Conclusion

Key Differences Between the Two Codes

1️⃣ First Code (Content-Based Filtering with TF-IDF & Neural Network)

- Uses **text descriptions** of items and converts them into **numerical vectors** using **TF-IDF**.
- **Similarity is computed using cosine similarity** to recommend items that are textually similar.
- **Doesn't require user interaction or ratings**, only item features (descriptions).

2️⃣ Second Code (Collaborative Filtering with Matrix Factorization)

- Uses a **user-item rating matrix** to infer hidden relationships between users and items.
- Implements **Matrix Factorization (MF)** using **Gradient Descent** to learn two matrices (P & Q).
- **Predictions are made by reconstructing the matrix** (i.e., estimating missing ratings).
- Requires **user interaction data** (ratings) but doesn't need item descriptions.

Content-Based vs. Collaborative Filtering – Which is Better for "EARS for Media"?

Criteria	Content-Based Filtering (TF-IDF)	Collaborative Filtering (MF)
Data Needed	Item descriptions or metadata	User-item interaction (ratings)
Cold Start Problem	Struggles with new users	Struggles with new items/users
Scalability	Good for large item sets	Needs a lot of rating data
Personalization	Suggests similar items based on features	Recommends based on user behavior
Works Well For	When item features are meaningful (e.g., movies, books)	When there are many users rating items

For "EARS for Media" (music/movies), collaborative filtering (matrix factorization) is generally better because:

- People's taste in media is **subjective and hard to describe in text**.
- **User ratings provide stronger signals** than just textual similarity.
- Once enough rating data is collected, **recommendations become highly personalized**.