

INSTAGRAM REELS RECOMMENDATION ALGORITHM USING GRAPHS AND HASHMAPS

Problem Statement

Project Overview

This is a simple yet clean and easy-to-understand Instagram Reels Recommendation system that leverages fundamental data structures—graphs and hashmaps. This project seeks to provide personalized content recommendations to users based on their interests, preferences, and content popularity.

Background and Objective

In real-world scenarios, users of social media platforms like Facebook, Instagram, and TikTok are essentially recommended short-form content-related videos, i.e., Reels, that are compatible with their interests and behaviors. Likewise, this project implements a recommendation algorithm that provides Instagram reels to users aligned with their preferences, social interests, and content engagement patterns.

Strategies and Features

This project combines several algorithms, strategies, and features.

Recommendation Strategies

1. Graph-based Recommendation - utilize users' follow relationships to recommend content
2. Collaborative Filtering - Identify and simplify each user with similar preferences and behaviors to suggest reels they interact with
3. Content-Based Filtering - Recommend content with the same interest tags and features a content that the user previously engaged with and liked.
4. Popularity Metrics - In overall engagement, such as like counts and views, as a signal

Features

1. Social Graph Analysis:- Allow the user network to identify both first and second-degree connections in the user's social network
2. Tag Similarity Matching - suggest reels with tags similar to the user's previously liked content
3. Recommendations Explanations - Provide clear explanations for why each content was recommended.
4. Visualization Tools- Tools to display graphically user behavior, recommendation sources, and social networks.

Algorithm Details

The recommendation algorithm uses several Data structures for efficiency

1. User Liked Reels HashMap - to map each user with the reels they liked.
2. User Viewed Reels HashMap- to track each user to their viewed reels.
3. User Follows HashMap- to record each user to the users they follow
4. Reel Tags HashMap- to store each reel with its tags.
5. Tag Reels HashMap- to map each tag to the reels that include it.
6. User Created Reels HashMap- to keep a record of the reels each user created.

Recommendation Process

1. First, identify reels from the users using first-degree connections.
2. Find other reels and content from second-degree connections – users followed another user
3. Then, we analyze the tag preferences based on the user's previously liked content
4. After that, we suggest reels with matching tags
5. And apply the popularity adjustments based on engagement metrics
6. Finally, we rank and return with top recommendations.

Extension ideas

Since this is a college project, we can have room for improvement to further improve and refine recommendations, and several extension ideas can still be explored, and some are.

1. Time-decayed factors- to prioritize new interactions over older ones, to give higher weights

2. Implement negative feedback- to adjust ranking and priorities based on skipped, hidden, and reported by the users.
3. Add content embeddings- for deeper semantic matching
4. Real-time signals- to incorporate real-time engagement signals
5. Diversity mechanisms- add complete and enhanced mechanisms to avoid filter bubbles