Understanding Artificial Intelligence

Day Two

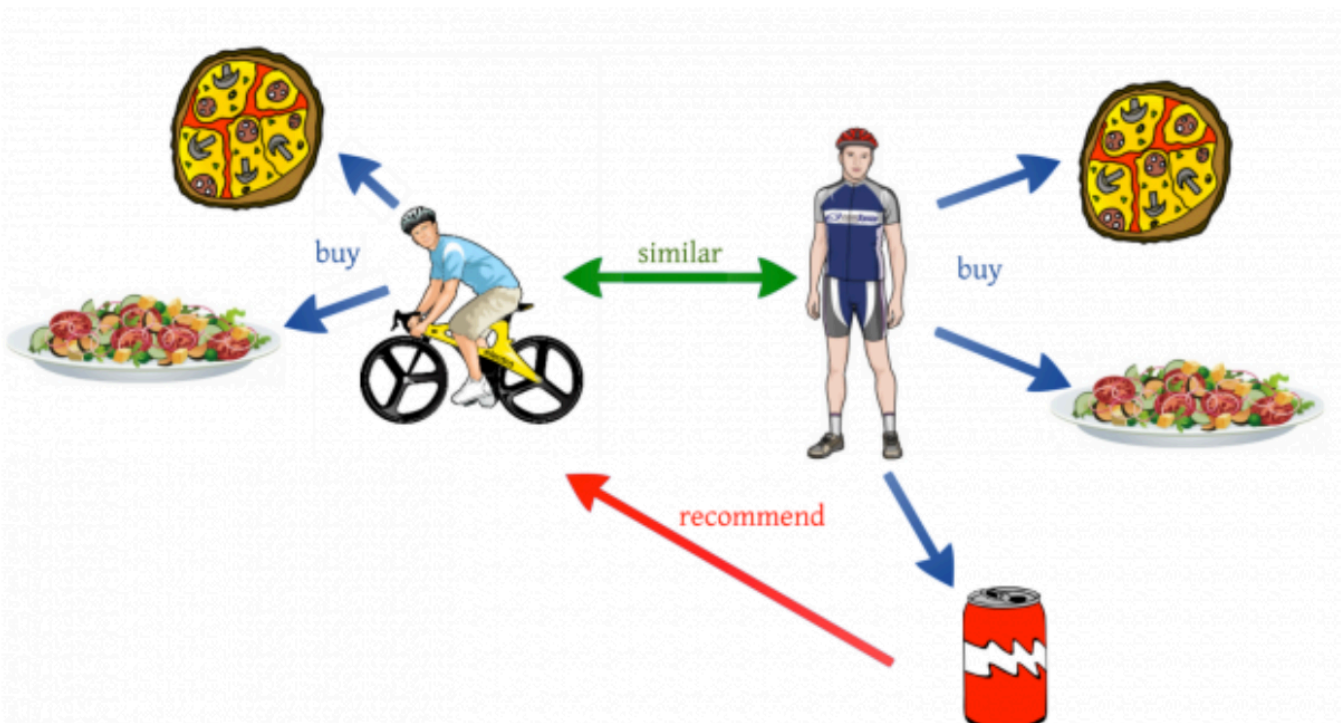
Recommenders

Overview

- "You don't know what you don't know"
  - News, music, videos
- Serendipity
  - *Unplanned fortunate discovery*
  - Drive users to return to a platform
  - Social media, online shopping, music
- Filters the entire data set into a subset the user hopefully is interested in

Approach: Collaborative Filtering

- Recommend things liked by other similar people
- Uses explicit (ratings) or implicit (purchase history) data



Example: Amazon Item-to-Item

Frequently bought together

This item: CanaKit Raspberry Pi 4 Extreme Kit - 128GB Edition (4GB RAM)

$169.99 ✓prime

FREENOVE Ultimate Starter Kit for Raspberry Pi 4 B 3 B+ 400, 558-Page Detailed Tutorial,...

$49.95 ✓prime

Programming the Raspberry Pi, Third Edition: Getting Started with Python

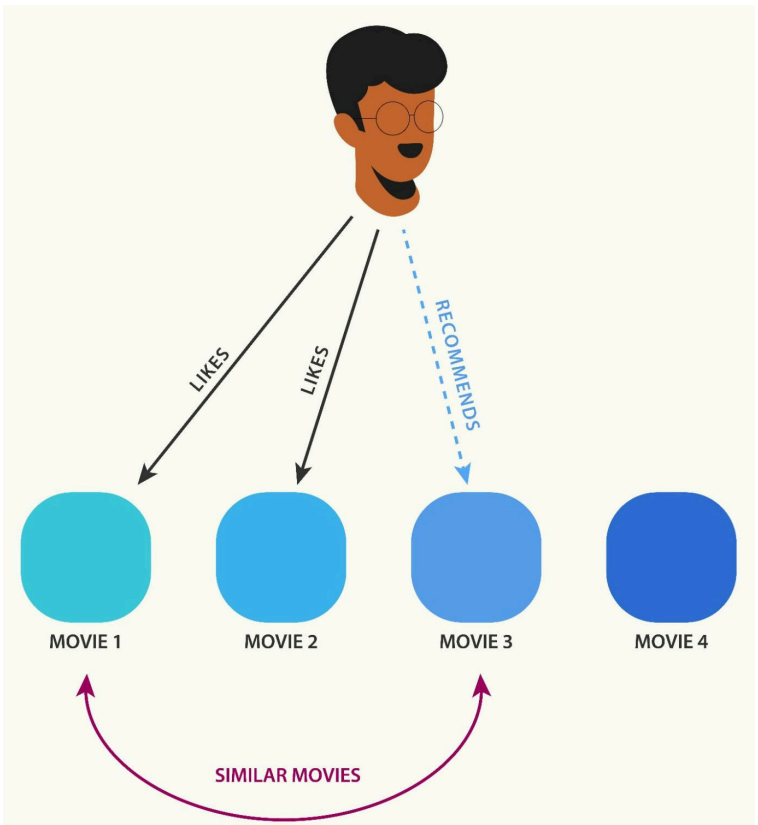
$15.00 ✓prime

Problems

- **Cold Start** — For new people, not enough data to make good recommendations
- **Scalability** — High-dimensional data, with many people it's challenging to find similar people
- **Sparsity** — Doesn't work well if most items have no rating or preference data

Approach: Content-Based Filtering

- Uses attributes of the items and user's preferences
- Tunes the model from results
- Some preferences are weighted as more important than others



Example: Pandora Radio

- Attributes of songs from Music Genome Project
- Likes, dislikes, skips used to model user preferences

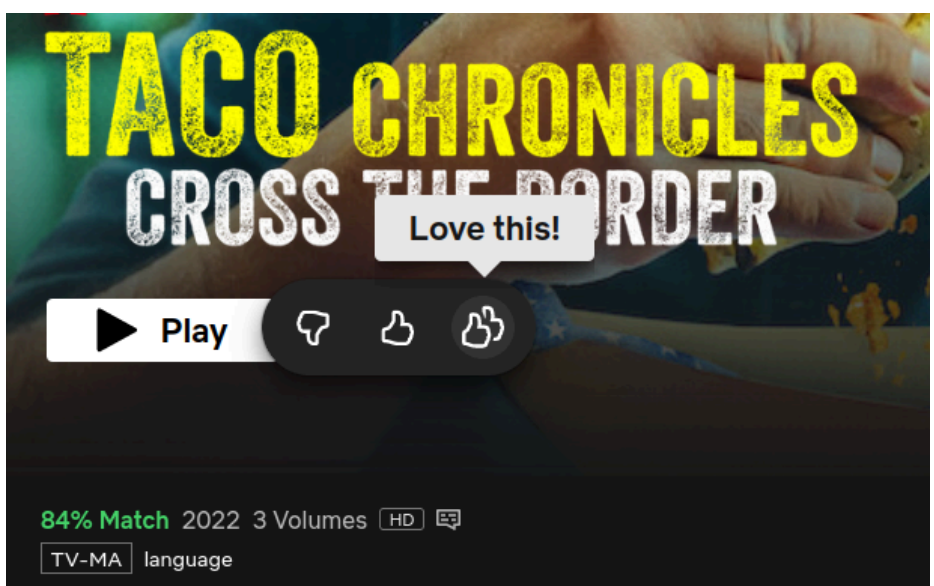
Based on what you've told us so far, we're playing this track because it features prominent use of synth, mellow rock instrumentation, major key tonality, extensive vamping and electronica influences.

Problems

- Doesn't work well across categories
  - Movie preferences don't clearly translate to news
- Can continue to recommend the same kind of thing
  - Variety is desirable for many domains, like music
- Requires accurate and detailed item attributes
  - Amazon sells tens of millions of different products

Hybrid Approaches

Most real-life systems use a combination of collaborative, content-based, and custom filtering.



Example: Netflix

- Collaborative filtering: Recommends based on other people who liked similar shows
- Content-based filtering: Recommends based on genre, categories, actors, release year, etc.
- Custom filtering: Time of day you watch, what device, how long you watch
- Asked to choose titles you like at signup (cold start)
- Recent preferences given more weight

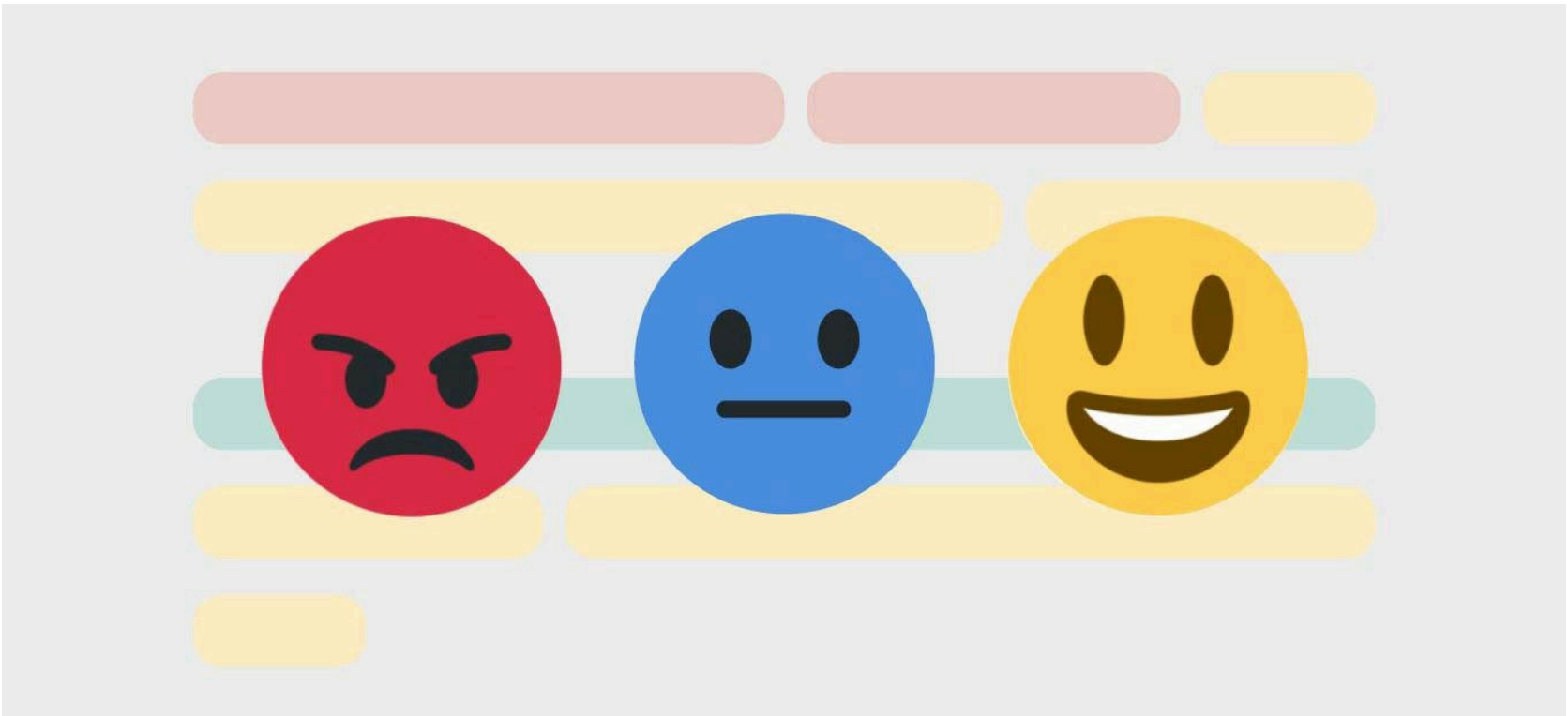
Examples

- What are some examples of recommender systems in your daily life?
- How do these systems use collaborative or content-based filtering?
- Would that product be better or worse without a recommender system?

Group Exercise

- Read the provided article: https://tinyurl.com/aicase2023
- Split into groups and discuss:
  - What harmful outcomes can recommender systems affect on individuals? On societey?
  - What responsibility should organizations that use recommender systems have to mitigate harm?
  - How can society mitigate the possible harms?
- We'll talk about what each group discussed as a class

Sentiment Analysis



Sentiment Analysis

Systematically identify, extract, quantify, and study emotional states and subjective information.

Inputs and Outputs

Typical inputs:

- Product reviews
- Posts, comments
- Customer complaints

Outputs:

- **Polarity** — Positive, Negative, or Neutral
- Specific emotions
- Subjectivity vs. Objectivity

Inputs and Outputs

"I love this phone!"

Polarity: Positive

"I love warning people about this phone!"

Polarity: Negative

Example: Duolingo

duolingo

Duolingo

Like most corporations with a social media strategy, Duolingo uses sentiment analysis to assess how effective its social media posts are.

Duolingo

- Playful digital presence, aimed at 16-34 year olds
- Trendjacking
- Prioritize entertainment (broccoli in pizza)
- Personificaion of mascot
- Consistent storylines
- Direct audience engagement

Duolingo

COMPARE TO | DEC 01, 2023 - FEB 29, 2024

Authenticate | Why?

EXPORT | SHARE

Duolingo @duolingo

Free language education for the world. Available on Android, iOS, and the web.

https://www.duolingo.com/

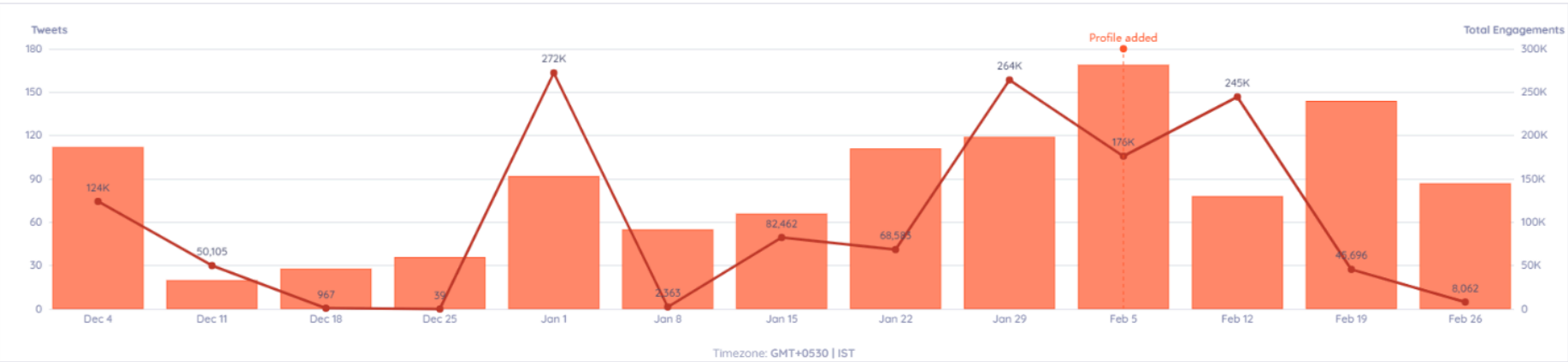
827,995	546	45,406
TOTAL FOLLOWERS	TOTAL FOLLOWING	TOTAL TWEETS

1,128	1,354,005	1,106	87	49,299,513	2.75%	0%
TWEETS THIS PERIOD	ENGAGEMENTS THIS PERIOD	AVG LIKES PER POST	AVG RETWEETS PER POST	IMPRESSIONS	ENGAGEMENT RATE	FOLLOWER GROWTH RATE

Profile Timeline

Click on the peaks in the line graph to understand what content resonated best.

TOTAL · LIKES · RETWEETS | GROUP BY WEEK



Bag of Words

`John likes to watch movies.`

john	likes	to	watch	movies
1	1	1	1	1

`Out of sight, out of mind.`

out	of	sight	mind
2	2	1	1

Bag of Concepts

Apply a weight to each word, then sum them.

like	love	hate	return	...
0.2	0.6	−0.2	−0.1	...

`I like this product` $\longrightarrow 0 + 0.2 + 0 + 0 = 0.2$

`I love this product` $\longrightarrow 0 + 0.6 + 0 + 0 = 0.6$

Can you think of problems with this approach?

Challenges

- I do not dislike this.
- Sometimes I hate shoes, but I like these.
- This lasted two days, TRULY AMAZING JOB, keep it up!
- This horror movie was unsettling.
- You should see their decadent dessert menu.
- I love this, but would not recommend it to friends.
- They’ve got that rizz.

Stump an Analyzer

https://freeaitools.dev/sentiment-analysis

- Can you make something that shows as negative when it is really positive?
- Can you make something that shows as positive when it is really negative?
- What happens if you have mixed emotions?
- Does it handle slang correctly?

Affective Computing

Sentiment analysis is one piece of the overall field of Affective Computing.

Read the provided article and we will have an open discussion:

- What current and potential applications seem useful?
- What applications have the potential to be problematic?