Project of Advanced A.I. 2022/23

Recommender System

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Introduction

Definition:

Recommender systems are algorithms designed to predict user preferences and make personalized recommendations. These algorithms can be based on various criteria, including past purchases, search history, demographic information, and other factors.

Our Task:

Recommender system for movies, based on a record of movies already seen.

Introduction

Implementation used:

Collaborative Filtering method, with a model-based approach with deep learning algorithms.

Metrics used:

- Hit Ratio (HR)
- Normalized Discounted Cumulative Gain (NDCG)
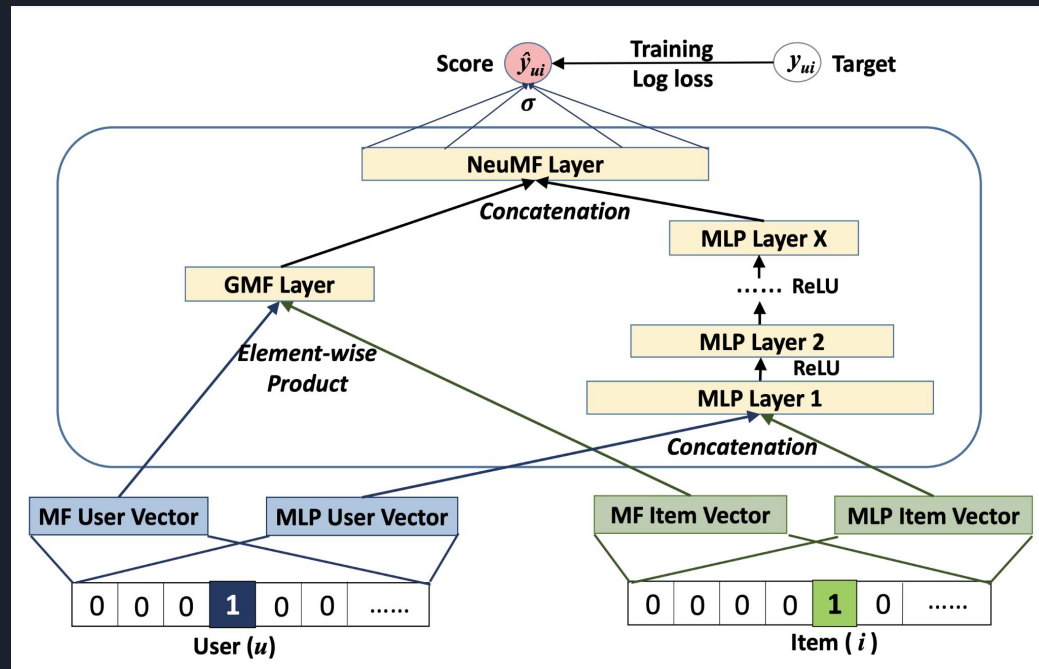
Assignment 1: NeuMF Model

- Generalized Matrix Factorization:

Estimates the interaction through the inner product of the latent vectors of user and item.

- Neural Collaborative Filtering:

Combine the features of the two latent vectors by concatenating them. Use a Multi-Layer Perceptron (MLP) to learn the interaction.
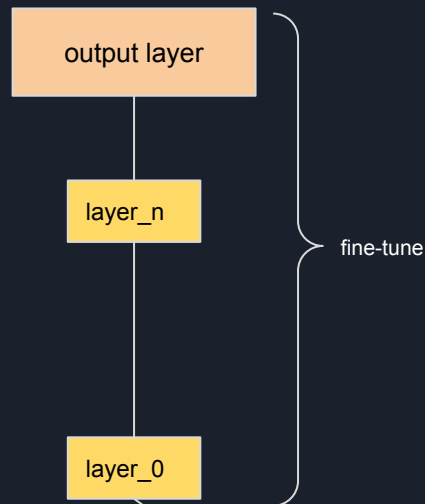
- Neural Matrix Factorization

Assignment 2: Transfer Learning

Transfer learning is a machine learning method where a model developed for a task is reused as the starting point for a model on a second task.
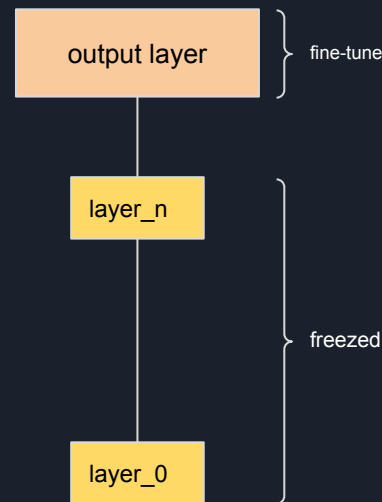
The pre-trained parameters from the MLP and GMF models are transferred to the respective layers of the NeuMF_transfer_nof and NeuMF_transfer_f models, enabling them to benefit from the knowledge learned in the pre-training phase.
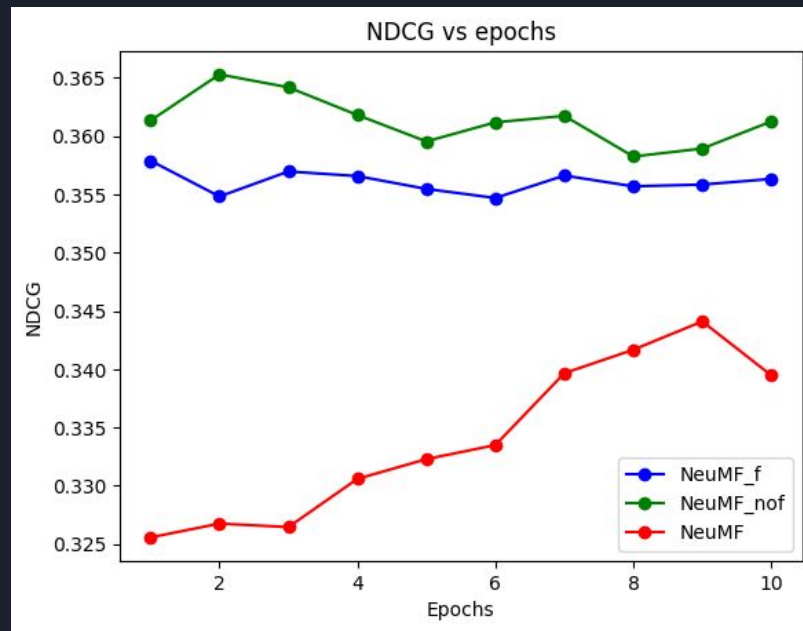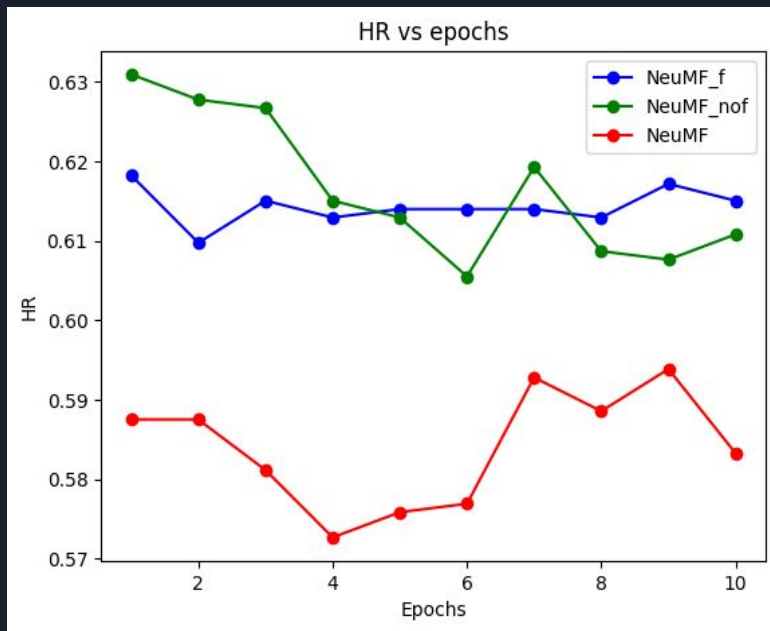
NeuMF_transfer_nof

NeuMF_transfer_f

output layer

layer_n

layer_0

fine-tune

output layer

fine-tune

layer_n

freezed

layer_0

target dataset

Comparison: NeuMF_f, NeuMF_nof, NeuMF

Assignment 3: Explainable AI

Explainable AI refers to methods and techniques in the application of artificial intelligence such that the results can be understood by humans.

LIME

LIME (Local Interpretable Model Agnostic Explainer)

- Generation of perturbed instances
- Sampling of data
- Creation of an interpretable model
- Identification of relevant features

LIME
in a recommender system

First approach:

- Select a User
- Select N Items (1 with positive interaction and N-1 with negative interaction)
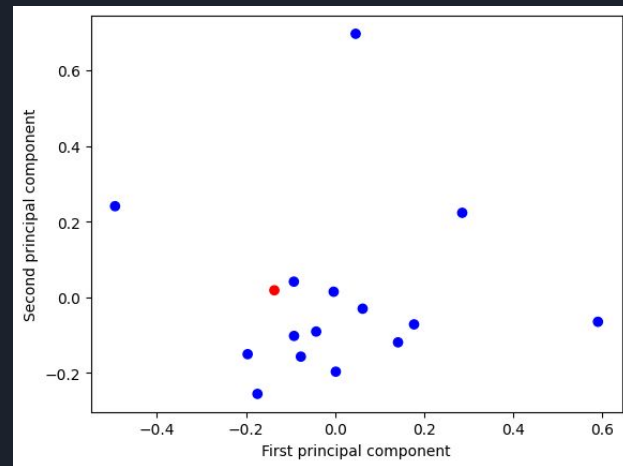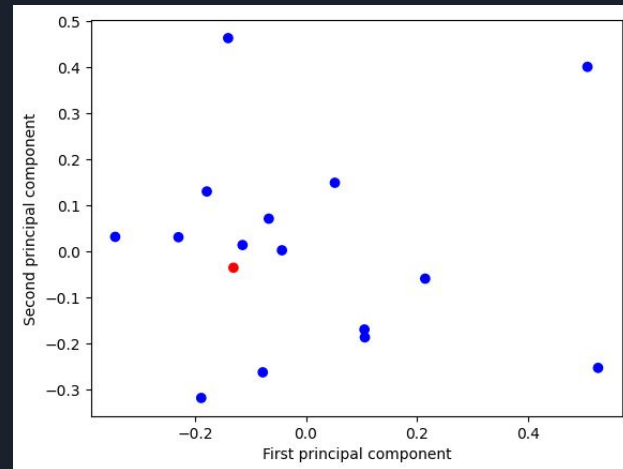
Second approach:

- Select 1 Item
- Select N Users who interact with it
- Select M Users who don't interact with it

LIME
in a recommender system

Third approach:

- Select a User
- Find a cluster of Users around him
- Compare features with a User "far" from the cluster

# Assignment 4: Attention Mechanism

Definition:

In machine learning, the attention mechanism refers to the model's ability to focus on few relevant parts of the input when generating the output.
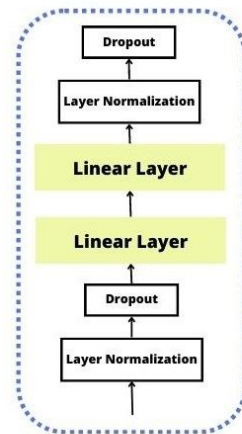
It enables the model to assign weights to the elements of the input sequence and better understand their context and dependencies.
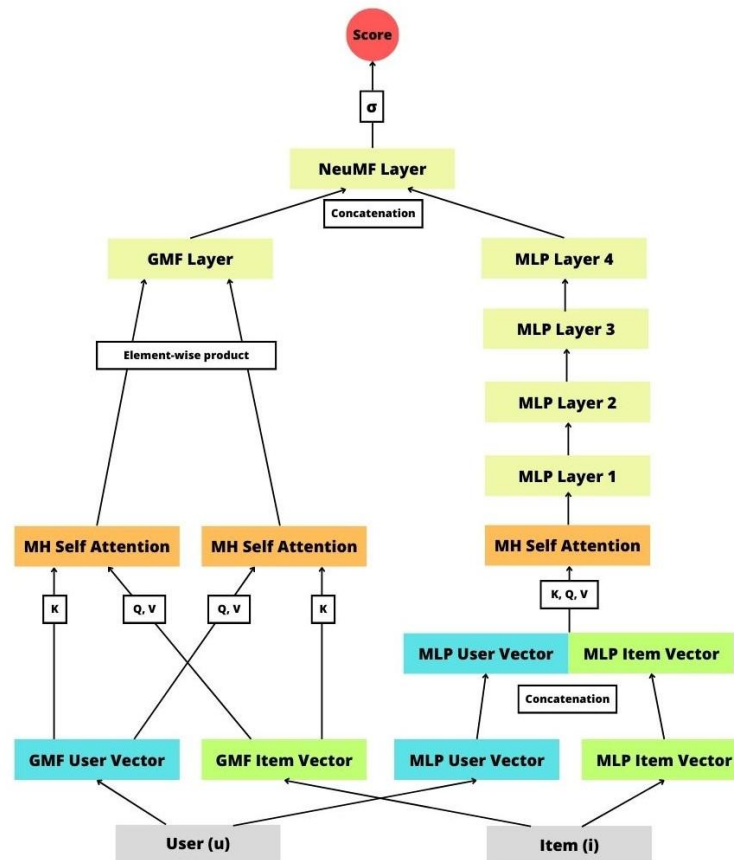
Assignment 4: Viviani's Model

The architecture follows the paper: "Deep Collaborative Recommendation Algorithm Based on Attention Mechanism" by Can Cui published in 2022.
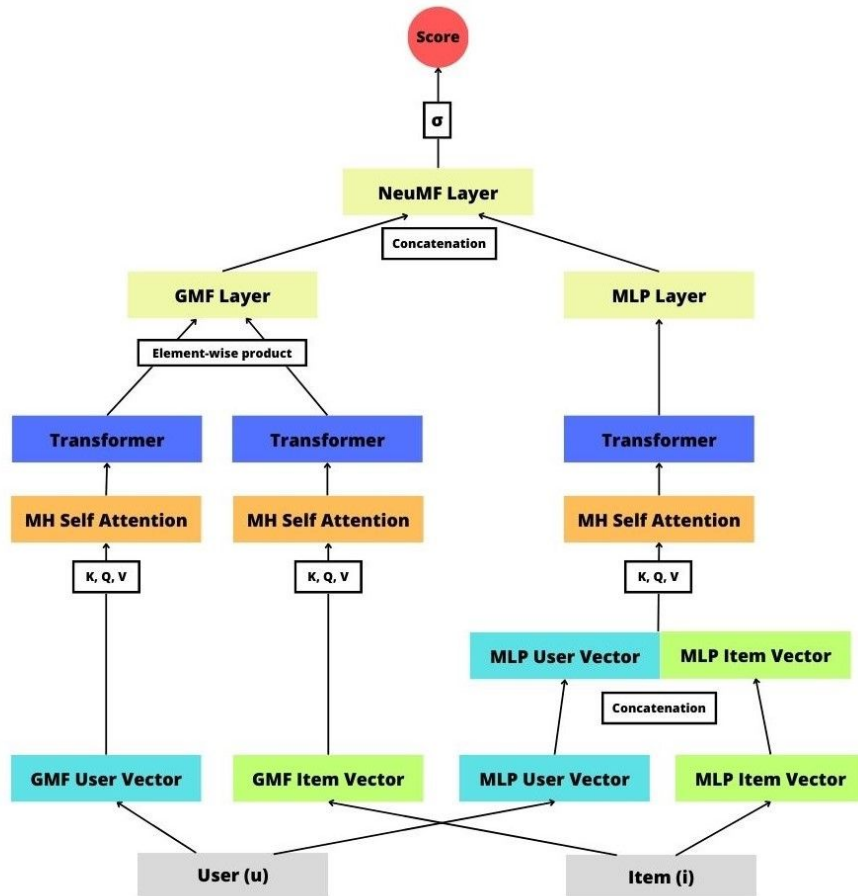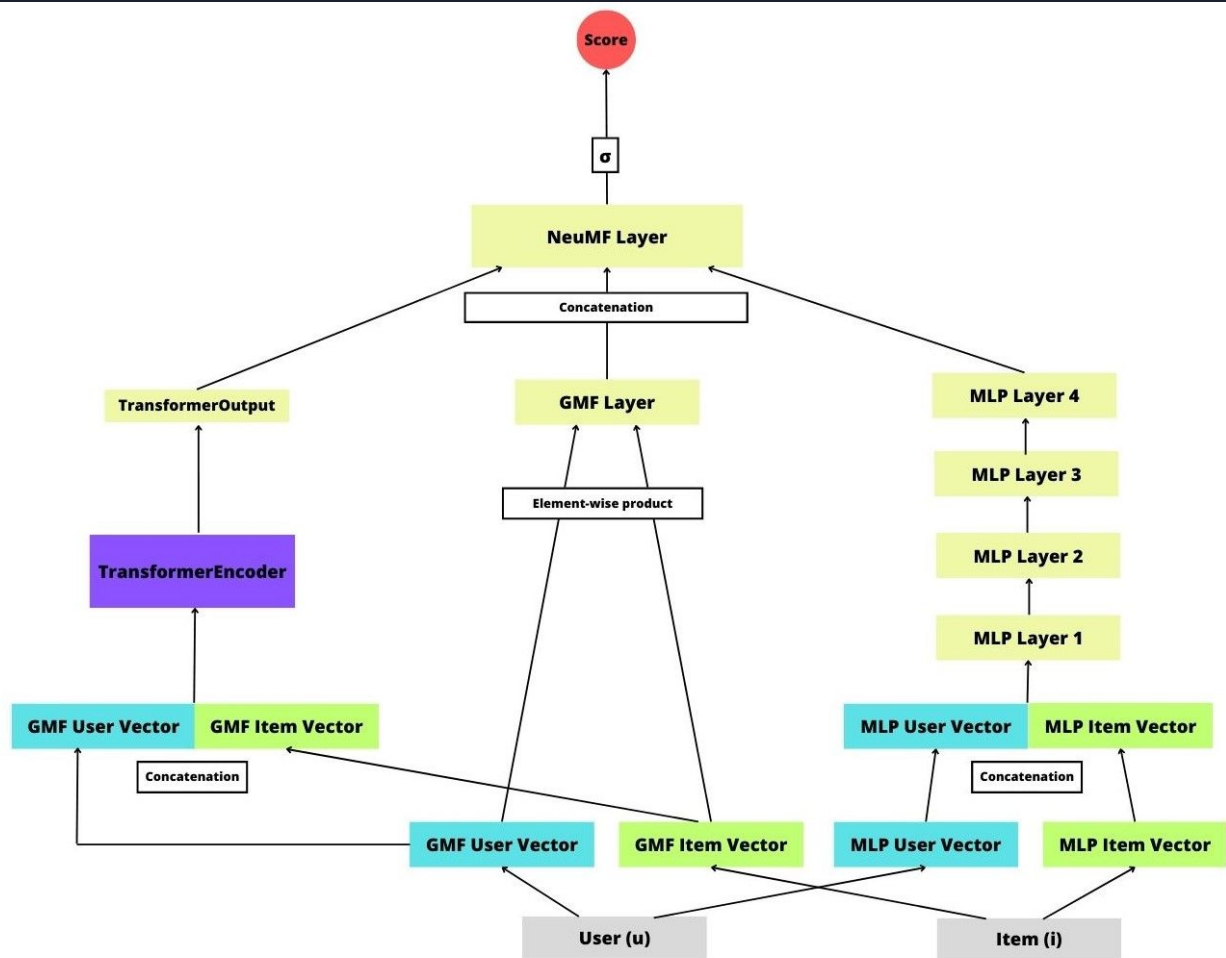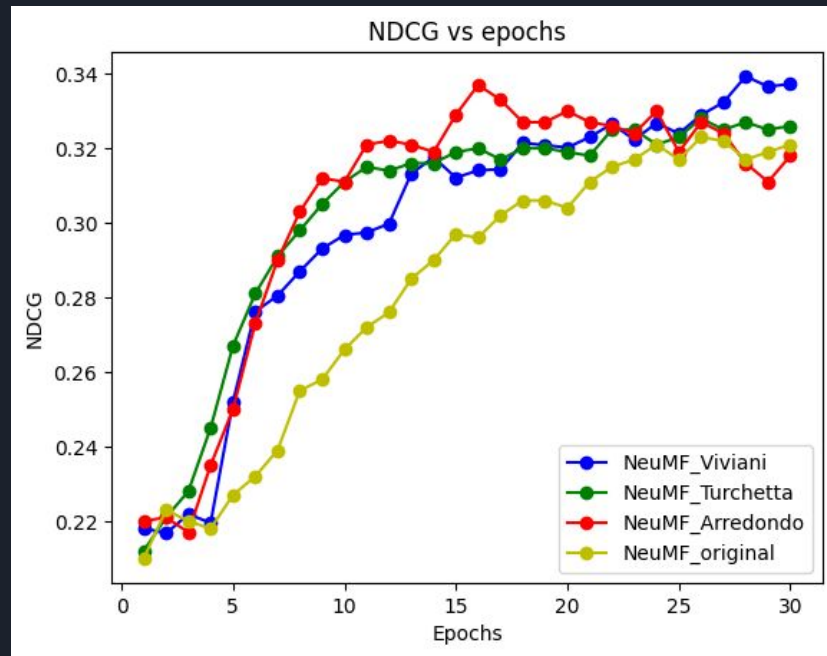
Assignment 4: Turchetta's Model

Assignment 4: Arredondo's Model

Comparison: with and without attention

Thanks For The Attention