
```

```
        UserID  MovieID  Rating   Timestamp
0            0        0     4.0   964982703
1            0        2     4.0   964981247
2            0        5     4.0   964982224
3            0       43     5.0   964983815
4            0       46     5.0   964982931
...        ...      ...     ...         ...
100831     609     9416     4.0  1493848402
100832     609     9443     5.0  1493850091
100833     609     9444     5.0  1494273047
100834     609     9445     5.0  1493846352
100835     609     9485     3.0  1493846415
```

```
[100836 rows x 4 columns]
```

```
Ratings_df['Rating'] = Ratings_df['Rating'].map(lambda x:
round(x)).values
```

```
Ratings_df
```

```
        UserID  MovieID  Rating   Timestamp
0            0        0       4   964982703
1            0        2       4   964981247
2            0        5       4   964982224
3            0       43       5   964983815
4            0       46       5   964982931
...        ...      ...     ...         ...
100831     609     9416       4  1493848402
100832     609     9443       5  1493850091
100833     609     9444       5  1494273047
100834     609     9445       5  1493846352
100835     609     9485       3  1493846415
```

```
[100836 rows x 4 columns]
```

```
movie =
MovieDataset(Ratings_df['UserID'],Ratings_df['MovieID'],Ratings_df['Ra
ting'])
```

```
movie[:]
```

```
{'users': tensor([  0,   0,   0,  ..., 609, 609, 609]),
 'movies': tensor([   0,    2,    5,  ..., 9444, 9445, 9485]),
 'rating': tensor([4., 4., 4.,  ..., 5., 5., 3.])}
```

```
X_train,X_test,y_train,y_test =
train_test_split(Ratings_df[['UserID','MovieID']],Ratings_df[['Rating'
]],test_size=0.1,random_state=42,stratify=Ratings_df['Rating'].values)
#X_valid,X_test,y_valid,y_test =
train_test_split(X_test_valid,y_test_valid,test_size=0.3,random_state=
101)
```

```
train_dataset,test_dataset =
MovieDataset(X_train['UserID'],X_train['MovieID'],y_train['Rating'].to
_numpy()),MovieDataset(X_test['UserID'],X_test['MovieID'],y_test['Rati
ng'].to_numpy())
```

```
def collate(b):
    b = default_collate(b)
    return torch.stack((b['users'],b['movies']),1),b['rating']


class Dataloaders:
    def __init__(self,train,test):
```

```
        self.train,self.test = train,test
    @classmethod
    def return_dl(cls,train_ds,test_ds,bs):
        return
cls( DataLoader(train_ds,bs,collate_fn=collate),DataLoader(test_ds,bs,
collate_fn=collate))

dls = Dataloaders.return_dl(train_dataset,test_dataset,bs=512)

next(iter(dls.train))
```

```
(tensor([[ 220, 3579],
         [ 493,  224],
         [ 559, 6265],
         ...,
         [ 248, 7981],
         [ 139, 2791],
         [ 392, 7627]]),
 tensor([4., 5., 4., 4., 2., 2., 4., 4., 4., 4., 2., 4., 4., 4., 3.,
2., 2., 4.,
         3., 2., 4., 4., 5., 4., 2., 2., 4., 3., 4., 4., 4., 4., 5.,
4., 4., 4.,
         4., 5., 5., 4., 4., 3., 2., 4., 4., 3., 5., 4., 4., 5., 5.,
4., 3., 5.,
         3., 3., 4., 4., 4., 4., 4., 4., 3., 3., 4., 3., 5., 4., 4.,
4., 4., 4.,
         3., 5., 5., 4., 1., 5., 4., 4., 4., 4., 4., 4., 2., 4., 3.,
4., 4., 3.,
         1., 4., 2., 5., 2., 4., 5., 4., 4., 3., 3., 2., 3., 4., 5.,
3., 4., 4.,
         4., 4., 4., 4., 2., 4., 3., 4., 0., 2., 4., 2., 4., 1., 1.,
1., 4., 5.,
         1., 0., 5., 5., 3., 4., 4., 4., 5., 4., 4., 4., 4., 3., 0.,
3., 4., 4.,
         3., 1., 4., 4., 5., 1., 4., 4., 4., 3., 4., 5., 4., 1., 5.,
3., 4., 2.,
         3., 3., 3., 4., 5., 3., 4., 4., 4., 4., 3., 5., 4., 4., 5.,
4., 4., 4.,
         4., 2., 5., 1., 5., 4., 3., 4., 2., 3., 4., 0., 4., 4., 2.,
1., 2., 4.,
         4., 4., 4., 4., 4., 3., 5., 4., 3., 2., 4., 4., 4., 2., 3.,
4., 2., 4.,
         4., 3., 4., 2., 3., 4., 5., 4., 3., 4., 4., 4., 4., 2., 3.,
5., 5., 4.,
         4., 5., 4., 4., 4., 3., 4., 4., 5., 4., 4., 4., 5., 4., 2.,
4., 2., 4.,
         5., 3., 4., 4., 3., 3., 3., 4., 3., 2., 5., 3., 4., 2., 4.,
4., 3., 3.,
         5., 3., 4., 4., 5., 5., 4., 4., 4., 4., 1., 5., 2., 4., 2.,
1., 3., 5.,
```

```
         4., 4., 4., 4., 3., 3., 4., 4., 4., 3., 5., 5., 4., 4., 2.,
2., 4., 4.,
         4., 4., 5., 3., 4., 5., 4., 4., 4., 2., 2., 4., 2., 4., 2.,
5., 3., 5.,
         2., 4., 4., 4., 4., 3., 4., 4., 3., 2., 4., 4., 2., 2., 4.,
3., 5., 4.,
         4., 5., 4., 4., 4., 3., 4., 3., 4., 4., 4., 5., 4., 5., 5.,
4., 3., 4.,
         4., 2., 1., 4., 4., 4., 4., 4., 4., 2., 1., 4., 2., 4., 4.,
4., 4., 2.,
         4., 4., 3., 4., 3., 2., 3., 4., 3., 4., 1., 1., 4., 4., 4.,
3., 5., 4.,
         4., 4., 2., 3., 4., 2., 4., 4., 3., 4., 4., 4., 4., 5., 3.,
4., 5., 5.,
         4., 1., 4., 4., 4., 5., 3., 2., 4., 2., 4., 3., 2., 3., 5.,
4., 4., 3.,
         4., 5., 2., 2., 1., 4., 4., 4., 4., 4., 2., 4., 2., 4., 4.,
4., 2., 4.,
         3., 4., 1., 4., 4., 4., 2., 5., 5., 4., 3., 4., 4., 5., 4.,
4., 4., 4.,
         5., 4., 4., 4., 4., 4., 4., 3., 4., 4., 1., 2., 3., 4., 3.,
1., 5., 4.,
         4., 4., 1., 2., 4., 3., 3., 4., 2., 4., 5., 4., 4., 4., 4.,
4., 4., 4.,
         4., 2., 5., 4., 2., 3., 4., 0.]))
```

```
#train_dl,test_dl =
DataLoader(train_dataset,64,collate_fn=collate),DataLoader(train_datas
et,64,collate_fn=collate)
```

```
var =   next(iter(dls.train))[1]
```

```
var.shape
```

```
torch.Size([512])
```

```
#torch.stack((dic['users'],dic['movies']),1)[:,0]
```

```
class GMF(nn.Module):
    def __init__(self,n_users,n_movies,n_factors,y_range=(0,5.5)):
        super(GMF,self).__init__()
        self.user_factors = nn.Embedding(n_users,n_factors)
        self.user_bias =  nn.Embedding(n_users,1)
        self.movie_factors = nn.Embedding(n_movies,n_factors)
        self.movie_bias =  nn.Embedding(n_movies,1)
        self.y_range = y_range
    def forward(self,x):
        #import pdb; pdb.set_trace()
        users = self.user_factors(x[:,0])
        movies = self.movie_factors(x[:,1])
        res = (users * movies).sum(dim=1, keepdim=True)
```

```
        res += self.user_bias(x[:,0]) + self.movie_bias(x[:,1])
        high,low =  self.y_range
        out =  (torch.sigmoid(res) * (high - low) + low).squeeze(1)
        return out
```

```
Ratings_df['MovieID']
```

```
0             0
1             2
2             5
3            43
4            46
          ...
100831    9416
100832    9443
100833    9444
100834    9445
100835    9485
Name: MovieID, Length: 100836, dtype: int64
```

```
Movies_df['Title'][0]
```

```
'Toy Story (1995)'
```

```
Ratings_df['UserID']
```

```
0             0
1             0
2             0
3             0
4             0
          ...
100831    609
100832    609
100833    609
100834    609
100835    609
Name: UserID, Length: 100836, dtype: int64
```

```
len(Ratings_df['UserID'].unique()),len(Ratings_df['MovieID'].unique())
```

```
(610, 9724)
```

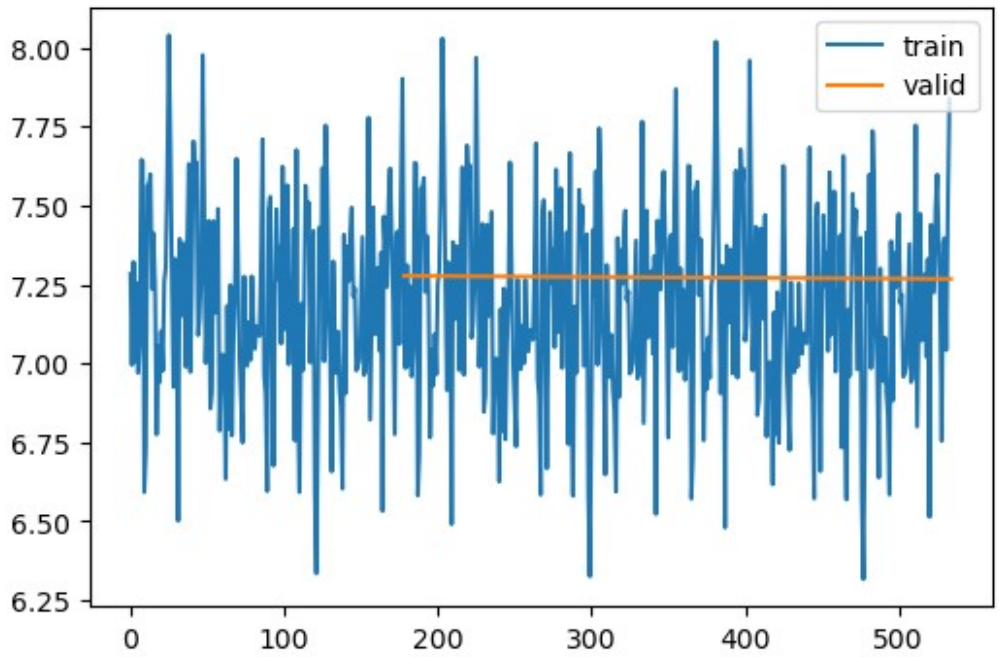
```
nn.MSELoss()
```

```
MSELoss()
```

```
MSELossFlat?

Signature:
MSELossFlat(
    *args,
    axis: 'int' = -1,
    floatify: 'bool' = True,
    reduction='mean',
)
Docstring: Same as `nn.MSELoss`, but flattens input and target.
File:      c:\users\sendh\anaconda3\envs\deep\lib\site-packages\
fastai\losses.py
Type:      function
```

```
device = torch.device('cuda')
n_users  = len(Ratings_df['UserID'].unique())
n_movies = len(Ratings_df['MovieID'].unique())
n_factors = 30
model  = GMF(n_users,n_movies,n_factors)
mb = MetricsCB(MulticlassAccuracy())
learn = TrainLearner(model.to(device),dls,nn.MSELoss(),epochs = 1,lr =
0.5,cbs = [DeviceCB(),mb,ProgressCB(plot=True)])

learn.fit(3,0.01)
```

```
<IPython.core.display.HTML object>

<IPython.core.display.HTML object>
```



```
from sklearn.preprocessing import LabelEncoder

torch.cuda.is_available()

torch.cuda.current_device()

0

movies

array([   0,    2,    5, ..., 9444, 9445, 9485], dtype=int64)

len(list(set(movies)))

9724

!pip install fastai

^C
Collecting fastai
  Downloading fastai-2.7.17-py3-none-any.whl (234 kB)
     ------------------------------------ 234.5/234.5 kB 7.2 MB/s
eta 0:00:00
Requirement already satisfied: matplotlib in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from fastai) (3.7.0)
Collecting spacy<4
  Downloading spacy-3.7.6-cp310-cp310-win_amd64.whl (12.1 MB)
     ---------------------------------------- 12.1/12.1 MB 10.5 MB/s
eta 0:00:00
Requirement already satisfied: pillow>=9.0.0 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from fastai) (9.4.0)
Requirement already satisfied: pip in c:\users\sendh\anaconda3\envs\
deep\lib\site-packages (from fastai) (22.3.1)
Requirement already satisfied: torch<2.5,>=1.10 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from fastai) (2.2.2+cu121)
Requirement already satisfied: torchvision>=0.11 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from fastai) (0.17.2+cu121)
Requirement already satisfied: scipy in c:\users\sendh\anaconda3\envs\
deep\lib\site-packages (from fastai) (1.10.0)
Collecting fastdownload<2,>=0.0.5
  Using cached fastdownload-0.0.7-py3-none-any.whl (12 kB)
Requirement already satisfied: fastprogress>=0.2.4 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from fastai) (1.0.3)
Requirement already satisfied: scikit-learn in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from fastai) (1.2.1)
Requirement already satisfied: fastcore<1.8,>=1.5.29 in c:\users\
sendh\anaconda3\envs\deep\lib\site-packages (from fastai) (1.5.29)
Requirement already satisfied: requests in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from fastai) (2.28.1)
Requirement already satisfied: packaging in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from fastai) (22.0)
```

```
Requirement already satisfied: pandas in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from fastai) (1.5.3)
Requirement already satisfied: pyyaml in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from fastai) (6.0)
Collecting langcodes<4.0.0,>=3.2.0
  Downloading langcodes-3.4.0-py3-none-any.whl (182 kB)
     ---------------------------------------- 182.0/182.0 kB 2.2 MB/s
eta 0:00:00
Collecting spacy-loggers<2.0.0,>=1.0.0
  Downloading spacy_loggers-1.0.5-py3-none-any.whl (22 kB)
Requirement already satisfied: numpy>=1.19.0 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from spacy<4->fastai) (1.23.5)
Collecting spacy-legacy<3.1.0,>=3.0.11
  Downloading spacy_legacy-3.0.12-py2.py3-none-any.whl (29 kB)
Requirement already satisfied: jinja2 in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from spacy<4->fastai) (3.1.2)
Collecting cymem<2.1.0,>=2.0.2
  Downloading cymem-2.0.8-cp310-cp310-win_amd64.whl (39 kB)
Collecting pydantic!=1.8,!=1.8.1,<3.0.0,>=1.7.4
  Downloading pydantic-2.8.2-py3-none-any.whl (423 kB)
     ---------------------------------------- 423.9/423.9 kB 8.8 MB/s
eta 0:00:00
Collecting srsly<3.0.0,>=2.4.3
  Downloading srsly-2.4.8-cp310-cp310-win_amd64.whl (481 kB)
     ---------------------------------------- 481.9/481.9 kB 10.0 MB/s
eta 0:00:00
Collecting catalogue<2.1.0,>=2.0.6
  Downloading catalogue-2.0.10-py3-none-any.whl (17 kB)
Collecting weasel<0.5.0,>=0.1.0
  Downloading weasel-0.4.1-py3-none-any.whl (50 kB)
     ---------------------------------------- 50.3/50.3 kB ? eta
0:00:00
Collecting typer<1.0.0,>=0.3.0
  Downloading typer-0.12.5-py3-none-any.whl (47 kB)
     ---------------------------------------- 47.3/47.3 kB 2.3 MB/s
eta 0:00:00
Collecting murmurhash<1.1.0,>=0.28.0
  Downloading murmurhash-1.0.10-cp310-cp310-win_amd64.whl (25 kB)
Collecting wasabi<1.2.0,>=0.9.1
  Downloading wasabi-1.1.3-py3-none-any.whl (27 kB)
Collecting preshed<3.1.0,>=3.0.2
  Downloading preshed-3.0.9-cp310-cp310-win_amd64.whl (122 kB)
     ---------------------------------------- 122.2/122.2 kB ? eta
0:00:00
Collecting thinc<8.3.0,>=8.2.2
  Downloading thinc-8.2.5-cp310-cp310-win_amd64.whl (1.5 MB)
     ---------------------------------------- 1.5/1.5 MB 11.8 MB/s eta
0:00:00
Requirement already satisfied: setuptools in c:\users\sendh\anaconda3\
```

```
envs\deep\lib\site-packages (from spacy<4->fastai) (65.6.3)
Requirement already satisfied: tqdm<5.0.0,>=4.38.0 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from spacy<4->fastai) (4.64.1)
Requirement already satisfied: certifi>=2017.4.17 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from requests->fastai)
(2023.7.22)
Requirement already satisfied: urllib3<1.27,>=1.21.1 in c:\users\
sendh\anaconda3\envs\deep\lib\site-packages (from requests->fastai)
(1.26.14)
Requirement already satisfied: charset-normalizer<3,>=2 in c:\users\
sendh\anaconda3\envs\deep\lib\site-packages (from requests->fastai)
(2.0.4)
Requirement already satisfied: idna<4,>=2.5 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from requests->fastai) (3.4)
Requirement already satisfied: typing-extensions>=4.8.0 in c:\users\
sendh\anaconda3\envs\deep\lib\site-packages (from torch<2.5,>=1.10-
>fastai) (4.10.0)
Requirement already satisfied: filelock in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from torch<2.5,>=1.10->fastai) (3.9.0)
Requirement already satisfied: networkx in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from torch<2.5,>=1.10->fastai) (2.8.4)
Requirement already satisfied: sympy in c:\users\sendh\anaconda3\envs\
deep\lib\site-packages (from torch<2.5,>=1.10->fastai) (1.11.1)
Requirement already satisfied: fsspec in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from torch<2.5,>=1.10->fastai) (2024.2.0)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from matplotlib->fastai)
(1.0.5)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from matplotlib->fastai)
(3.0.9)
Requirement already satisfied: cycler>=0.10 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from matplotlib->fastai)
(0.11.0)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from matplotlib->fastai)
(2.8.2)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from matplotlib->fastai)
(4.25.0)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from matplotlib->fastai)
(1.4.4)
Requirement already satisfied: pytz>=2020.1 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from pandas->fastai) (2022.7)
Requirement already satisfied: threadpoolctl>=2.0.0 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from scikit-learn->fastai)
(2.2.0)
Requirement already satisfied: joblib>=1.1.1 in c:\users\sendh\
```

```
anaconda3\envs\deep\lib\site-packages (from scikit-learn->fastai)
(1.1.1)
Collecting language-data>=1.2
  Downloading language_data-1.2.0-py3-none-any.whl (5.4 MB)
     ---------------------------------------- 5.4/5.4 MB 11.5 MB/s eta
0:00:00
Collecting pydantic-core==2.20.1
  Downloading pydantic_core-2.20.1-cp310-none-win_amd64.whl (1.9 MB)
     ---------------------------------------- 1.9/1.9 MB 11.0 MB/s eta
0:00:00
Collecting annotated-types>=0.4.0
  Downloading annotated_types-0.7.0-py3-none-any.whl (13 kB)
Requirement already satisfied: six>=1.5 in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from python-dateutil>=2.7->matplotlib-
>fastai) (1.16.0)
Collecting blis<0.8.0,>=0.7.8
  Downloading blis-0.7.11-cp310-cp310-win_amd64.whl (6.6 MB)
     ---------------------------------------- 6.6/6.6 MB 11.4 MB/s eta
0:00:00
Collecting confection<1.0.0,>=0.0.1
  Downloading confection-0.1.5-py3-none-any.whl (35 kB)
Requirement already satisfied: colorama in c:\users\sendh\anaconda3\
envs\deep\lib\site-packages (from tqdm<5.0.0,>=4.38.0->spacy<4-
>fastai) (0.4.6)
Collecting rich>=10.11.0
  Downloading rich-13.8.0-py3-none-any.whl (241 kB)
     ------------------------------------ 241.6/241.6 kB 14.5 MB/s
eta 0:00:00
Requirement already satisfied: click>=8.0.0 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from typer<1.0.0,>=0.3.0-
>spacy<4->fastai) (8.0.4)
Collecting shellingham>=1.3.0
  Downloading shellingham-1.5.4-py2.py3-none-any.whl (9.8 kB)
Requirement already satisfied: smart-open<8.0.0,>=5.2.1 in c:\users\
sendh\anaconda3\envs\deep\lib\site-packages (from
weasel<0.5.0,>=0.1.0->spacy<4->fastai) (5.2.1)
Collecting cloudpathlib<1.0.0,>=0.7.0
  Downloading cloudpathlib-0.19.0-py3-none-any.whl (49 kB)
     ---------------------------------------- 49.4/49.4 kB ? eta
0:00:00
Requirement already satisfied: MarkupSafe>=2.0 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from jinja2->spacy<4->fastai)
(2.1.1)
Requirement already satisfied: mpmath>=0.19 in c:\users\sendh\
anaconda3\envs\deep\lib\site-packages (from sympy->torch<2.5,>=1.10-
>fastai) (1.2.1)
Collecting marisa-trie>=0.7.7
  Downloading marisa_trie-1.2.0-cp310-cp310-win_amd64.whl (152 kB)
     ------------------------------------ 152.4/152.4 kB 9.5 MB/s
```

```
eta 0:00:00
Collecting markdown-it-py>=2.2.0
  Downloading markdown_it_py-3.0.0-py3-none-any.whl (87 kB)
     ---------------------------------------- 87.5/87.5 kB ? eta
0:00:00
Collecting pygments<3.0.0,>=2.13.0
  Downloading pygments-2.18.0-py3-none-any.whl (1.2 MB)
     ---------------------------------------- 1.2/1.2 MB 11.0 MB/s eta
0:00:00
Collecting mdurl~=0.1
  Downloading mdurl-0.1.2-py3-none-any.whl (10.0 kB)
Installing collected packages: cymem, wasabi, spacy-loggers, spacy-
legacy, shellingham, pygments, pydantic-core, murmurhash, mdurl,
marisa-trie, cloudpathlib, catalogue, blis, annotated-types, srsly,
pydantic, preshed, markdown-it-py, language-data, fastdownload, rich,
langcodes, confection, typer, thinc, weasel, spacy, fastai
  Attempting uninstall: pygments
    Found existing installation: Pygments 2.11.2
    Uninstalling Pygments-2.11.2:
      Successfully uninstalled Pygments-2.11.2
Successfully installed annotated-types-0.7.0 blis-0.7.11 catalogue-
2.0.10 cloudpathlib-0.19.0 confection-0.1.5 cymem-2.0.8 fastai-2.7.17
fastdownload-0.0.7 langcodes-3.4.0 language-data-1.2.0 marisa-trie-
1.2.0 markdown-it-py-3.0.0 mdurl-0.1.2 murmurhash-1.0.10 preshed-3.0.9
pydantic-2.8.2 pydantic-core-2.20.1 pygments-2.18.0 rich-13.8.0
shellingham-1.5.4 spacy-3.7.6 spacy-legacy-3.0.12 spacy-loggers-1.0.5
srsly-2.4.8 thinc-8.2.5 typer-0.12.5 wasabi-1.1.3 weasel-0.4.1
```

```
c = torch.Tensor([1,2,3])
```

```
c[None].squeeze(1)
```

```
tensor([[1., 2., 3.]])
```

```
torch.bmm?
```

```
Docstring:
bmm(input, mat2, *, out=None) -> Tensor

Performs a batch matrix-matrix product of matrices stored
in :attr:`input`
and :attr:`mat2`.

:attr:`input` and :attr:`mat2` must be 3-D tensors each containing
the same number of matrices.

If :attr:`input` is a :math:`(b \times n \times m)`
tensor, :attr:`mat2` is a
:math:`(b \times m \times p)` tensor, :attr:`out` will be a
:math:`(b \times n \times p)` tensor.
```

```
.. math::
    \text{out}_i = \text{input}_i \mathbin{@} \text{mat2}_i

This operator supports :ref:`TensorFloat32<tf32_on_ampere>`.

On certain ROCm devices, when using float16 inputs this module will
use :ref:`different precision<fp16_on_mi200>` for backward.

.. note:: This function does not :ref:`broadcast <broadcasting-
semantics>`.
          For broadcasting matrix products, see :func:`torch.matmul`.

Args:
    input (Tensor): the first batch of matrices to be multiplied
    mat2 (Tensor): the second batch of matrices to be multiplied

Keyword Args:
    out (Tensor, optional): the output tensor.

Example::

    >>> input = torch.randn(10, 3, 4)
    >>> mat2 = torch.randn(10, 4, 5)
    >>> res = torch.bmm(input, mat2)
    >>> res.size()
    torch.Size([10, 3, 5])
Type:      builtin_function_or_method

!pip    install  xelatex

ERROR: Could not find a version that satisfies the requirement xelatex
(from versions: none)
ERROR: No matching distribution found for xelatex
```