Recommender Algorithms

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OUTLINE

(1) What is a Recommender Algorithm?

(2) History of Development

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  (a) General

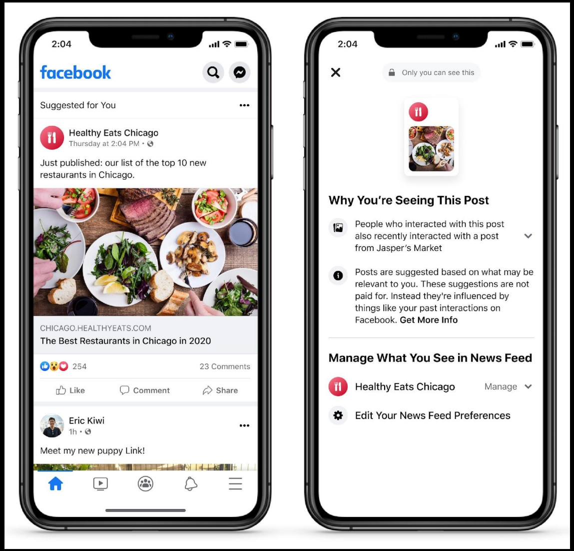
  (b) Emotional/Psychological

  (c) Radicalization

(5) Possible Solutions

What is a Recommender Algorithm ?

“THE ALGORITHM”



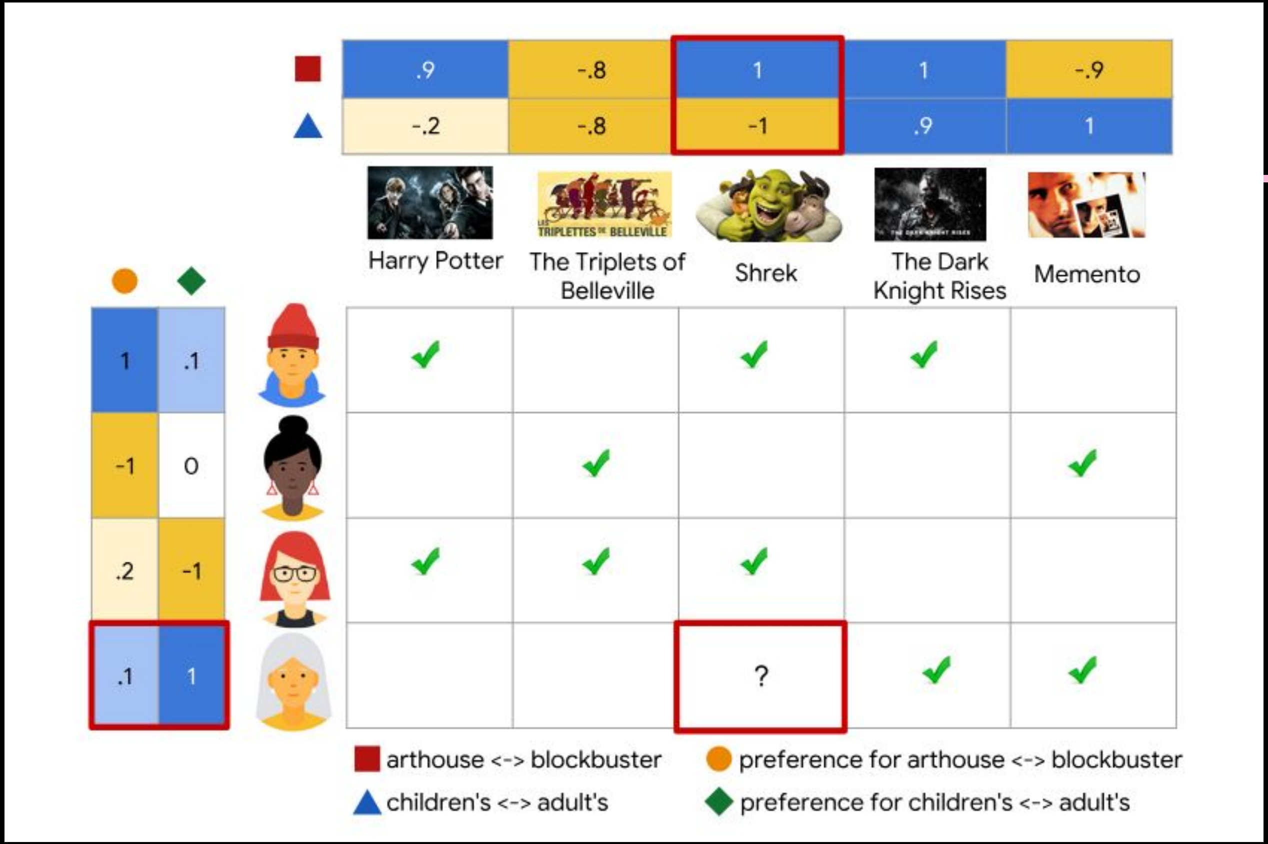
The problem it addresses - Maximizing user’s time

- Many companies using recommender algorithms collect and & sell user data to advertisers & other third-parties
- Others operate on a subscription model (Netflix), and aim to keep their subscribers paying
- Both of these lead priorities to the primary goal of **maximizing time spent by users on the platform**–to maximize profits

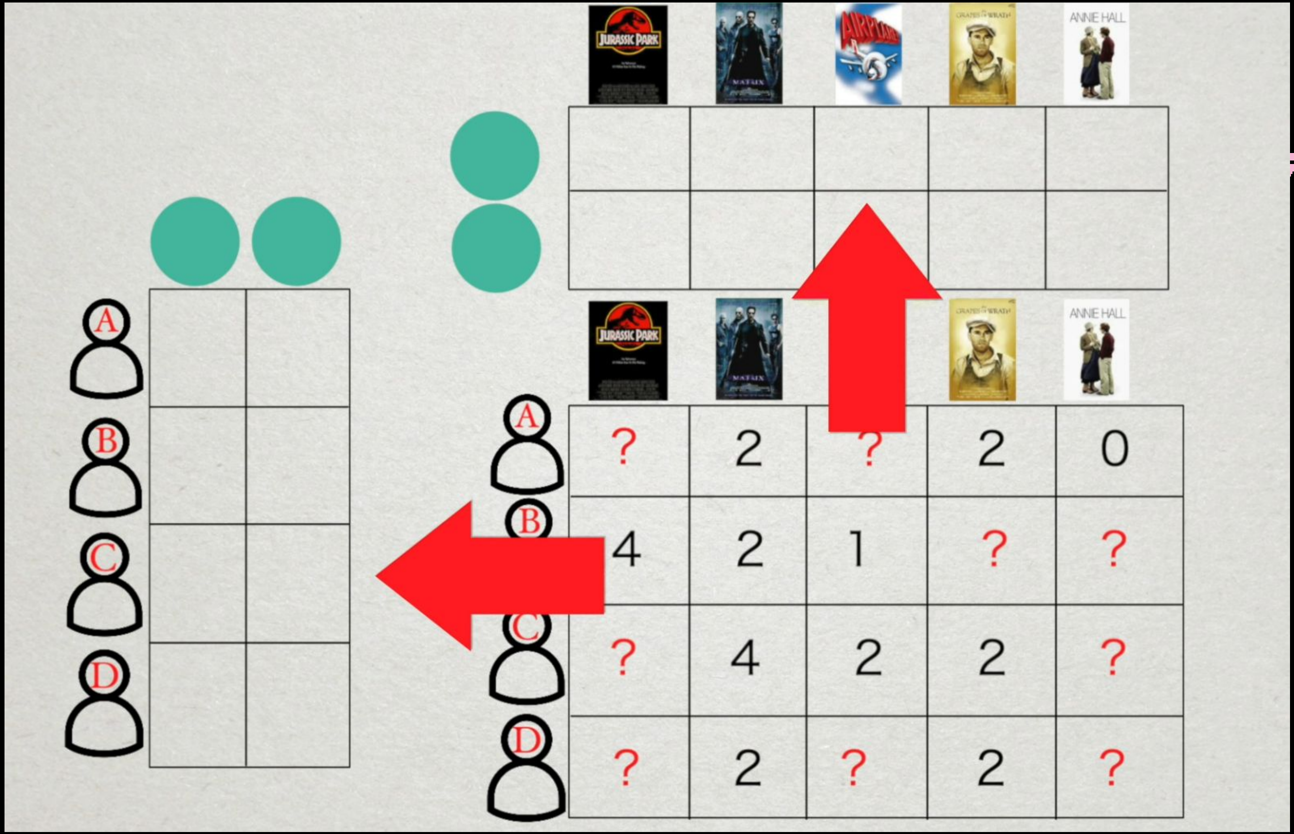
Recommender algorithms are the key to achieving this goal, providing users with content they are most likely to enjoy

History & Algorithm Overview

Recommender Algorithm Origins - Collaborative Filtering



Recommender Algorithm Evolution - Matrix Factorization



Modern Recommender Algorithms - Deep Neural Networks (Ex. Youtube)

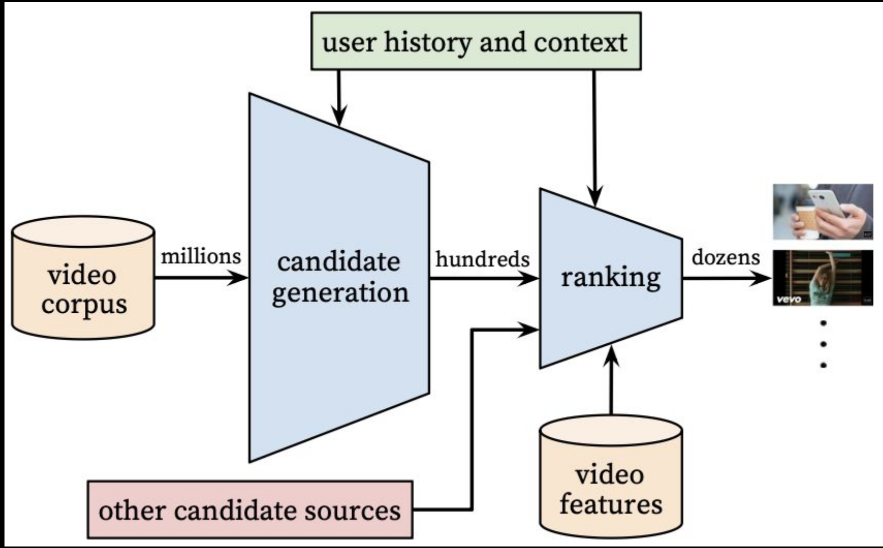
Two stage pipeline:

1. Candidate Generation (Rough Personalization)

Input: user's watch history, search history, and basic demographics (location, age, device).

2. Ranking (Fine-Tuned Personalization)

Input: More features (hundreds) like channel history, time since last watch, click frequency etc.



Privacy

"Does the system know who I am? How much does it know?"

Concerns

User Profiling:

- Systems track many things (searches, clicks, time spent) to build a profile.

Inference & sensitive attribute disclosure:

- Even if you didn't tell the system your age, gender, or medical condition, algorithms might infer it from your behaviour

Lack of control / transparency

- Users may not know what data is used, whether they can control it, or how to opt out.

Trade-off

Personalization vs privacy

- The more personalized recommendations get, the more data is used - this can reduce privacy.

Fairness & Ethics

"Is it morally acceptable for a company to design the algorithm so that I stay longer even if it harms my well-being?"

Popularity bias & “rich get richer”

- “Niche books... accounted for 30–40% of Amazon book sales.”

Unequal exposure for creators/groups

- “Popularity can derive from historical and structural inequalities, which means favoring popular items can be unfair towards protected groups.”

Reduced user autonomy & manipulation

- Preferences shaped even if users “think” they’re choosing freely

Opaque decision-making

- Users have no visibility into why something is recommended

Emotional/Psychological Impact

“Recommendations can affect how we feel, what we believe, and our habits.”

Addiction & continuous scrolling

- The system learns what keeps you engaged

Mood-based content loops (sad -> sadder)

- Content often reflected or amplified users' emotional expression

Self-image & unrealistic standards

- Exposure to idealised physical appearance and lifestyle content was associated with lower self-esteem

Echo-chambers & emotional escalation

- Recommendations can trap you in narrow emotional/ideological loops.

Algorithmic Radicalization

“A serious risk: how recommender systems may push users toward extreme or radicalised content.”

Engagement loop rewards extreme content

- Content that triggers strong emotion often yields high engagement

Progressive escalation path

- A user might start with “mild” content and gradually be recommended more extreme content.

Filter bubbles & narrow world-views

- The system may increasingly show similar content, reducing exposure to opposing views

Solutions & Mitigations

"What can be done: both technically and from a design/ethical standpoint."

Solutions to Privacy Concerns

Federated Learning / On-device processing

- Instead of sending all your data to central server, compute recommendations partly on your device
- Share only aggregated updates. (keeps raw data local)

User control & transparency

- Give clear options: “See what data we use”, “Delete your data”, “Turn off personalized recommendations”.
- Show “why was I recommended this?” logs.

Solutions to Fairness & Ethical Concerns

Include fairness/diversity objectives

- Shift algorithm goal: not just “keep you longer”, but “serve you well” and “treat creators fairly”.

Expose reasoning: “Why was this recommended?”

Design for well-being, not only attention

- Algorithms can detect signs of negative loops (emotional or ideological) and moderate.

Independent audits of recommendation outcomes (exposure, fairness, emotional impact)

Why corporations ultimately don’t care about implementing solutions

Goals of **product** recommender systems:

- Better understand what the user wants
- Increase user satisfaction
- Increase number of items sold
- Sell more diverse items

Goals of **content** recommender systems:

- Better understand what the user wants
- Increase user satisfaction
- Increase user’s total content consumption time
- Maximize ad revenue

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THANK YOU!

Questions ?

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