Assignment03 Report

Requirements

1. Use the latest version of PyTorch.

```
!pip show torch

Name: torch
Version: 2.3.0
Summary: Tensors and Dynamic neural networks in Python with strong GPU acceleration
Home-page: https://pytorch.org/
Author: PyTorch Team
Author-email: packages@pytorch.org
License: BSD-3
Location: /usr/local/lib/python3.10/dist-packages
Requires: filelock, fsspec, jinja2, networkx, nvidia-cublas-cu12, nvidia-cuda-cupti-cu12, nvidia-cuda-nvrtc-cu12, nvidia-cuda-runtime-cu12, nvidia-cudnn-cu12,
nvidia-cufft-cu12, nvidia-curand-cu12, nvidia-cusolver-cu12, nvidia-cusparse-cu12, nvidia-nccl-cu12, nvidia-nvtx-cu12, sympy, triton, typing-extensions
Required-by: flash-attn, lightning-thunder, speechbrain, torch-tensorrt, torchaudio, torchdata, torchtext, torchvision, transformer-engine
```

2. Implement the three methods without redundant code

3. Follow the training and test setting introduced in the Subsection 4.1

- Dataset: MovieLens-1 million

Dataset	Interaction#	Item#	User#
MovieLens	About 1 million	3706	6040

- Metric: HR@10 and NDCG@10
- optimizer: Adam with learning rate 0.001
- Predictive factor: 8

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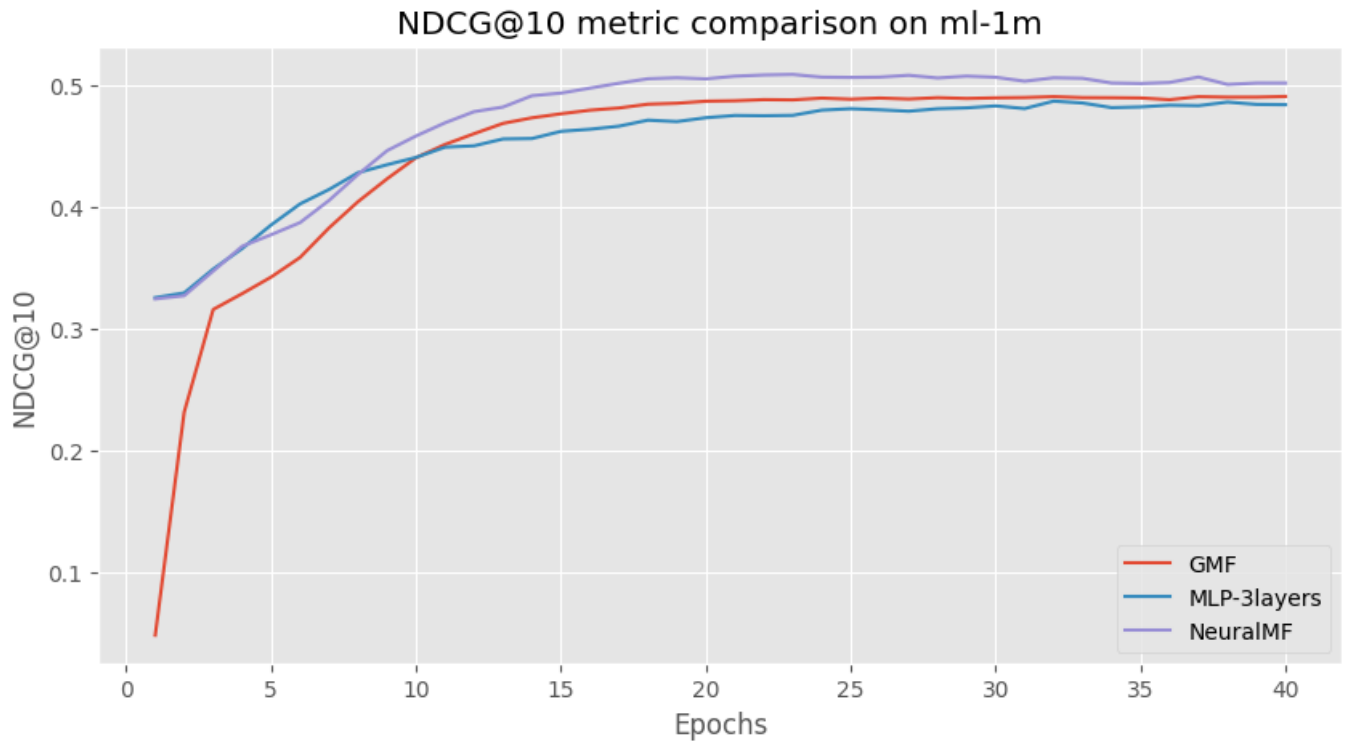
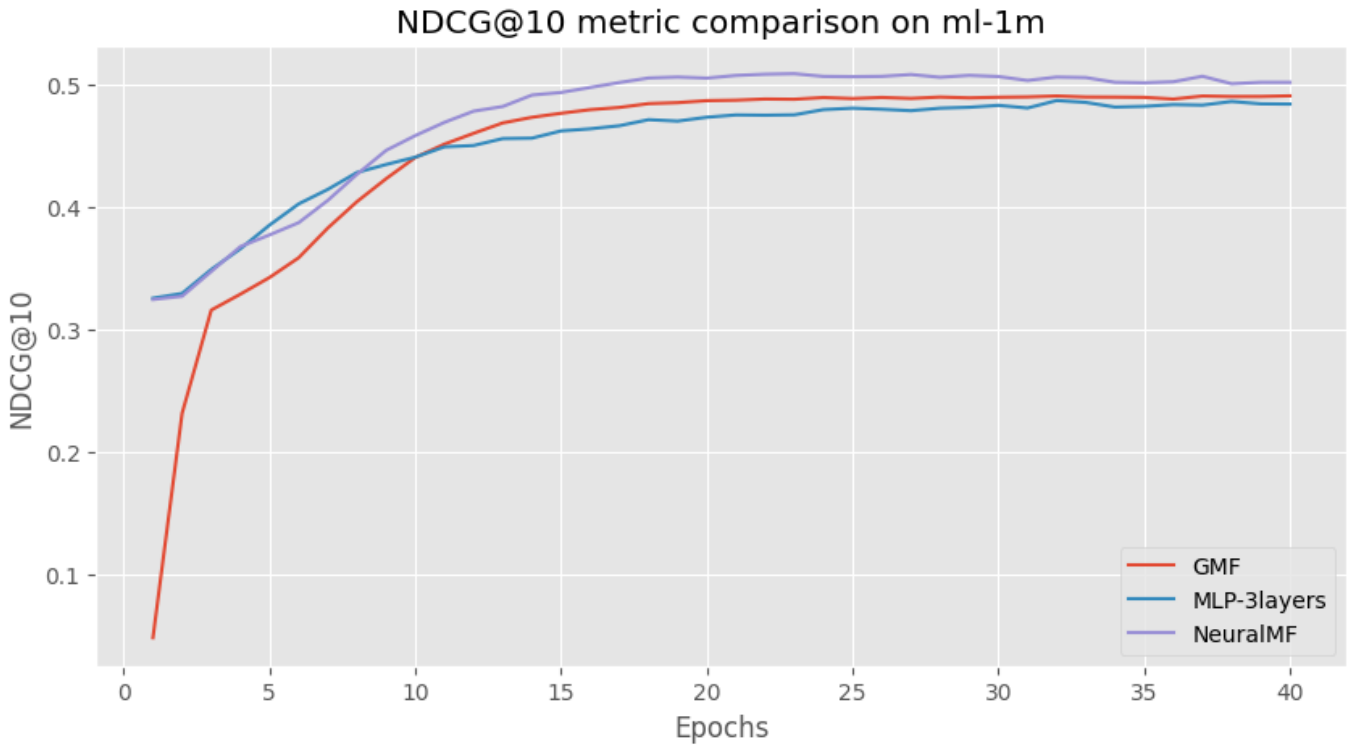
4. Compare the three methods using the metrics of HR@10 and NDCG@10



HR@10 metric comparison



NDCG@10 metric comparison

5. Reproduce the ablation study in Table 3: comparing the results of MLP with different layers.

Metric	GMF	NeuMF	MLP-0	MLP-1	MLP-2	MLP-3	MLP-4
HR@10	0.750000	0.555960	0.674503	0.729801	0.743046	0.757781	0.770861
NDCG@10	0.491107	0.329678	0.415787	0.469550	0.487267	0.496092	0.509181

From final results we can derive:

- NeuMF perform the best, then the MLP-4, MLP with no hidden layers perform the worst.
- GMF beats MLP with layer# less than 3
- It is easy for MLP with higher number of hidden layers to suffer from overfitting
- (The data set was split without overlapping between test set and training set, but the results are still too good to be true...)

Reference

[1] He, Xiangnan, et al. "Neural collaborative filtering." Proceedings of the 26th international conference on world wide web. 2017