In [ ]:
```
# 1. Installing the Required Libraries

!pip install numpy==1.24.3 scikit-surprise
!pip install --no-cache-dir --force-reinstall scikit-surprise
```

```
Collecting numpy==1.24.3
  Downloading numpy-1.24.3-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_6
4.whl.metadata (5.6 kB)
Collecting scikit-surprise
  Downloading scikit_surprise-1.1.4.tar.gz (154 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 154.4/154.4 kB 2.2 MB/s eta 0:00:00
  Installing build dependencies ... done
  Getting requirements to build wheel ... done
  Preparing metadata (pyproject.toml) ... done
Requirement already satisfied: joblib>=1.2.0 in /usr/local/lib/python3.11/dist-pa
ckages (from scikit-surprise) (1.4.2)
Requirement already satisfied: scipy>=1.6.0 in /usr/local/lib/python3.11/dist-pac
kages (from scikit-surprise) (1.14.1)
Downloading numpy-1.24.3-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_64.w
hl (17.3 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 17.3/17.3 MB 50.0 MB/s eta 0:00:00
Building wheels for collected packages: scikit-surprise
  Building wheel for scikit-surprise (pyproject.toml) ... done
  Created wheel for scikit-surprise: filename=scikit_surprise-1.1.4-cp311-cp311-l
inux_x86_64.whl size=2505217 sha256=8696e75d1548ff64f0e68c033ac1a58ce054a40c28b2f
8659c7fb2dfa88caec5
  Stored in directory: /root/.cache/pip/wheels/2a/8f/6e/7e2899163e2d85d8266daab4a
a1cdabec7a6c56f83c015b5af
Successfully built scikit-surprise
Installing collected packages: numpy, scikit-surprise
  Attempting uninstall: numpy
    Found existing installation: numpy 2.0.2
    Uninstalling numpy-2.0.2:
      Successfully uninstalled numpy-2.0.2
ERROR: pip's dependency resolver does not currently take into account all the pac
kages that are installed. This behaviour is the source of the following dependenc
y conflicts.
tensorflow 2.18.0 requires numpy<2.1.0,>=1.26.0, but you have numpy 1.24.3 which
is incompatible.
pymc 5.21.2 requires numpy>=1.25.0, but you have numpy 1.24.3 which is incompatib
le.
albumentations 2.0.5 requires numpy>=1.24.4, but you have numpy 1.24.3 which is i
ncompatible.
blosc2 3.3.1 requires numpy>=1.26, but you have numpy 1.24.3 which is incompatibl
e.
albucore 0.0.23 requires numpy>=1.24.4, but you have numpy 1.24.3 which is incomp
atible.
jaxlib 0.5.1 requires numpy>=1.25, but you have numpy 1.24.3 which is incompatibl
e.
thinc 8.3.6 requires numpy<3.0.0,>=2.0.0, but you have numpy 1.24.3 which is inco
mpatible.
jax 0.5.2 requires numpy>=1.25, but you have numpy 1.24.3 which is incompatible.
treescope 0.1.9 requires numpy>=1.25.2, but you have numpy 1.24.3 which is incomp
atible.
Successfully installed numpy-1.24.3 scikit-surprise-1.1.4
```

```
Collecting scikit-surprise
  Downloading scikit_surprise-1.1.4.tar.gz (154 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0.0/154.4 kB ? eta -:--:--
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 154.4/154.4 kB 4.6 MB/s eta 0:00:00
  Installing build dependencies ... done
  Getting requirements to build wheel ... done
  Preparing metadata (pyproject.toml) ... done
Collecting joblib>=1.2.0 (from scikit-surprise)
  Downloading joblib-1.4.2-py3-none-any.whl.metadata (5.4 kB)
Collecting numpy>=1.19.5 (from scikit-surprise)
  Downloading numpy-2.2.5-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_64.
whl.metadata (62 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 62.0/62.0 kB 107.0 MB/s eta 0:00:00
Collecting scipy>=1.6.0 (from scikit-surprise)
  Downloading scipy-1.15.2-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_6
4.whl.metadata (61 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 62.0/62.0 kB 109.2 MB/s eta 0:00:00
Downloading joblib-1.4.2-py3-none-any.whl (301 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 301.8/301.8 kB 23.9 MB/s eta 0:00:00
Downloading numpy-2.2.5-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_64.wh
l (16.4 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 16.4/16.4 MB 193.0 MB/s eta 0:00:00
Downloading scipy-1.15.2-cp311-cp311-manylinux_2_17_x86_64.manylinux2014_x86_64.w
hl (37.6 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 37.6/37.6 MB 157.7 MB/s eta 0:00:00
Building wheels for collected packages: scikit-surprise
  Building wheel for scikit-surprise (pyproject.toml) ... canceledERROR: Operatio
n cancelled by user
^C
```

In [ ]:

```python
# 2. Import Required Libraries

import numpy as np
import pandas as pd
from surprise import SVD, Dataset, Reader
from surprise.model_selection import cross_validate
```

In [ ]:

```python
# 3. Prepare the Sample Dataset

# Define users, items, and ratings
users = [1, 2, 3, 4, 1, 2, 3, 4]
movies = [
    "Star Wars",
    "Hary Porter",
    "Star Wars",
    "Star Wars",
    "Hary Porter",
    "Tom Rider",
    "Hary Porter",
    "Tom Rider",
]
ratings = [1, 3, 4, 2, 3, 4, 1, 1]

# Create a dictionary and convert to DataFrame
rating_dict = {
    "userID": users,
    "ItemID": movies,
    "rating": ratings
}
```

```
df = pd.DataFrame(rating_dict)
df
```

Out[ ]:

	userID	ItemID	rating
0	1	Star Wars	1
1	2	Hary Porter	3
2	3	Star Wars	4
3	4	Star Wars	2
4	1	Hary Porter	3
5	2	Tom Rider	4
6	3	Hary Porter	1
7	4	Tom Rider	1

In [ ]:
```
# 4. Define Reader and Load Dataset

# Define the rating scale (min=1, max=5)
reader = Reader(rating_scale=(1, 5))

# Load dataset in Surprise format
data = Dataset.load_from_df(df[["userID", "ItemID", "rating"]], reader)
```

In [ ]:
```
# 5. Apply SVD Collaborative Filtering Algorithm

# Initialize the SVD algorithm
algo = SVD()

# Fit the algorithm on the data
algo.fit(data.build_full_trainset())
```

Out[ ]:
```
<surprise.prediction_algorithms.matrix_factorization.SVD at 0x784b11b2b050>
```

In [ ]:
```
# 6. Evaluate the Model using Cross Validation

cross_validate(algo , data , measures = ['rmse' , 'mae'] , cv  =5 , verbose = Tr
```

```
Evaluating RMSE, MAE of algorithm SVD on 5 split(s).

                  Fold 1  Fold 2  Fold 3  Fold 4  Fold 5  Mean    Std
RMSE (testset)    2.0248  0.4334  1.5797  1.9429  0.9482  1.3858  0.6090
MAE (testset)     2.0219  0.3997  1.5750  1.9429  0.9482  1.3775  0.6187
Fit time          0.00    0.00    0.00    0.00    0.00    0.00    0.00
Test time         0.00    0.00    0.00    0.00    0.00    0.00    0.00
```

Out[ ]:

```
{'test_rmse': array([2.02475105, 0.43342643, 1.57972267, 1.942881  , 0.9482274
9]),
 'test_mae': array([2.0218816 , 0.39971443, 1.57495684, 1.942881  , 0.9482274
9]),
 'fit_time': (0.0014197826385498047,
  0.00039076805114746094,
  0.0002872943878173828,
  0.0002970695495605469,
  0.0002691745758056640 6),
 'test_time': (0.00011086463928222656,
  0.00043654441833496094,
  4.124641418457031e-05,
  2.8133392333984375e-05,
  2.7894973754882812e-05)}
```