

Week 1: Introduction to Recommender Systems

CSX4207/ITX4207: Decision Support
and Recommender Systems

Asst. Prof. Dr. Rachsuda Setthawong

Objectives

- To introduce the course
- To understand what Decision Support System is
- To understand what Recommender System (RS) is and the importance of RSs
- To know different types of RSs
- To explore existing well-known RSs in real life

Outlines

- Introduction to Decision Support Systems (DSS)
- Introduction to Recommender Systems (RSs)
- Existing well-known RSs in real life
- What will you learn from this course?
- Types of RSs wrt
 - User Profiles
 - Characteristics and Algorithms

What is Decision Support System (DSS)?



- DSS is **an information system** that supports business or organizational decision-making activities
 - A computerized program that analyzes large volume of data
- DSSs serve the management, operations and planning levels of an organization and **help people make faster and better decisions about problems** that may be rapidly changing and not easily specified in advance.

Additional Explanation about DSS

- Decision support systems are types of information systems that **analyze data to support executives, managers and staff in business decision-making**. These systems **assess large amounts of data, identify patterns** and **analyze the effects** of business decisions.
- A DSS **uses current and historical data to predict future trends**, which reduces guessing and saves time.

Emerging of DSSs and Related Fields

- 
- Time
- Late 1950s: introducing DSSs
 - 1980s: gaining in intensity
 - Late 1980s: evolving executive information systems (EIS), group decision support systems (GDSS), and organizational decision support systems (ODSS)
 - 1987: deployed the Gate Assignment Display System (GADS) for United Airlines
 - 1990: introducing data warehousing and on-line analytical processing (OLAP)
 - mid-1990s: introducing Recommender Systems
 - Early 2000s: Personalization becomes more sophisticated.
 - 2020s and Beyond: AI and real-time personalization

Classifications of DSS

Based on the relationship with the user

Passive DSS

- Aids the process of decision making, BUT that **CANNOT** bring out **EXPLICIT** decision suggestions or solutions

Active DSS

- Can bring out **EXPLICIT** decision suggestions or solutions

Cooperative DSS

- Allows for an iterative process between human and system towards the achievement of a consolidated solution
- (The decision maker) can modify, complete, or refine the decision suggestions provided by the system, BEFORE sending them back to the system for validation

Another Classifications of DSS

Based on the mode of assistance

A communication-driven DSS

A data-driven DSS

A document-driven DSS

A knowledge-driven DSS

A model-driven DSS

A Communication-driven DSS



- Enables **cooperation**,
supporting more than one person working on a shared task



A Data-driven DSS



OLAP

(On-Line Analytical
Processing)



+ a b | e a u



- Emphasizes access to and manipulation of a **time series** of internal company **data** and sometimes external data



A Document-driven DSS



The Web



Search Engines



Microsoft Edge



- Manages, retrieves, and manipulates **unstructured information** in a variety of electronic formats
- Integrates a variety of storage and processing technologies **to provide document retrieval and analysis**

Ref:

<http://dssresources.com/faq/index.php?action=artikel&id=136#:~:text=Examples%20of%20documents%20that%20might,corporate%20records%20and%20important%20correspondence.>

A Knowledge-driven DSS



Has **specialized problem-solving expertise** relevant to a specific narrow task



Suggests or recommends actions to **targeted users**



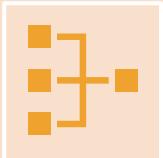
Provides specialized problem-solving **expertise stored** such as facts, rules, procedures, interactive decision trees and flowcharts

- Examples:
 - Advisory systems
 - Consultation systems
 - Suggestion systems
 - Knowledge-based systems
 - Recommender systems
 - Rule-based DSS
 - Management expert systems

A Model-driven DSS



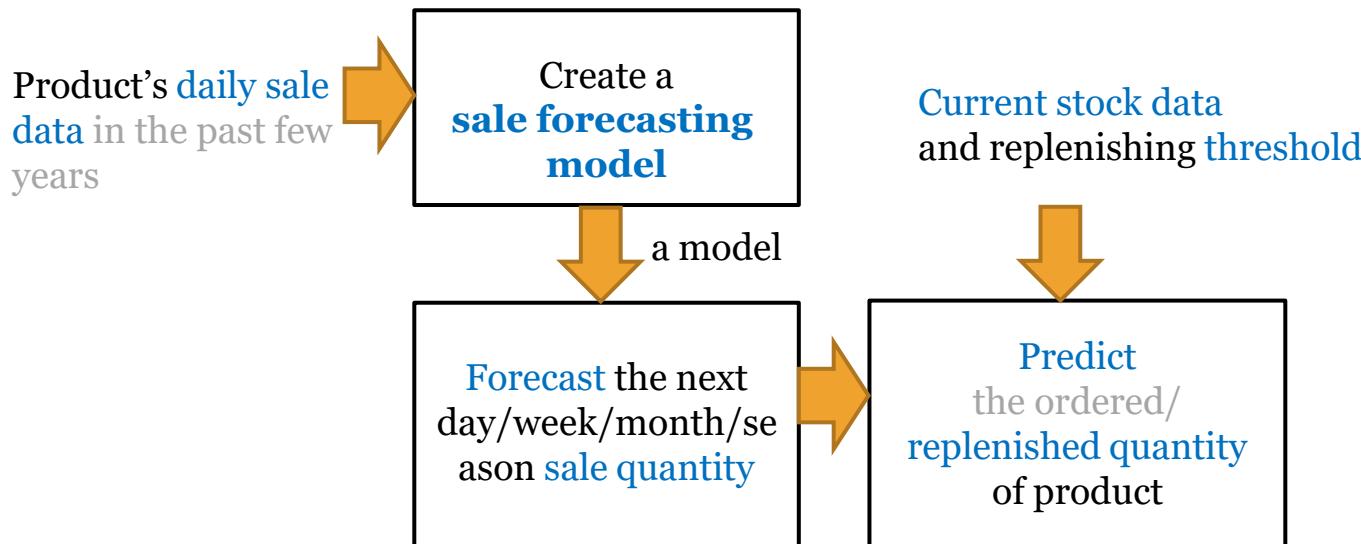
Emphasizes access to and manipulation of a **statistical, financial, optimization, or simulation model**



Uses **data** and **parameters** provided by users to assist decision makers **in** analyzing a situation

- Examples:
 - Forecasting Support System
 - Statistical Software Package
 - SAS, SPSS, Minitab
 - Optimization Software
 - MATLAB

An Example of Model-driven DSS Applications - Sale Forecasting and Stock Replenishment



- Use forecasting model for sale forecasting and stock replenishment

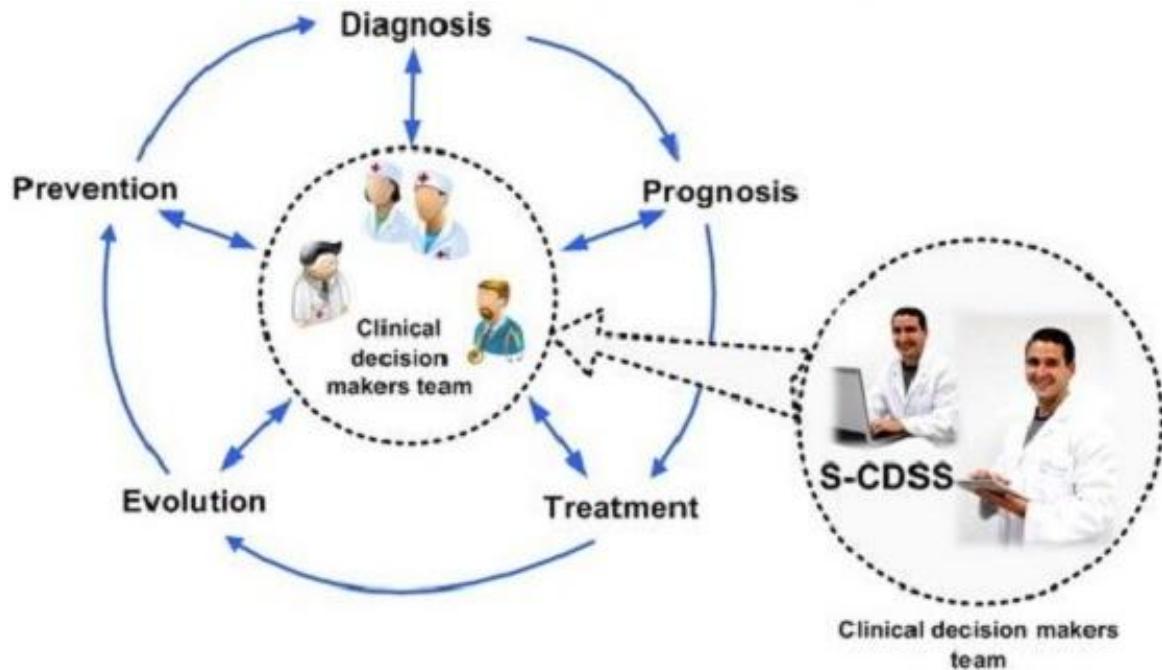
Basic components of a DSS Architecture

The database
(knowledge base)

The model
(the decision
context and user
criteria)

The user
interface

An Example of DSS Applications - Clinical Decision Support System (CDSS)

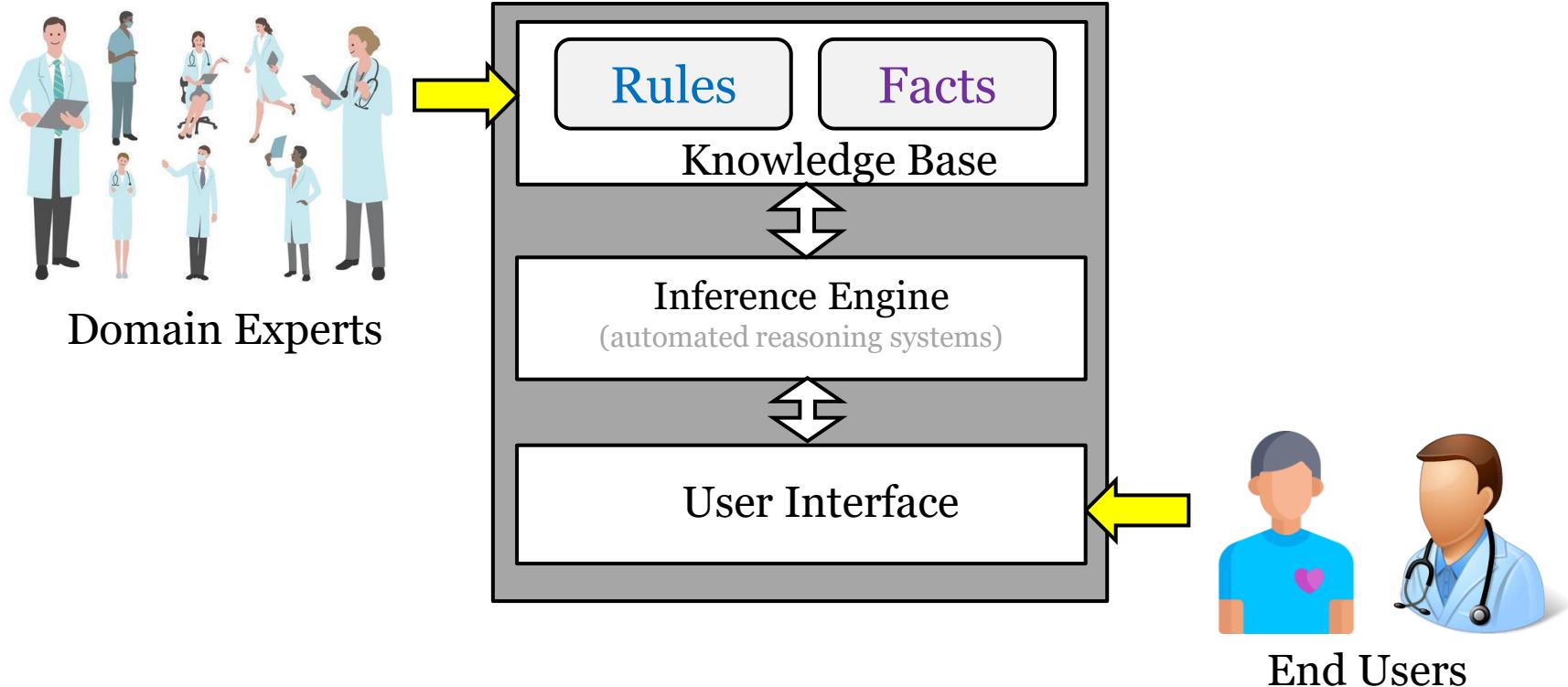


- Is an administrative/clinical tool which helps in improving operational efficiency of healthcare practices.
- Assist physicians & other health professionals in clinical decision-making tasks.
- Aid business management
 - Help managing data faster decision-making, and higher workflow efficiency in patient care.

Two Main Types of CDSS

- Knowledge-based CDSS (~rule-based expert system)
- Non-knowledge-based CDSS (~machine learning-based techniques applied)

Main Components of Rule-based Expert Systems



Knowledge Base

Examples:

Rule Name	Condition	Action
R1	Give birth AND blood type is warm	Add “X is a mammal”
R2	Has feathers	Add “X is a bird”
R3	Can fly AND lay eggs	Add “X is a bird”
R4	Is bird AND outlook is black	Add “X is a crow”

- A repository of **facts** and **rules**
- **Fact** is a small portion of important **information** relating with the problem to be solved in an ES.
- **A rule (heuristic) the reasoning procedures** of an expert on the subject, which is constructed over the facts.
 - Syntax:

[Rule name]: IF (condition) THEN (action)

Inference Engine

- An **automated reasoning system** that applies the rules to the **known facts** to **deduce new facts**



- Is divided into 2 modes:
 - **Forward chaining:**
 - Derive intermediate results using the observed data, and the last one is the final result.
 - **Backward chaining:**
 - Make a hypothesis first, and verify or prove the hypothesis using the data

Examples of Forward Chaining

Rule Name	Condition	Action
R1	Give birth AND blood type is warm	Add “X is a mammal”
R2	Has feathers	Add “X is a bird”
R3	Can fly AND lay eggs	Add “X is a bird”
R4	Is bird AND outlook is black	Add “X is a crow”

What is this animal?



Cycle	Selected Rule(s)	Facts (f) stored in working memory
0		f1: x has feathers f2: x can fly and lay eggs f3: x's outlook is black.
1	R2, R3	f4: x is a bird
2	R4	f5: x is a crow



The initial information
The additional
information obtained
from the inference engine.

Non-knowledge-based CDSS

- Examples of techniques used:
 - Support-vector machines
 - Artificial neural networks
 - Genetic algorithms
- Use machine learning techniques, which allow computers to learn from past experiences and/or find patterns in clinical data.
- **Pros:** eliminate the need for writing rules and for expert input
- **Cons:** cannot explain the reasons for their conclusions

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- **Introduction to Recommender Systems (RSs)**
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What is Recommender System (RS)?

Definitions of Recommender System (RS)

- “Software tools and techniques **providing suggestions for items** to be of use to a user” – *Recommender Systems Handbook*
- “Software applications that aim to **support users in their decision-making** while **interacting** with large information spaces” – *ACM Recommender Systems 2010*
- “A specific type of **information filtering** (IF) technique that attempts to present information items (movies, musics, books, news, images, web pages, etc.) that are likely of interest to the user.” – *Wikipedia*
- “A recommendation system **calculates** and **provides relevant content** to the user **based on knowledge of the user, content, and interactions** between the user and the items.” – *Practical Recommender Systems*

What is the **difference** between decision support system and recommendation system?

- “**A decision support system (DSS)** is a computerized information system used to **support decision-making** in an organization or a business. A DSS lets users sift through and **analyze massive reams of data** and **compile information that can be used to solve** problems and **make better decisions**.
- While **a recommendation engine (or system) analyzes** the **user behavior** to **suggest items which they are likely to prefer**. A recommendation system **uses data analysis techniques** to figure out the items that match the users' taste & preferences.”

Brick-and-mortar Shop vs Long-tail Economy

- **A traditional street-side business** that offers products and services to customers face-to-face in an office or store (physical store).
- **Limitations:**
 - Need to stock products (limited space)
 - Cost of warehousing
 - Has limited space to show products
 - Has limited customers who comes to your shop
- **Idea:** if you have a web store, you can store an infinite no. of products.
- You can even stock and **sell non-popular products.**



A Challenge in Long-tail Economy

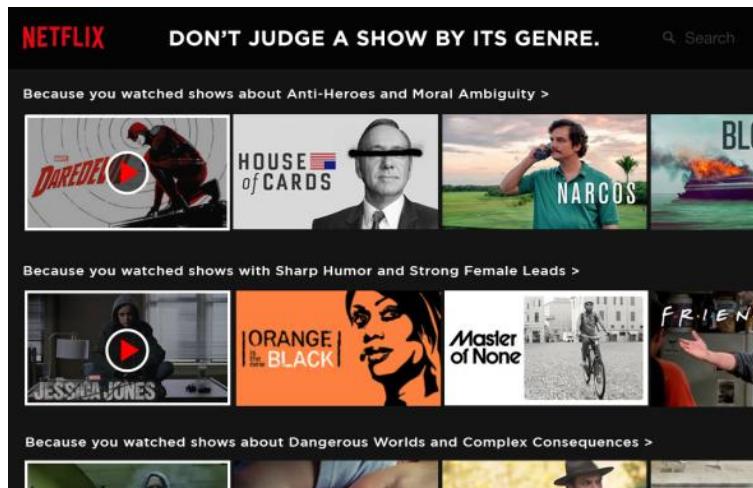
If having a huge catalog of products,
how do user find what they want?



Why are RSs Needed? - 1/2

Pains

- Limited time
- Overwhelming data
- User satisfaction



Gains

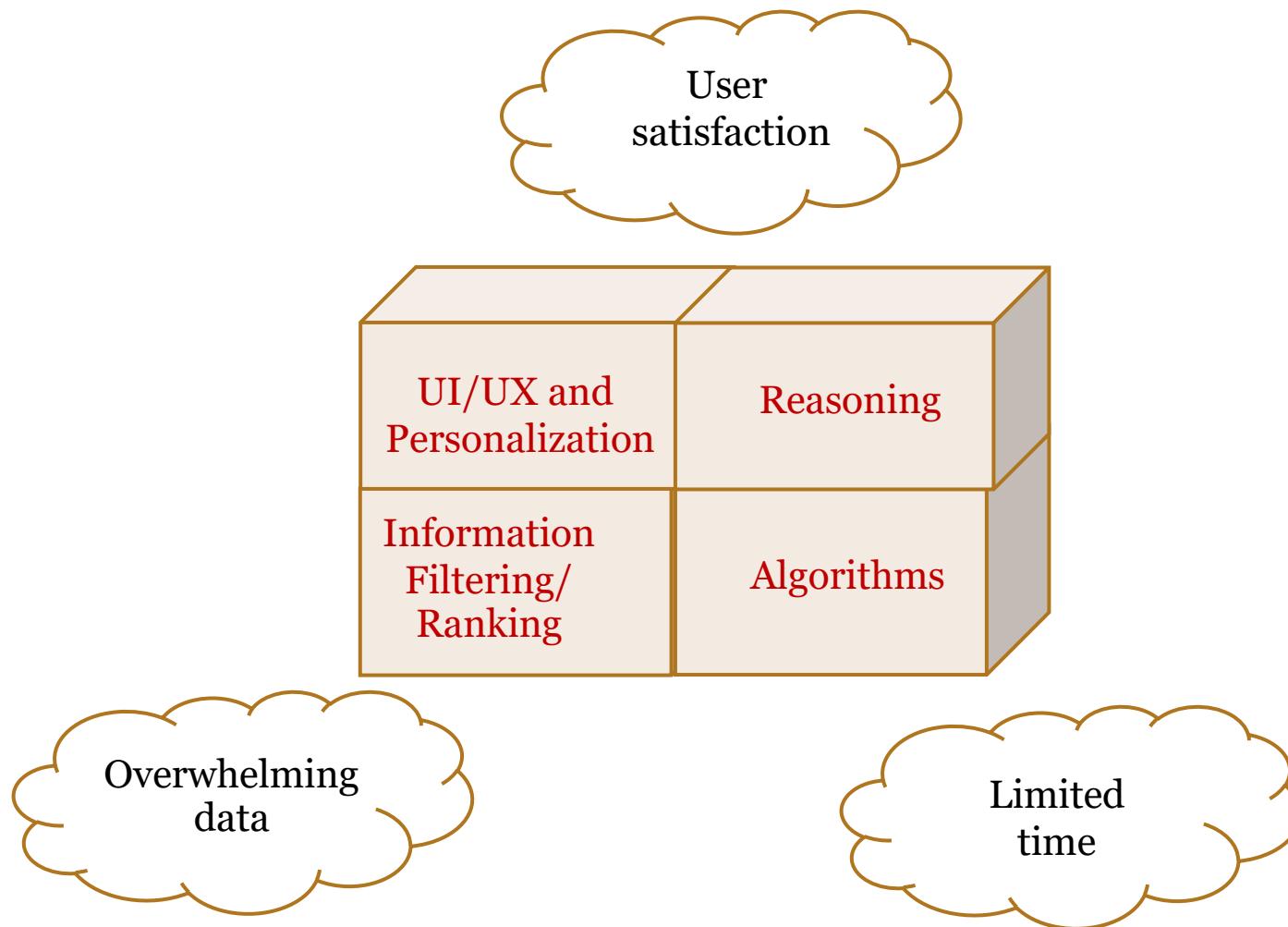
- Increase sales/conversion
 - Relevance
 - Diversity
- Increase the user satisfaction
 - Novelty
 - Serendipity (surprised -- “happy” and “unexpected”)
- Increase user loyalty/Reduce churn
- Better understand what the user wants

Ref: <https://business.financialpost.com/technology/personal-tech/the-end-of-genres-how-netflix-is-refining-its-recommendations>

More articles: <https://www.intotheminds.com/blog/en/how-novelty-and-serendipity-improve-customer-satisfaction/>

<https://towardsdatascience.com/serendipity-accuracy-unpopular-best-friend-in-recommender-systems-cao79b493f3c>

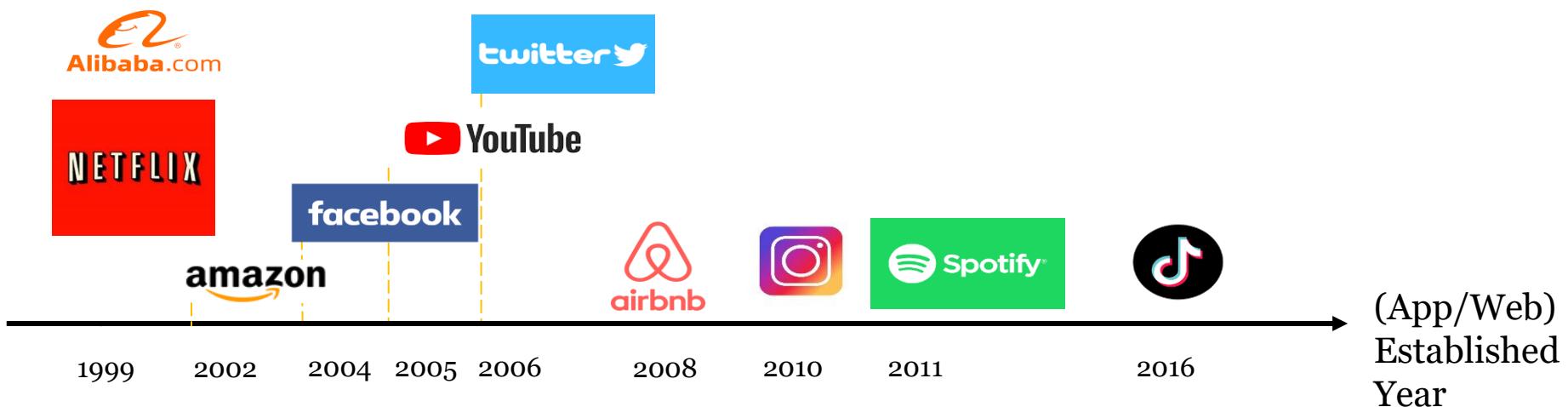
Why are RSs Needed? - 2/2



Outlines

- Introduction to Recommender Systems (RSs)
- Existing well-known RSs in real life
- What will you learn from this course?
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Exploring Popular RSs



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Netflix



Binge-worthy TV Dramas Featuring a Strong Female Lead



TV Comedies



NETFLIX DON'T JUDGE A SHOW BY ITS GENRE.

Because you watched shows about Anti-Heroes and Moral Ambiguity >

Because you watched shows with Sharp Humor and Strong Female Leads >

Because you watched shows about Dangerous Worlds and Complex Consequences >

Because you watched shows about Edgy Coming of Age Tales >

FOURSQUARE

FOURSQUARE CITY GUIDE

Steakhouses Current Map View

1. Santa Fé Steak

 (แซนด์วิช เฟรช สเต็ก)
 Steakhouse • \$\$\$
 Imperial World Samrong (B Fl.), Mueang Samut Prakan

Alangchang • September 10, 2013
 ที่นี่มี promotion ลดลง tuna cream salad อร่อยมาก

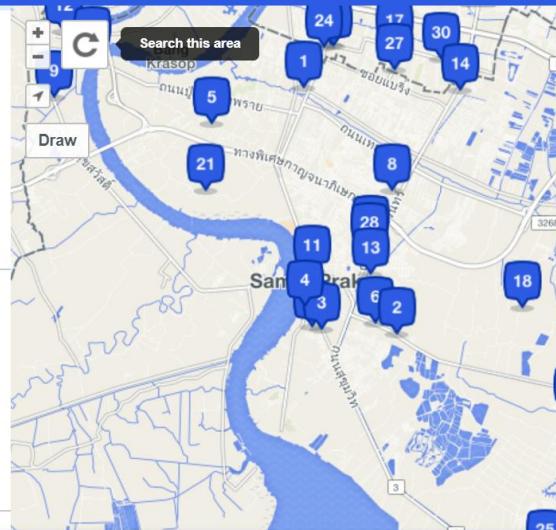
2. BKK Grill

 Steakhouse • \$\$\$
 Phraeksa Rd., Mueang Samut Prakan

Yodpha B. • February 16, 2014
 Best steak in Samut Prakan

FOURSQUARE
 ★★★★
 Find the best places to eat, drink, shop and visit.

+123 456 7890 TEXT M



Google Hotels

The screenshot shows the Google Hotels search interface. At the top left is the Google logo with a menu icon (three horizontal lines). To the right is a large, semi-transparent background image of a tropical resort with palm trees, umbrellas, a pool, and a city skyline in the distance. Overlaid on this background are several navigation icons: a suitcase for 'Trips', a compass for 'Explore', an airplane for 'Flights', and a bed for 'Hotels'. The word 'Hotels' is prominently displayed in large, bold, black letters in the center of the page. Below this is a search bar with a location placeholder 'Where to?' and a date range from 'Sun, Jan 12' to 'Mon, Jan 13' for two people. A 'Popular destinations' section is visible at the bottom.

≡ Google

Trips

Explore

Flights

Hotels

Hotels

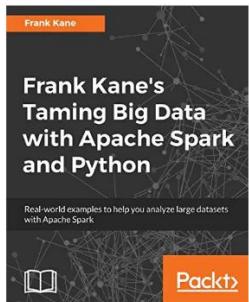
Where to?

Sun, Jan 12 < > Mon, Jan 13 < > 2 ▾

Popular destinations

Amazon

Inspired by your views



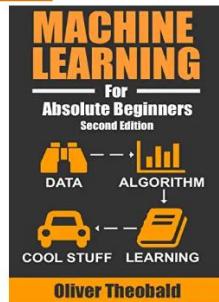
Frank Kane's Taming Big Data with Apache Spark and Python
by Frank Kane

★★★★★ 13

Paperback

\$39.99

Best Seller



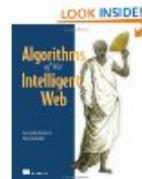
Machine Learning For Absolute Beginners: A Plain English Introduction (Second Edition)
(Machine Learning From Scratch...
by Oliver Theobald

★★★★★ 151

Kindle Edition

\$5.45 \$15.80

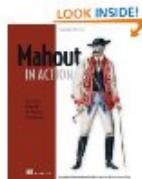
Customers Who Bought This Item Also Bought



Algorithms of the Intelligent Web
Haralambos Maramanis
★★★★★ (12)
Paperback
\$25.77



Recommender Systems Handbook
Francesco Ricci
Hardcover
\$142.14



Mahout in Action
Sean Owen
★★★★★ (7)
Paperback
\$29.69

Explore more items



BLU Advance S5 HD – Unlocked Single Sim Smartphone, 16GB+1GB RAM -Black
★★★★★ 31
\$49.99



Zeolite Powder, 1 Pound, Ultra FINE Less-Than 2 µm, Clinoptilolite: 95%, 3X Activated, Natural...
★★★★★ 33
\$31.70



Natural Dish Sponge Vegetable Scrubber for Kitchen 100% Loofah Plant Cellulose Scouring...
★★★★★ 244
\$6.99



2020 Diary Planner/Appointment Book 2020 - Diary 5-3/4" x 8-1/4" Daily Planner...
★★★★★ 187
\$17.39

Ref:

https://en.wikipedia.org/wiki/History_of_Amazon#:~:text=Amazon%20was%20founded%20in%20the,service%20as%20an%20online%20bookstore.&text=In%20the%20first%20two%20months,states%20and%20over%2045%20countries.

YouTube

The image shows the YouTube interface with the 'Recommended' section highlighted. The sidebar on the left includes links for Home, Trending, Subscriptions, Library, History, Watch later, Liked videos, Subscriptions (Galit Shmueli), and More from YouTube (YouTube Premium, Gaming). The main content area displays several video thumbnails:

- The Best Of YIRUMA | Yiruma's Greatest Hits ~ Best Piano** by Miracle Music (5.4K views, 5 months ago)
- รวมเพลงพระราชนิพัทธ์ตลอดกาล | หากันจนເອງ, ອຸ່ນແກ້ໄຂ, ໄກເຮືອ** by 60 Minutes Longplay (661K views, 2 months ago)
- ชา X 3 กับพระมหาสมบูรณ์และทีมงาน** by BUDdee CHANNAL (5.2M views, 1 year ago)
- Relaxing Guitar Music, Music for Stress Relief, Relaxing...** by Yellow Brick Cinema - Relaxin... (1.1M views, 3 years ago)
- Alcançarás se tiver fé** by Whitney Houston - When You Believe (with Mariah Carey) (13M views, 2 years ago)
- Bryan Adams, Westlife, Shayne Ward, MLTR, Backstreet Boys...** by # Music (269K views, 4 weeks ago)
- รวมเพลงอิตมาก อัลสี วัสดุต สิทธิ์ ของເຊົາ, ເຮອມນິຈ, ອະຍາກໄດ້ຢືນວ...** by Maya Trân (3.6K views, 2 weeks ago)
- MOZART COMPLETE PIANO SONATAS Klará Würz** by Brilliant Classics (1.6M views, 1 year ago)

What RSs Else Do You know?



Outlines

- Introduction to Decision Support Systems (DSS)
- Introduction to Recommender Systems (RSs)
- Existing well-known RSs in real life
- What will you learn from this course?
- Types of RSs

What will you learn from this course?



**Challenges in
RSs**



**Algorithms/
Approaches**
(ideas + technical
details)



**Evaluation
measures**



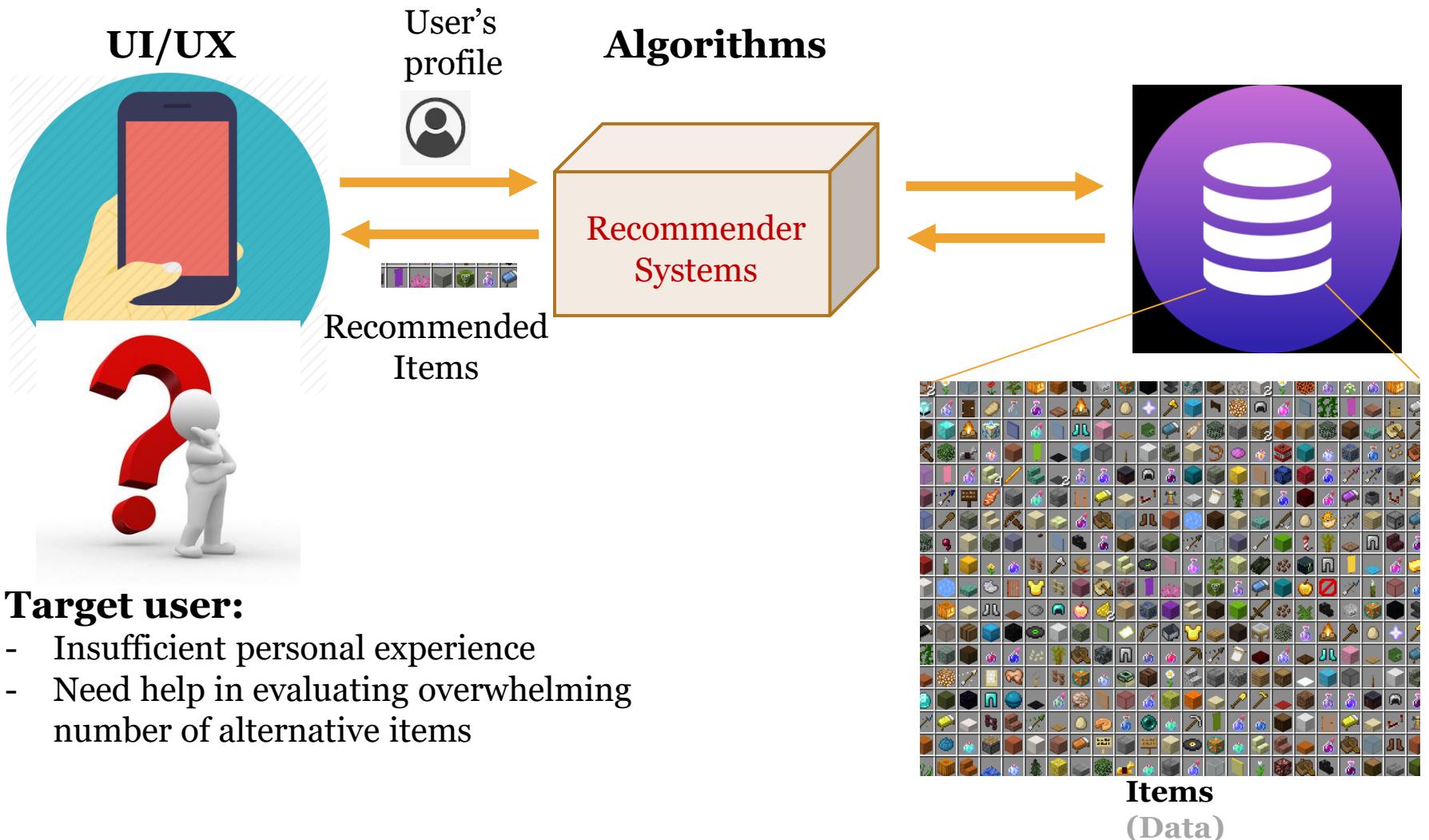
**Matching
recommendation
technologies and
domains**



**Hand-on
experience**

Utilizing and
developing some
Recommender
Systems (algorithms)

RSS Scopes



RSs' Outcomes

Recommendation

- **Rank items** based on how much target users will like an item (e.g., top 10 greatest hits albums)
- Simplify as ‘shown’ items

Prediction

- Estimate **how much** target users will **like** an item (a numerical value)

Prediction vs Recommendation

Apps Gmail YouTube Maps Translate Saved UI/UX DataMining RS Other bookmarks

Deals List your property Hotels.com™ Rewards

Destination, property or landmark: Taipei, Taiwan Check-in: 12-01-2020 Sunday Check-out: 13-01-2020 Monday Rooms: 1 night Adults: 2 Aged 18+ Children: 0 0-17 Search

Recommendations

Narrow results:

e.g. Hilton Popular filters: Free Breakfast, Pool, Free wifi, Free Parking, Pet Friendly

Nightly Price: B0 to B25,000+ Star rating: 5-star, 4-star, 3-star, 2-star, 1-star

Taipei, Taiwan

Sort by: Featured Star rating Distance Guest rating Price

Today's Best Deal

Dandy Hotel Jianmu Branch
No.2, Ln. 728, Sec. 6, Zhongshan N. Rd., Shilin Dist., Taipei, 111, Taiwan
3.5-star Shilin 8.8 km to City centre 7.7 km to Taipei Station Collect nights Free parking Airport transfer Air Conditioning

Loved by guests Exceptional 9.4 408 Hotels.com guest reviews We have 1 left at B2,161 B1,897 Choose Room

Just Sleep - NTU
No.83, Sec. 4, Roosevelt Road, Da'an District, Taipei, 10673, Taiwan
3.5-star Daan 3.0 km to City centre 4.2 km to Taipei Station Collect nights

Loved by guests Exceptional 9.4 25 Hotels.com guest reviews We have 2 left at B2,607 Choose Room

Predictions

Outlines

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Types of RS (wrt User Profiles)

Non-personalized

Personalized

Non-Personalized RS

<https://www.zagat.com/p/austin> - 1/2

The screenshot shows the Zagat website for Austin. The top navigation bar includes 'PLACES', 'LISTS', 'BUZZ', the 'ZAGAT' logo, and a dropdown for 'AUSTIN'. A search bar says 'Find a great place in Austin'. The main content area is titled 'Austin' and 'RESTAURANTS'. It displays a list of 1-15 of 592 results, sorted by 'Food rating'. Each result includes a thumbnail image, the restaurant name, location, and ratings for Food, Decor, and Service. To the right of the list is a map of Austin neighborhoods. On the right side of the page are three vertical sidebar boxes: 'CUISINES' (American, Mexican, Barbecue, Cafe, Pizza), 'NEIGHBORHOODS' (Downtown, East Austin, Zilker, South Austin, Bouldin Creek), and 'CITIES' (Austin, Round Rock, Bee Cave, Cedar Park, Lockhart). The bottom right sidebar also lists 'GOOD FOR' categories like Dinner, Takeout, Lunch, Outdoor seating, and Breakfast.

AUSTIN

RESTAURANTS

1-15 of 592 Sort by: Food rating

Restaurant	Location	Food	Decor	Service
UCHI	Japanese • Bouldin Creek • \$\$\$	4.9	4.7	4.7
FRANKLIN BARBECUE	Barbecue • East Austin • \$\$	4.8	4.0	4.3
UCHIKO	Japanese • Rosedale • \$\$\$	4.8	4.7	4.7
LITTLE DELI & PIZZERIA	Pizza • Crestview • \$\$	4.8	3.8	4.5

CUISINES

- American (50)
- Mexican (38)
- Barbecue (31)
- Cafe (27)
- Pizza (24)

VIEW ALL

NEIGHBORHOODS

- Downtown (75)
- East Austin (69)
- Zilker (27)
- South Austin (24)
- Bouldin Creek (22)

VIEW ALL

CITIES

- Austin (542)
- Round Rock (13)
- Bee Cave (7)
- Cedar Park (6)
- Lockhart (3)

VIEW ALL

GOOD FOR

- Dinner (288)
- Takeout (259)
- Lunch (258)
- Outdoor seating (198)
- Breakfast (77)

VIEW ALL

Non-Personalized RS

<https://www.zagat.com/r/ruths-chris-steak-house-austin> - 2/2

Screenshot of the Zagat website showing a restaurant review for Ruth's Chris Steak House in Austin.

The page includes the following sections:

- Header:** PLACES, LISTS, BUZZ, ZAGAT, AUSTIN, MORE, SEARCH.
- Section 1 (Main Review):**
 - RUTH'S CHRIS STEAK HOUSE:** Steakhouse • Downtown • \$\$\$
 - Image:** A plate of scallops with sauce.
 - Share Buttons:** Facebook, Twitter, Pinterest, Google+, Email.
 - THE ZAGAT REVIEW:** Overall rating 4.7 (FOOD), 4.5 (DECOR), 4.5 (SERVICE). This section is circled in red.
 - Description:** This Downtown outpost of the national chain is "always on the mark" thanks to "excellent" steaks you can cut "with a fork" and "wonderful" service in "calm, classy" surroundings; the bar can be a power scene, especially at happy hour, and tabs a bit "pricey", but most agree it's "worth the cost."
 - Zagat reviews are compiled from individual user reviews. Write your review.**
 - VIEW MENU** button.
- Section 2 (Related Listings):** YOU MIGHT ALSO LIKE (circled in red).
 - FLEMING'S PRIME STEAKHOUSE & WINE BAR:** Steakhouse • Downtown • \$\$\$
 - ALC STEAKS:** Steakhouse • Downtown • \$\$
 - VINCE + YOUNG STEAKHOUSE:** Steakhouse • Downtown • \$\$\$
 - ESTÂNCIA CHURRASCARIA:** Steakhouse • Great Hills • \$\$\$
- RESERVATION FORM:** Date 08/05/2016, Time 7:00 PM, Guests 2 people, FIND A TABLE button.
- Logos:** Austin Restaurants with Best Decor, Austin's Best.
- Footer:** Join the conversation, social media icons.

“Zagat reviews are compiled from individual user reviews. Write your review.”

UCHI X

Japanese | Bouldin Creek

Food Decor Service Cost

1 2 3 4 5 1 2 3 4 5 1 2 3 4 5 \$ (Optional)

Per person with drink and tip

Your review Your email

Describe your experience at Uchi

Email Address

I'm not a robot 
reCAPTCHA
Privacy - Terms

400 characters remaining.

Submit [Terms & conditions](#)

Simple Rating Formula

- Rating = {1, 2, 3, 4, 5}
- Score = MEAN(ratings)

Non-Personalized RS

<https://www.tripadvisor.com> - 1/2

Your Selections Clear all

- Restaurants
- Thai
- Lunch

Establishment Type

- Restaurants
- Quick Bites
- Dessert

More ▾

Reservations

- Online Reservations

Cuisines & Dishes

- Asian
- Thai
- Japanese

More ▾

Dietary Restrictions

- Vegetarian Friendly
- Vegan Options
- Gluten Free Options
- Halal

Meals

- Lunch
- Breakfast
- Brunch
- Dinner

Price

- Cheap Eats
- Mid-range
- Fine Dining

Neighborhoods:

The screenshot shows the Tripadvisor homepage with a search for "Restaurants" in "Bangkok". The results are titled "Restaurants in Bangkok". The first result is "1. Siam Tea Room" with a rating of 4.5 stars and 824 reviews. The second result is "2. The Family" with a rating of 4.5 stars and 483 reviews. The sorting dropdown on the right is circled in red and set to "Highest Rating". A yellow arrow points from the "Establishment Type" section on the left towards this circled dropdown.

Filtering criteria

Non-Personalized RS

<https://www.tripadvisor.com> - 2/2

Siam Tea Room  Claimed

 824 reviews | #28 of 11,947 Restaurants in Bangkok | \$\$ - \$\$\$, Thai, Asian, Vegetarian Friendly

📍 199 Sukhumvit Soi 22, Klong Ton, Klong Toey | Bangkok Marriott Marquis Queen's Park, Bangkok 10110, Thailand | ☎ +66 2 059 5999 | 🌐 Website | 📜 Menu ↗

⌚ Open Now: 7:00 AM - 11:00 PM ⌚

Reserve a Table

 2  Thu, 1/9  8:00 PM

Find a table

OR

Reserve a Table 



 Certificate of Excellence



Ratings and reviews

5.0  824 reviews

#17 of 2,094 Asian in Bangkok
#28 of 8,890 Restaurants in Bangkok

 Certificate of Excellence 2018 - 2019 Winner

Reviews (824) 

Traveler rating	Traveler type	Time of year	Language
<input type="checkbox"/> Excellent	<input type="checkbox"/> Families	<input type="checkbox"/> Mar-May	<input type="radio"/> All languages
<input type="checkbox"/> Very good	<input type="checkbox"/> Couples	<input type="checkbox"/> Jun-Aug	<input checked="" type="radio"/> English (566)
<input type="checkbox"/> Average	<input type="checkbox"/> Solo	<input type="checkbox"/> Sep-Nov	<input type="radio"/> Thai (125)
<input type="checkbox"/> Poor	<input type="checkbox"/> Business	<input type="checkbox"/> Dec-Feb	<input type="radio"/> Chinese (Sim.) (79)
<input type="checkbox"/> Terrible	<input type="checkbox"/> Friends		More languages ▾

Food and ambie

Local cuisine, Thai, Vegan Options

 ข้าวผัดปลาส้ม กุ้ง

 Seriously awesome and super friendly!

 Highly recommend Salad with tempura

 Our favorite dish

Show reviews that mention

Search reviews

All reviews thai food crispy egg pandan pork ribs bread crab curry pastry mango sticky rice

cakes salad fries marriott marquis queens park service team nice service food was amazing

great taste

RATINGS

 Food



 Service



 Value



Write a Review



Siam Tea Room

199 Sukhumvit Soi 22, Klong Ton, Klong Toey | Bangkok Marriott Marquis Queen's Park, Bangkok 10110, Thailand

Your first-hand experiences really help other travelers. Thanks!

Your overall rating of this restaurant



[Click to rate](#)

Changes will save automatically

Title of your review

Summarize your visit or highlight an interesting detail

Your review

Tips for writing a great review

Tell people about your experience: your meal, atmosphere, service?

(100 character minimum)

What sort of visit was this?

- Couples
- Family
- Friends
- Business
- Solo

Were you here for...



Could you say a little more about it? (optional)

Does this restaurant offer **takeout or food to go?**

- Yes
- No
- Not Sure

Does this restaurant offer **highchairs for toddlers?**

- Yes
- No
- Not Sure

Does this restaurant accept **reservations?**

- Yes
- No
- Not Sure

Can a vegetarian person get a good meal at this restaurant?

- Yes
- No
- Not Sure

Can a vegan person get a good meal at this restaurant?

- Yes
- No
- Not Sure

Is this an **Asian** restaurant?

- Yes
- No
- Not Sure

Click to select a rating

Service



[Click to rate](#)

Food



[Click to rate](#)

Value



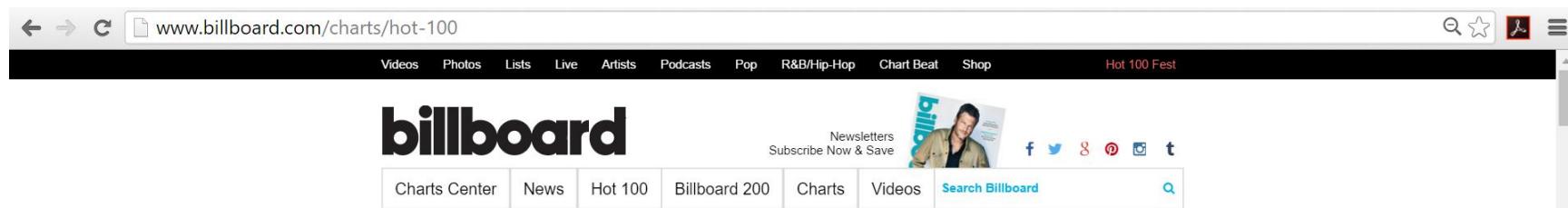
[Click to rate](#)

How expensive is this restaurant? ?



Non-Personalized RS

<http://www.billboard.com/>



The screenshot shows the Billboard Hot 100 chart for the week of August 13, 2016. The chart lists the top 10 songs:

Rank	Song	Artist(s)
1	Cheap Thrills	Sia Featuring Sean Paul
2	Cold Water	Major Lazer Featuring Justin Bieber & MØ
3	One Dance	Drake Featuring WizKid & Kyla
4	This Is What You Came For	Calvin Harris Featuring Rihanna
5	Work	Jessie J
6	Uptown Funk	Mark Ronson Featuring Bruno Mars
7	Bad Blood	Lady Gaga & Taylor Swift
8	Worth It	Drake
9	Body on Me	Shawn Mendes
10	Meant to Be	Hairbrush

A callout box highlights the search bar with the text: "Search recent archives. Try entering a birthday or anniversary".

This week's most popular songs across all genres, ranked by radio airplay audience impressions

Non-personalized RS

Do NOT use individual profiles when recommending items.

Usually compile ALL opinions (ratings) as averages

Alternatively, straightforwardly count and rank items
(e.g., best selling, top chart, etc.)

Non-personalized vs Personalized RS

The screenshot shows the Netflix homepage with a comparison between two recommendation interfaces.

Non-personalized interface (left): Shows a grid of movie posters under the heading "Trending Now". The movies include "EAT PRAY LOVE", "TALLULAH", "LIFE AS WE KNOW IT", "the ugly truth", "he's just not that into you", and "What's Your NUMBER?".

Personalized interface (right): Shows a similar grid of movie posters under the heading "Trending Now", but the titles are partially obscured by a dark overlay, illustrating how personalized recommendations can be more tailored to individual user interests.

Romantic Western Movies: A section titled "Romantic Western Movies" with a link. It displays posters for "Rumor has it...", "THE LUCKY ONE", "No Reservations", "NO STRINGS ATTACHED", "KNIGHT AND DAY", and "first daughter".

Recently Added: A section titled "Recently Added" showing posters for "STRANGER THINGS", "GRIDLOCKED", "COSMOS", "SICK IN LOVE", "TONY ROBBINS I AM NOT YOUR GURU", and "LAST U CHANCE".

The top navigation bar includes the Netflix logo, a "Browse" dropdown, and a search bar. The bottom right corner shows a user profile for "Rachsuda J..." with a notification count of 1.

Non-personalized vs Personalized RS

The screenshot shows the Netflix website at <https://www.netflix.com/browse>. The interface displays a grid of movie and TV show thumbnails. Three specific sections of the recommendations are highlighted with red circles:

- Because you watched The Darkest Hour**: This section contains thumbnails for "FORWARD", "WAR OF THE WORLDS", "SUPER 8", "Z NATION", "CONTAGION", and "SYNCHRONICITY".
- Because you watched Jack Reacher**: This section contains thumbnails for "COLLATERAL", "UNKNOWN", "FLIGHT", "WORLD WAR Z", "MISSION: IMPOSSIBLE 3", and "GI JOE: RETALIATION".
- Because you watched Kate & Leopold**: This section contains thumbnails for "SERENDIPITY", "SIMPLY IRRESISTIBLE", "NIGHTS IN RODANTHE", "MORNING GLORY", "DID YOU HEAR ABOUT THE MORGANS?", and "DANGEROUS BEAUTY".

The top navigation bar includes links for "NETFLIX", "BROWNS", "KIDS", "HANGOVER PART II", and "Search". A user profile for "Rachsuda J..." is visible on the right.

Non-personalized vs Personalized RS

https://www.netflix.com/browse

NETFLIX Browse Kids Search Rachsuda J...

Continue Watching for Rachsuda Jiamthaphaksin

Action & Adventure

Top Picks for Rachsuda Jiamthaphaksin

Dramas

Non-personalized vs Personalized RS

The screenshot shows the Amazon.com homepage with several sections:

- Welcome:** Includes a "Sign in securely" button.
- Popular departments:** Features Kindle, Amazon Video, Music, and Grocery.
- The dress shop:** Shows a woman in a blue dress.
- Compare products across the web:** Features a GoPro camera, a dress, and a handbag, with an "amazon assistant" button.
- Deal of the day:** Shows a \$79.99 deal on a three-tier food dehydrator.
- We Have Recommendations for You:** Includes a "Sign in to see personalized recommendations" button.

Non-personalized vs Personalized RS

← → C https://www.amazon.com/gp/goldbox/ref=topnav_storetab_gb

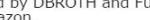
Today's Deals

New deals. Every day. Shop our Deal of the Day, Lightning Deals and more daily deals and limited-time sales. See deals you're Watching [here](#).

Showing 1-32 of 3990 results

Never miss another deal ▾

Sort by [Relevance](#) ▾

Department	Product Image	Deal of the Day	Product Image	Deal of the Day	Product Image	Deal of the Day	Product Image	Deal of the Day
<input type="checkbox"/> Amazon Devices <input type="checkbox"/> Amazon Video <input type="checkbox"/> Arts, Crafts & Sewing <input type="checkbox"/> Automotive & Motorcycle <input type="checkbox"/> Baby <input type="checkbox"/> Baby Clothing & Accessories <input type="checkbox"/> Beauty <input type="checkbox"/> Books <input type="checkbox"/> Boys' Fashion <input type="checkbox"/> Camera & Photo <input type="checkbox"/> Cell Phones & Accessories <input type="checkbox"/> Collectibles & Fine Art See more		DEAL OF THE DAY \$59.99 - \$78.99 Ends in 2:00:57 Extra plush Fitted Mattress Topper - Found in Marriott H...  1830		DEAL OF THE DAY \$19.99 List: \$44.98 (56% off) Ends in 2:00:56 The Bourne Classified Collection on Blu-ray Ships from and sold by Amazon.com.  47		DEAL OF THE DAY \$79.99 Price: \$129.95 (38% off) Ends in 2:00:57 Ivation Electric Countertop Food Dehydrator with 6 Dryin... Sold by DBROTH and Fulfilled by Amazon.  61		DEAL OF THE DAY \$35.98 - \$61.98 Ends in 2:00:56 Up to 40% Off Timberland Kid's Boots  229

Non-personalized vs Personalized RS

https://www.amazon.com/Coupons/b/ref=sv_gb_1?ie=UTF8&node=2231352011

Coupons [Sign in to view your coupons](#)

Discounts applied at check out or on first subscription. Some coupons may only be available to Prime members. [Some restrictions apply.](#)

Gourmet Foods & Beverages [See more](#)

Never Run Out [Subscribe & Save](#) 153 Coupons

Huggies Quaker Lysol Dove Find Coupons by Brand

Exclusively for Prime Members [Prime Pantry](#) 235 Coupons

Most Popular | Display: All Coupons | Sort by: Newest

 PrimePantry Save 25% 25% off Cereals, Hot Cereals and Pop-Tarts Products Clip Coupon	 Subscribe & Save Save 10% Save 10% when you 'Subscribe and Save' on Clip Coupon	 PrimePantry Save \$0.50 Kleenex \$0.50 Off Clip Coupon	 Subscribe & Save Save 10% Save 10% when you 'Subscribe and Save' on Clip Coupon	 Save 40% Ozeri Pro Kitchen Scale - Super Sale Clip Coupon
--	---	--	---	---

Don't Miss a Single Deal
Sign up for daily deals delivered right to your inbox
[Learn more](#)

What Do You Think?
Have a comment on our new layout or a suggestion for a coupons feature we should add? [Let us know.](#)

javascript:void(0)

Non-personalized vs Personalized RS

https://www.amazon.com/gp/yourstore/home/ref=nav_cs_ys

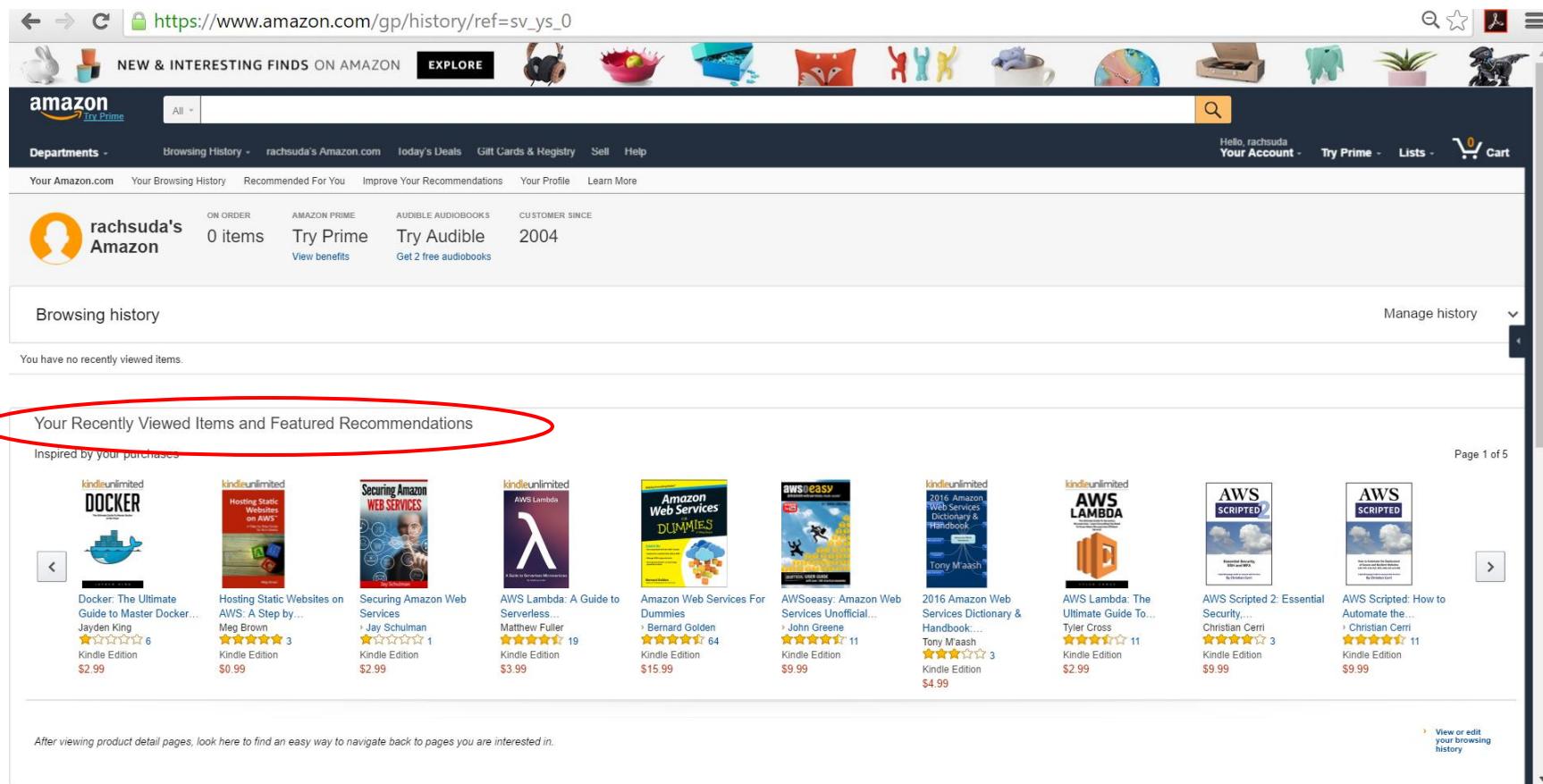
The screenshot shows the Amazon homepage with a red circle highlighting the "Recommended for you, rachsuda" section. This section displays five recommended items: "Infrastructure as Code" by Kief Morris, "The Man in the High Castle" Prime Video series, "MAKE YOUR OWN NEURAL NETWORK" by TARIQ RASHID, "Java A Beginner's Guide" by Herbert Schildt, and "storytelling with data" by cole nussbaumer knaflic.

Category	Item 1	Item 2	Item 3	Item 4	Item 5
Computer & Technology Books	Infrastructure as Code	The Man in the High Castle	MAKE YOUR OWN NEURAL NETWORK	Java A Beginner's Guide	storytelling with data
94 ITEMS	25 ITEMS	75 ITEMS	8 ITEMS	72 ITEMS	

Category	Item 1	Item 2	Item 3	Item 4
Time Management	TIME MANAGEMENT	ANALYTICAL METHODS FOR SOCIAL RESEARCH	BLOCKCHAIN	SOA-BASED ENTERPRISE INTEGRATION
KEYS TO MAXIMIZING YOUR TIME AND BECOMING MORE EFFICIENT	Data Analysis Using Regression and Multivariate Methods	Blockchain: Tap into the Future of Cryptocurrency	BITCOIN: THE SIMPLE GUIDE TO WHAT YOU NEED TO KNOW	The Constitution of the United States of America
ilY disciplines				We the People
24/7				

Non-personalized vs Personalized RS

https://www.amazon.com/gp/history/ref=sv_ya_0



The screenshot shows the Amazon browsing history page. At the top, there's a navigation bar with links like 'NEW & INTERESTING FINDS ON AMAZON', 'EXPLORE', and various promotional banners. Below the navigation is the Amazon header with the logo, user information ('Hello, rachsuda'), and a search bar.

The main content area starts with a 'Browsing history' section. It displays a message: 'You have no recently viewed items.' followed by a 'Manage history' link. Below this, a section titled 'Your Recently Viewed Items and Featured Recommendations' is circled in red. This section lists several recently viewed items and featured recommendations, each with a thumbnail, title, author, price, and rating. For example, it includes books like 'Docker: The Ultimate Guide to Master Docker...', 'AWS Lambda: A Guide to Serverless...', and 'AWS Scripted: How to Automate the...'. At the bottom of this section, there's a note: 'After viewing product detail pages, look here to find an easy way to navigate back to pages you are interested in.' On the right side of the page, there are links for 'View or edit your browsing history' and 'Page 1 of 5'.

Non-personalized vs Personalized RS

Screenshot of an Amazon personalized recommendation page:

https://www.amazon.com/gp/yourstore/recs/ref=sv_ya_1

The page shows recommendations based on the user's history. The "Recommended for You" section is circled in red.

Recommendations

- 1. **The Art of Monitoring** by James Turnbull (June 8, 2016)
Average Customer Review: ★★★★☆ (5)
Auto-delivered wirelessly
Kindle Price: \$9.99
- 2. **The Docker Book: Containerization is the new virtualization** by James Turnbull (July 12, 2014)
Average Customer Review: ★★★★☆ (76)
Auto-delivered wirelessly
Kindle Price: \$9.67
- 3. **Make Your Own Neural Network** by Tariq Rashid (April 16, 2016)
Average Customer Review: ★★★★☆ (21)
Auto-delivered wirelessly
Kindle Price: \$3.99
- 4. **AWS Lambda: A Guide to Serverless Microservices** by Matthew Fuller (January 11, 2016)
Average Customer Review: ★★★★☆ (19)

Left sidebar (Departments):

- Amazon Video
- Appliances
- Appstore for Android
- Arts, Crafts & Sewing
- Automotive
- Baby
- Books
- Books on Kindle
- Camera & Photo
- CDs & Vinyl
- Cell Phones & Accessories
- Clothing & Accessories
- Computers
- Digital Music
- Electronics
- Grocery & Gourmet Food
- Home & Kitchen
- Home Improvement
- Industrial & Scientific
- Jewelry
- Kitchen & Dining
- Magazine Subscriptions
- Magazines on Kindle
- Movies
- Movies & TV
- Musical Instruments
- Newspapers on Kindle
- Office & School Supplies
- Patio, Lawn & Garden
- Pet Supplies
- Shoes

Non-personalized vs Personalized RS

Screenshot of the Amazon.com website showing a personalized recommendation interface.

The URL in the browser bar is https://www.amazon.com/gp/yourstore/iyr/ref=sv_yr_2.

The page title is "NEW & INTERESTING FINDS ON AMAZON".

The navigation bar includes links for "EXPLORE", "All", "Browsing History", "rachsuda's Amazon.com", "Today's Deals", "Gift Cards & Registry", "Sell", "Help", "Hello, rachsuda", "Your Account", "Try Prime", "Lists", and a "Cart" icon.

The main content area shows a "Your Amazon.com > Improve Your Recommendations" section, which is circled in red. Below it, a message says: "Help us make better recommendations. You can refine your recommendations by rating items or adjusting the checkboxes." A link "click here" is also present.

A sidebar titled "EDIT YOUR COLLECTION" lists categories: "Items you've purchased", "Videos you've watched", "Items you've marked 'I own it'", "Items you've rated", "Items you've marked 'Not interested'", and "Items you've marked as gifts".

The main content displays a list of recommended items:

- Kindle for PC [Download]** by Amazon Digital Services LLC. Rating:  This was a gift Don't use for recommendations
- Python Machine Learning** by Sebastian Raschka. Rating:  This was a gift Don't use for recommendations
- Fundamentals of Database Systems (7th Edition)** by Ramez Elmasri. Rating:  This was a gift Don't use for recommendations
- Getting Started with AWS: Hosting a Web Application** by Amazon Web Services. Rating:  This was a gift Don't use for recommendations

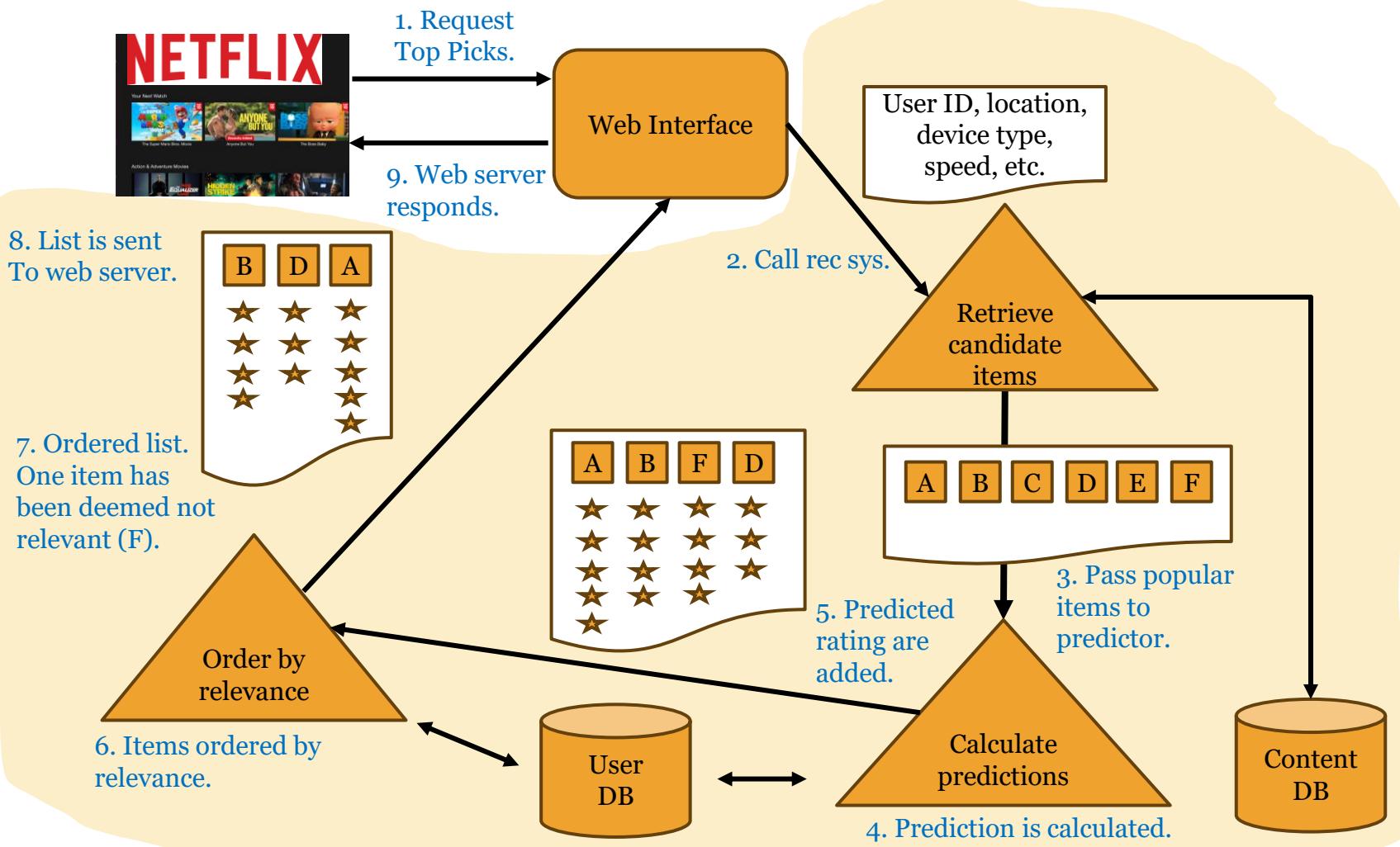
Summarizing Non-personalized vs Personalized RS

	Non-personalized RSs	Personalized RSs
Using individual profiles when recommending items	No	Yes
Recommendation Techniques	<ul style="list-style-type: none">- Usually compile ALL opinions (ratings) as averages- Alternatively, straightforwardly count and rank items (e.g., best selling, top chart, etc.)	TBDL

Issues on Inputs of Personalized Recommendation

- How to acquire/exploit user preferences?
 - Implicitly
 - Explicitly
- What kind of additional information the system should exploit to generate a list of personalized recommendations?

How Netflix Top Picks Might Be Calculated



Types of RSs

wrt Characteristics and Algorithms

Content-based recommendation

Collaborative recommendation

Knowledge-based recommendation

Hybrid approaches

Content-based Recommendation - 1/2

- Rooted in the fields of Information retrieval and information filtering with different focus
 - IR: to discriminate between relevant and irrelevant documents
 - RSs: to select the most interesting items from a larger set
(dealing with information overloaded)
- Basic idea – exploit information derived from the documents' contents to rank them.
 - Examples, item descriptions and user profiles

Content-based Recommendation - 2/2

- Advantages

- Not require information from community (a group of users) to achieve reasonable recommendation accuracy.
- Can suggest new items given that item attributes are available.



Collaborative Recommendation

- Basic idea –users who share the same interest, tends to have similar tastes.
- Only use community opinion to suggest items → No need to maintain items' information



“Collaborative Filtering (CF)”

Knowledge-based Recommendation

- Is suitable for one-time buyers.
- Makes use of query-based information related to the current user and/or the available items.
- Often uses interactive-based approaches and/or personalized dialog to incrementally discover preferences.
- Example, constraint-based recommenders.



Hybrid approaches - 1/2

- Combine different techniques to generate better or more precise recommendations

Content-based RS

Collaborative RS

Knowledge-based RS

Recommended Systems Resource Center and Further Reading Articles

- How Does the Recommendation System Work on Tmall?: https://www.alibabacloud.com/blog/how-does-the-recommendation-system-work-on-tmall_595335
- Order Matters: Alibaba's Transformer-based Recommender System:
<https://www.kdnuggets.com/2019/08/order-matters-alibabas-transformer-based-recommender-system.html>

Assignment 1

1. Type your group's topic in the link provide:

[https://docs.google.com/spreadsheets/d/1Id41BmVjwThZgxvs67etLxdaqQ5oVdfEKjIecUBXCzI
/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1Id41BmVjwThZgxvs67etLxdaqQ5oVdfEKjIecUBXCzI/edit?usp=sharing)

2. Prepare 8-mins presentation that covers the following topics on your selected web/mobile app (to be presented next week)

- 1) Overview of this web/mobile app
- 2) What are the items suggested on this web/mobile app?
- 3) Explain components that make the web/mobile app personalized.
- 4) What are user's data used in the recommendation algorithm to in generating recommendations?
- 5) What is/are the recommendation algorithm(s) used? Briefly explain according to your understanding
- 6) Explain 3 highlight features of this web/mobile app
- 7) What are strong points and weak points of this web/mobile app? How do you suggest to improve them, if any.
- 8) Add references of the web/mobile app (e.g., URL)

Submission

- **Submission details:**
 - Only ONE representative will submit your work in MS Teams' assignment 'Assignment1'
 - File name: '**A1_groupX.pdf**', e.g., A1_group1.pdf).
 - The presentation slides must **include group number, ID and name of team members in the first slide.**
 - **Submitted file in other format**, e.g., URL to Canva, .ppt file, **will not be graded** (zero score's submission).
- **Submission Due:** check in MS Teams' Assignment1
- **Remark:**
 - **Every team member must present your submitted work next week.**
 - Any member who does **not present** will **get zero score** for this assignment.

Grading Criteria

1. Completeness and correctness of the content
2. Interestingness
3. Presentation (well explanation; presenting, not reading; Q&A)