

# Week 1: Introduction to Recommender Systems

CSX4207/ITX4207: Decision Support  
and Recommender Systems /  
ITX4287: Selected Topic in 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

# 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



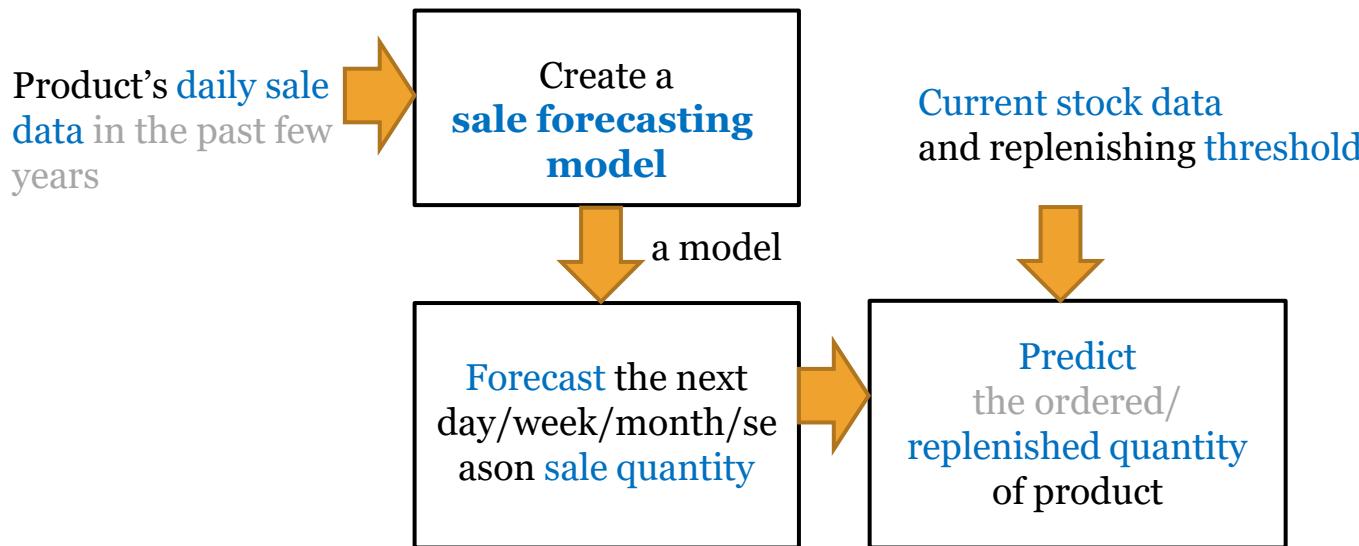
Emphasizes access to and manipulation of a **statistical, financial, optimization, or simulation model**



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

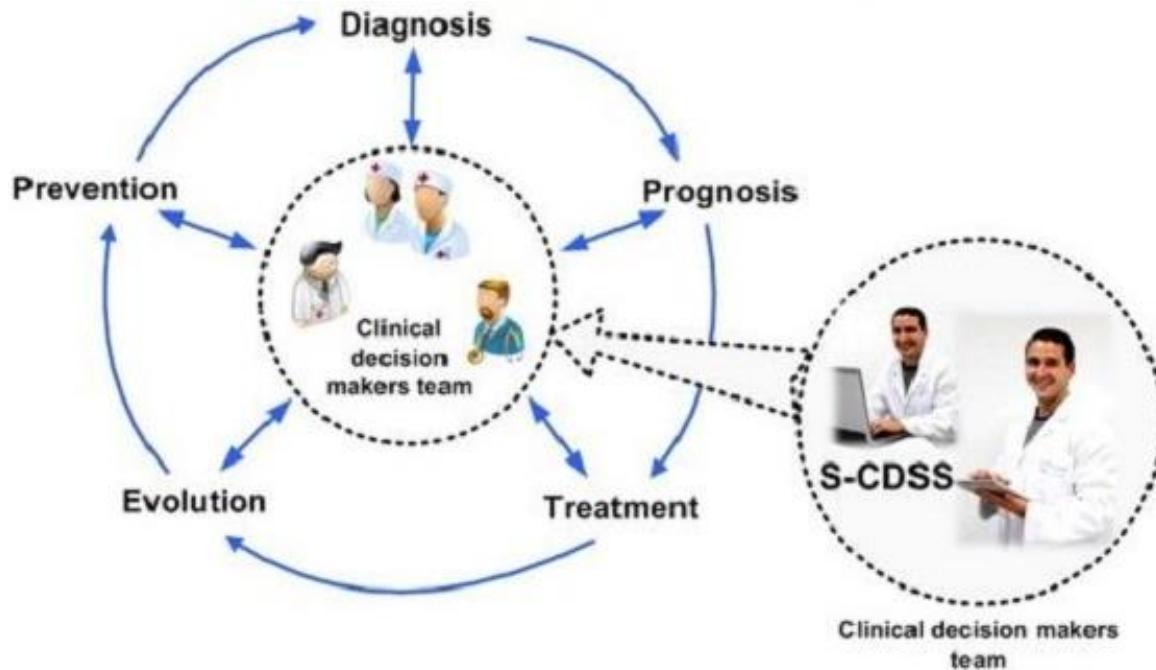
# Basic components of a DSS Architecture

The database  
(knowledge base)

The model  
(the decision  
context and user  
criteria)

The user  
interface

# An Example of DSS Applications - Clinical decision support system

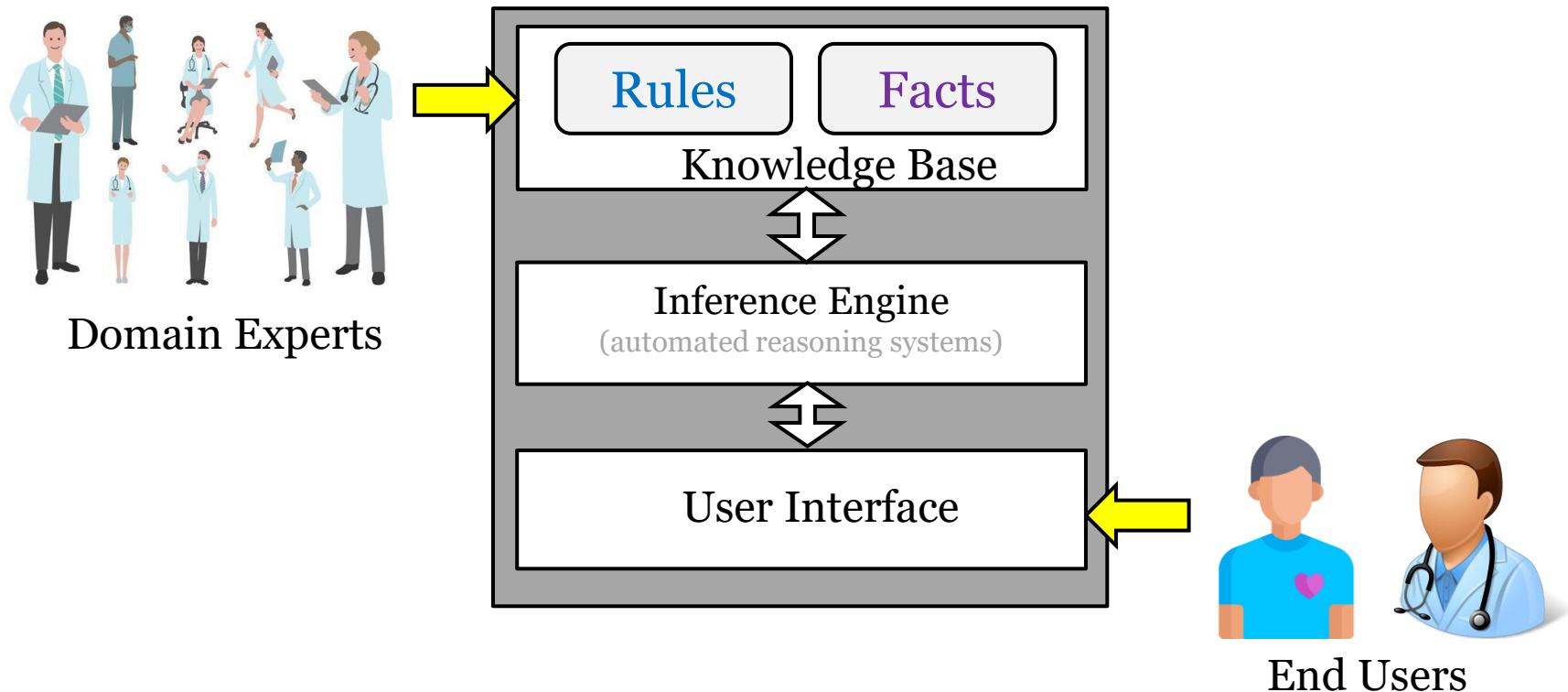


- Is an administrative/clinical tool which helps in improving operational efficiency of healthcare practices.
- Assist physicians & other health professionals in clinical decision-making tasks.
- Aid business management
  - Help managing data faster decision-making, and higher workflow efficiency in 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 <b>feathers</b> f2: x <b>can fly</b> and <b>lay eggs</b> f3: x's <b>outlook is black.</b>
1	R2, R3	f4: x is a <b>bird</b>
2	R4	f5: x is a <b>crow</b>



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

# Outlines

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- **Introduction to Recommender Systems (RSs)**
- Existing well-known RSs in real life
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  - User Profiles
  - Characteristics and Algorithms

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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.

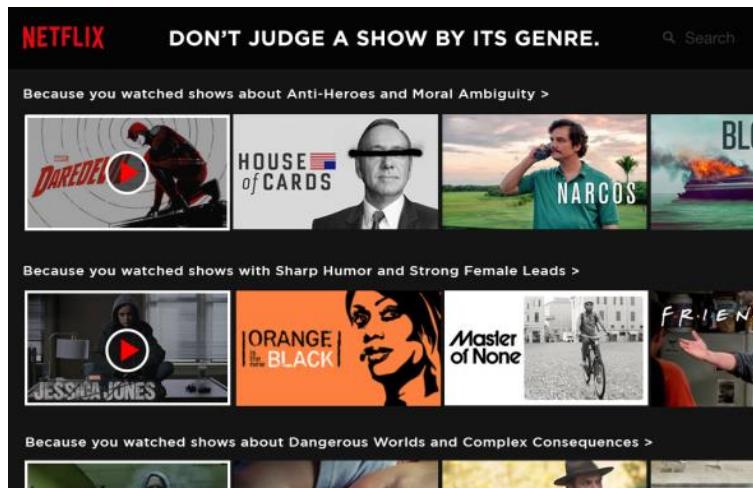
# A Challenge in Long-tail Economy

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

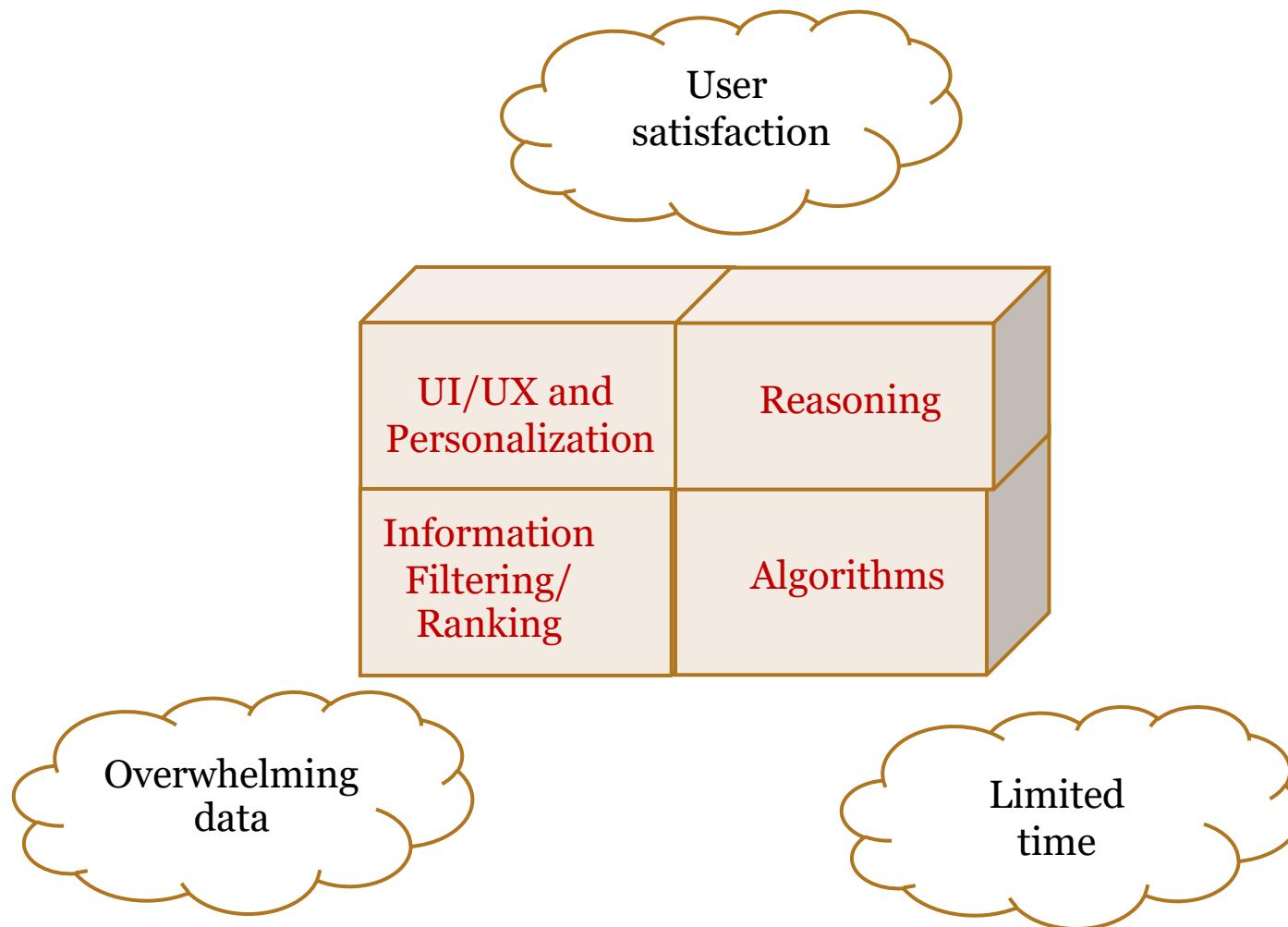
- Increase sales/conversion
  - Relevance
  - Diversity
- Increase the user satisfaction
  - Novelty
  - Serendipity (surprised -- “happy” and “unexpected”)
- Increase user loyalty/Reduce churn
- Better understand what the user wants

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>

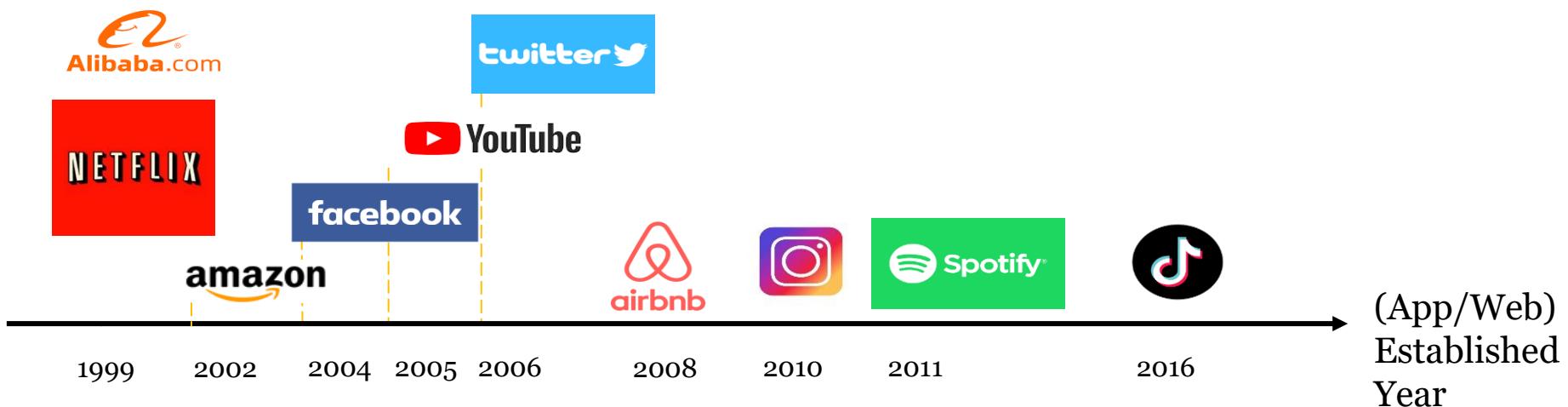
# Why are RSs Needed? - 2/2



# Outlines

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

# 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**  
  
 (แซนเต้า เฟฟ สเต็ก)  
 Steakhouse • \$\$\$  
 Imperial World Samrong (B Fl.), Mueang Samut Prakan

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

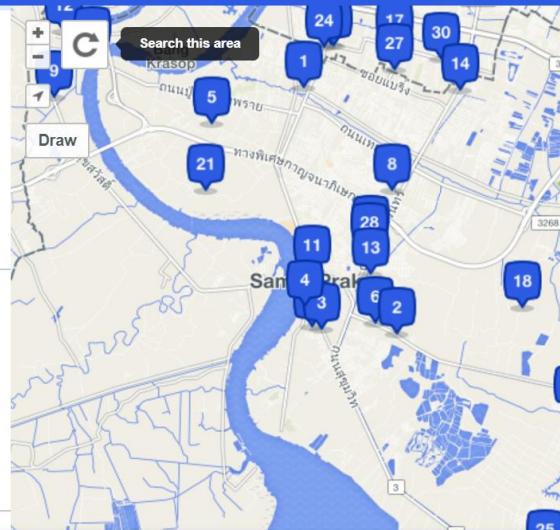
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**2. BKK Grill**  
  
 Steakhouse • \$\$\$  
 Phraeksa Rd., Mueang Samut Prakan

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

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

+123 456 7890   



# Google Hotels

The screenshot shows the Google Hotels search interface. At the top left is the Google logo with three horizontal bars. To its right are links for "Trips", "Explore", "Flights", and "Hotels". The background features a stylized illustration of a beach with umbrellas, palm trees, and a city skyline. In the center, the word "Hotels" is displayed in large, bold letters. Below it is a search bar with a location placeholder "Where to?", a date range from "Sun, Jan 12" to "Mon, Jan 13", and a guest count of "2". A "Popular destinations" section is visible at the bottom.

≡ Google

Trips

Explore

Flights

Hotels

Hotels

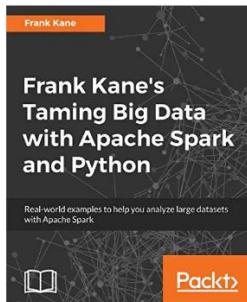
Where to?

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



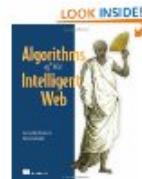
Machine Learning For Absolute Beginners: A Plain English Introduction (Second Edition)  
(Machine Learning From Scratch...  
by Oliver Theobald

★★★★★ 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.](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 screenshot shows the YouTube interface with a sidebar on the left and a main content area on the right.

- Sidebar (Left):**
  - Home (selected)
  - Trending
  - Subscriptions
  - Library
  - History
  - Watch later
  - Liked videos
  - SUBSCRIPTIONS**
  - Galit Shmueli
  - Browse channels
  - MORE FROM YOUTUBE**
  - YouTube Premium
  - Gaming
- Main Content Area:**

### Recommended

  - The Best Of YIRUMA | Yiruma's Greatest Hits ~ Best Piano** by Miracle Music (5.4K views • 5 months ago)
  - รวมเพลงพระราชนิพัทธ์ตลอดกาล | ทำกันจนເອົາ, ອູ້ແຮງໃຈ** by 60 Minutes Longplay (661K views • 2 months ago)
  - ชา X 3 กับพระมหาสมปองและพี่มุก** by BUDdee CHANNEL (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)
  - Alcançará 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)
  - MOZART COMPLETE PIANO SONATAS** by Mozart: Complete Piano Sonatas (Brilliant Classics) (3.6K views • 2 weeks ago)

# What RSs Else Do You know?



# Outlines

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# What will you learn from this course?



**Challenges in  
RSs**



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



**Evaluation  
measures**



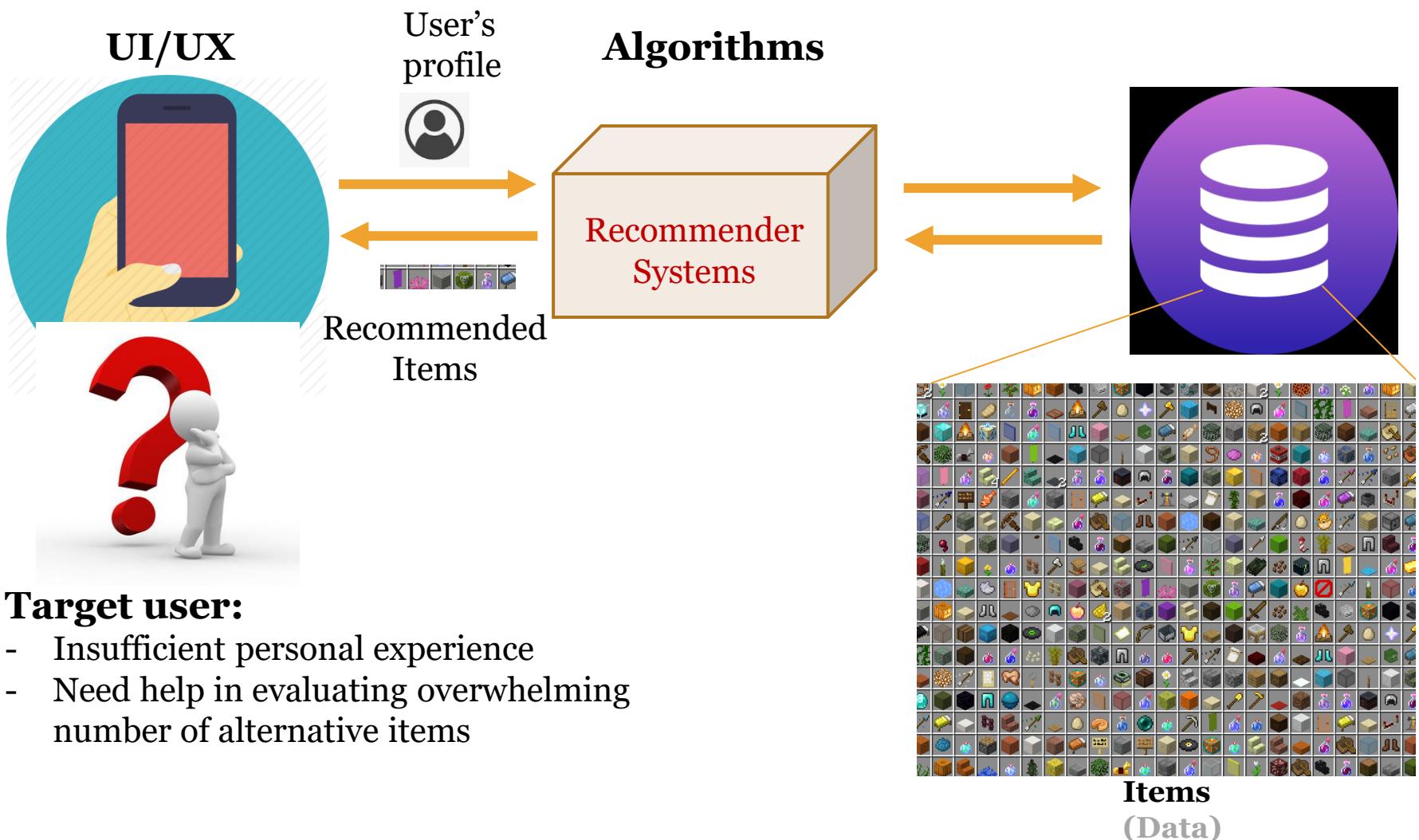
**Matching  
recommendation  
technologies and  
domains**



**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'. To the right are sections for 'CUISINES', 'NEIGHBORHOODS', 'GOOD FOR', and 'CITIES'. The main content area displays a list of 1-15 of 592 restaurants, each with a thumbnail, name, address, and ratings for Food, Decor, and Service.

**Austin**

**RESTAURANTS**

**FILTERS**

**Food** Any rating  
 Any  3.0+  3.5+  4.0+  
 4.5+

**Decor** Any rating  
 Any  3.0+  3.5+  4.0+  
 4.5+

**Service** Any rating  
 Any  3.0+  3.5+  4.0+  
 4.5+

**Price**  
 \$  \$\$  \$\$\$  \$\$\$\$

New openings  Has online menu

**1-15 of 592** Sort by: Food rating

Restaurant	Address	Rating	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	

**AUSTIN**

**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**

**GOOD FOR**

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

**CITIES**

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

**VIEW ALL**

# Non-Personalized RS

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

Screenshot of the Zagat website showing a non-personalized restaurant recommendation for Ruth's Chris Steak House in Austin.

The page includes the following elements:

- Header:** PLACES, LISTS, BUZZ, ZAGAT, AUSTIN, MORE, SEARCH.
- Main Content:**
  - RUTH'S CHRIS STEAK HOUSE:** Steakhouse • Downtown • \$\$\$
  - Image:** A plate of scallops with a red circle around it.
  - ZAGAT REVIEW:** 4.7 FOOD, 4.5 DECOR, 4.5 SERVICE (all circled).
  - Address:** 107 West 6th Street | Map, Austin, Texas 78701, 512-477-7884, [www.ruthschris.com/restaurant-locations/austin/?utm\\_...](http://www.ruthschris.com/restaurant-locations/austin/?utm_...)
  - Today's Hours:** 4:30PM - 11:00PM
  - Appears In These Lists:** Austin Restaurants with Best Decor, Austin's Best
- Sidebar:** YOU MIGHT ALSO LIKE (circled), featuring:
  - FLEMING'S PRIME STEAKHOUSE & WINE BAR: Steakhouse • Downtown • \$\$\$
  - ALC STEAKS: Steakhouse • Downtown • \$\$
  - VINCE + YOUNG STEAKHOUSE: Steakhouse • Downtown • \$\$\$
  - ESTÂNCIA CHURRASCARIA: Steakhouse • Great Hills • \$\$\$
- Bottom Navigation:** VIEW MENU, MAKE A RESERVATION AT RUTH'S CHRIS STEAK HOUSE (with date, time, people, FIND A TABLE), and various icons for Windows, search, file, etc.
- Footer:** Join the conversation (with a Z logo) and a small camera icon.

“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

400 characters remaining.

I'm not a robot   
reCAPTCHA  
Privacy - Terms

**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:

**tripadvisor** Bangkok ▾

Bangkok Hotels Things to do **Restaurants** Flights Vacation Rentals Shopping Vacation Packages Cruises Rental Cars •••

Asia > Thailand > Bangkok > Bangkok Restaurants Best Restaurants in Bangkok, Thailand

## Restaurants in Bangkok

Sort by: **Highest Rating** [?](#)

Your Selections [Clear all](#)

- Restaurants
- Thai
- Lunch

Establishment Type

- Restaurants
- Quick Bites
- Dessert
- More ▾

**1. Siam Tea Room**

4.5 stars 824 reviews · Open Now  
Thai, Asian · \$\$ - \$\$\$ · [Menu ↗](#)

“*ข้าวผัดป่าลาสเลด fried rice with crispy fish*”  
“*Seriously awesome, tasty and unique Thai food and super friendly service by L...*”

[Reserve](#)

**2. The Family**

4.5 stars 483 reviews · Closed today  
Asian, Thai · \$

“*Amazing food with great atmos*”  
“*What a great find!!*”

# 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		<b>More languages ▾</b>

**Food and ambie**

Local cuisine, Thai, Vegan Options

 ข้าวผัดปลาส้ม กุ้ง

 Seriously awesome and super friendly!

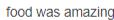
 Highly recommend Salad with tempura

 Our favorite dish

**Show reviews that mention**

Search reviews

**All reviews**        

**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



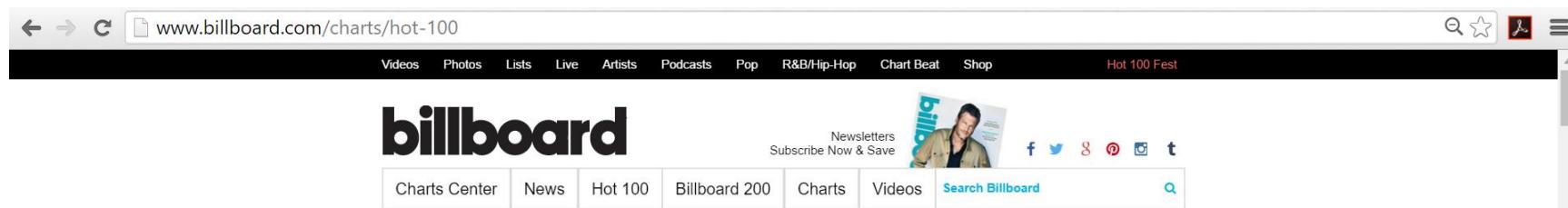
[Click to rate](#)

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

A callout box points to the search bar with the text: "This week's most popular songs across all genres, ranked by radio airplay audience impressions".

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 several sections of recommended content:

- Trending Now:** Displays movie posters for "EAT PRAY LOVE", "TALLULAH", "LIFE AS WE KNOW IT", "the ugly truth", "he's just not that into you", and "What's Your NUMBER?".
- Romantic Western Movies:** Shows posters for "Rumor has it...", "THE LUCKY ONE", "No Reservations", "NO STRINGS ATTACHED", "KNIGHT AND DAY", and "first daughter".
- Recently Added:** Shows posters for "STRANGER THINGS", "GRIDLOCKED", "COSMOS", "SICK IN LOVE", "TONY ROBBINS I AM NOT YOUR GURU", and "LAST U CHANCE".

The page also features the Netflix logo, a search bar, and a user profile for "Rachsuda J...".

# Non-personalized vs Personalized RS

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

- Because you watched The Darkest Hour**: This section contains posters for "FORWARD", "WAR OF THE WORLDS", "SUPER 8", "Z NATION", "CONTAGION", and "SYNCHRONICITY".
- Because you watched Jack Reacher**: This section contains posters for "COLLATERAL", "UNKNOWN", "FLIGHT", "WORLD WAR Z", "MISSION: IMPOSSIBLE III", and "GI JOE: RETALIATION".
- Because you watched Kate & Leopold**: This section contains posters 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", "HANGOVER PART II", "Search", and a user profile for "Rachsuda J..".

# Non-personalized vs Personalized RS

The screenshot shows the Netflix homepage with several sections of movie recommendations:

- Continue Watching for Rachsuda Jiamthaphaksin:** A row of movie posters including "Morning Glory", "The Darkest Hour", "Manhattan Romance", "Get Smart", "How Do You Know", and "Yes Man".
- Action & Adventure:** A row of movie posters including "Star Trek Into Darkness", "In Time", "Pacific Rim", "Sherlock Holmes: A Game of Shadows", "Mission: Impossible - Ghost Protocol", and "The Town".
- Top Picks for Rachsuda Jiamthaphaksin:** A row of movie posters circled in red, including "ALOHA", "CRAZY STUPID LOVE", "two weeks notice", "SEX AND THE CITY 2", "SEX AND THE CITY", and "what happens in VEGAS".
- Dramas:** A row of movie posters including "LOVE ACTUALLY", "THE KITE RUNNER", "MAGICAL", "THE SECRET LIFE OF ANNE FRANK", "THE COUNSELOR", and "THE PIANIST".

# 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 an "amazon assistant" button and a "Learn More" button.
- Deal of the day:** Shows a \$79.99 item (a food dehydrator) with a "Shop all deals" link.
- We Have Recommendations for You:** Includes a "Sign in to see personalized recommendations" button.

# Non-personalized vs Personalized RS

[https://www.amazon.com/gp/goldbox/ref=topnav\\_storetab\\_gb](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 <a href="#">See more</a>		<b>DEAL OF THE DAY</b> \$59.99 - \$78.99 Ends in 2:00:57 Extra plush Fitted Mattress Topper - Found in Marriott H...		<b>DEAL OF THE DAY</b> \$19.99 List: \$44.98 (56% off) Ends in 2:00:56 The Bourne Classified Collection on Blu-ray		<b>DEAL OF THE DAY</b> \$79.99 Price: \$129.95 (38% off) Ends in 2:00:57 Ivation Electric Countertop Food Dehydrator with 6 Dryin...		<b>DEAL OF THE DAY</b> \$35.98 - \$61.98 Ends in 2:00:56 Up to 40% Off Timberland Kid's Boots
<b>Deal Type</b> Deal of the Day Lightning Deals Savings & Sales Coupons Prime Early Access Deals	<a href="#">See details</a>	<a href="#">Add to Cart</a>	<a href="#">Add to Cart</a>	<a href="#">Add to Cart</a>	<a href="#">See details</a>			

# Non-personalized vs Personalized RS

[https://www.amazon.com/Coupons/b/ref=sv\\_gb\\_1?ie=UTF8&node=2231352011](https://www.amazon.com/Coupons/b/ref=sv_gb_1?ie=UTF8&node=2231352011)

The screenshot shows the Amazon Coupons page. At the top, there's a navigation bar with back, forward, and search icons, followed by the URL. Below the URL, there's a 'Coupons' section with a 'Sign in to view your coupons' link. To the right, a note says 'Discounts applied at check out or on first subscription. Some coupons may only be available to Prime members. [Some restrictions apply.](#)'

On the left, there's a sidebar with a 'Gourmet Foods & Beverages' section featuring a 'See more' link and a grid of product images. Below it is a 'Don't Miss a Single Deal' section with a sign-up form and a 'Learn more' link.

The main content area has several promotional sections: 'Never Run Out' (with 'Subscribe & Save' options for 153 coupons), 'Find Coupons by Brand' (listing Huggies, Quaker, Lysol, Dove), and 'Exclusively for Prime Members' (Prime Pantry with 235 coupons).

The central part of the page displays a grid of coupon offers. A dropdown menu over the 'Sort by:' button allows users to choose from 'Newest', 'Oldest', 'Expiring Soon', 'Most Popular', and 'Discount Percentage'. The offers include:

- Pop-Tarts**: Prime Pantry, Save 25% off Cereals, Hot Cereals and Pop-Tarts Products. Clip Coupon.
- Aveeno**: Subscribe & Save, Save 10% off. Clip Coupon.
- Kleenex**: Prime Pantry, Save \$0.50 off Kleenex. Clip Coupon.
- Neutrogena**: Subscribe & Save, Save 10% off. Clip Coupon.
- Ozeri Pro Kitchen Scale**: Save 40% off. Clip Coupon.

At the bottom, there's a footer with a 'What Do You Think?' section and a 'javascript:void(0)' placeholder.

# Non-personalized vs Personalized RS

https://www.amazon.com/gp/yourstore/home/ref=nav\_cs\_ys

The screenshot shows the Amazon personalized recommendations interface. At the top, there's a navigation bar with links like 'NEW & INTERESTING FINDS ON AMAZON', 'EXPLORE', and various decorative icons. Below the bar, the user profile 'rachsuda's Amazon' is displayed, showing '0 items' in the cart and '2004' as the 'CUSTOMER SINCE' year. The main content area is titled 'Recommended for you, rachsuda'. This section is circled in red. Below it, there are five product cards arranged in a grid:

- Computer & Technology Books**: Infrastructure as Code by Kief Morris (94 items)
- Prime Video – Unlimited Streaming for Prime Members**: THE MAN IN THE HIGH CASTLE (25 items)
- Reference Books**: MAKE YOUR OWN NEURAL NETWORK by TARIQ RASHID (75 items)
- Education & Teaching Books**: Java A Beginner's Guide, Sixth Edition by Herbert Schildt (8 items)
- Science & Math Books**: Storytelling with Data by cole nussbaumer knaflic (72 items)

At the bottom of the page, there are two additional sections:

- TIME MANAGEMENT**: KEYS TO MAXIMIZING YOUR TIME AND BECOMING MORE EFFICIENT. Includes icons for clock, stopwatch, and discipline.
- Data Analysis Using Regression and Multivariate Methods**: Practical Methods for Social Research.

On the right side, there are logos for 'The Constitution of the United States of America' and 'SOA-BASED ENTERPRISE INTEGRATION'.

# Non-personalized vs Personalized RS

[https://www.amazon.com/gp/history/ref=sv\\_ya\\_0](https://www.amazon.com/gp/history/ref=sv_ya_0)

The screenshot shows the Amazon website with the URL https://www.amazon.com/gp/history/ref=sv\_ya\_0. The top navigation bar includes links for 'NEW & INTERESTING FINDS ON AMAZON', 'EXPLORE', and various categories like 'Departments', 'Browsing History', and 'Your Account'. The main content area displays 'rachsuda's Amazon' information (ON ORDER: 0 items, AMAZON PRIME, AUDIBLE AUDIOBOOKS, CUSTOMER SINCE: 2004). Below this is a section titled 'Browsing history' which states 'You have no recently viewed items.' A red circle highlights the 'Your Recently Viewed Items and Featured Recommendations' section, which lists ten AWS-related books. At the bottom, a note says 'After viewing product detail pages, look here to find an easy way to navigate back to pages you are interested in.'

Your Recently Viewed Items and Featured Recommendations

Inspired by your purchases

Docker: The Ultimate Guide to Master Docker... Jayden King ★★★★★ 6 Kindle Edition \$2.99	Hosting Static Websites on AWS: A Step by... Meg Brown ★★★★★ 3 Kindle Edition \$0.99	Securing Amazon WEB SERVICES Jay Schulman ★★★★★ 1 Kindle Edition \$2.99	AWS Lambda: A Guide to Serverless... Matthew Fuller ★★★★★ 19 Kindle Edition \$3.99	Amazon Web Services FOR DUMMIES Jay Schulman ★★★★★ 64 Kindle Edition \$15.99	AWS for Dummies John Greene ★★★★★ 11 Kindle Edition \$9.99	AWS Seaside: Amazon Web Services Unofficial... Bernard Golden ★★★★★ 11 Kindle Edition \$9.99	2016 Amazon Web Services Dictionary & Handbook Tony Mraash ★★★★★ 3 Kindle Edition \$4.99	AWS Lambda: The Ultimate Guide To... Tyler Cross ★★★★★ 11 Kindle Edition \$2.99	AWS Scripted 2: Essential Security... Christian Carri ★★★★★ 3 Kindle Edition \$9.99	AWS Scripted: How to Automate the... Christian Carri ★★★★★ 11 Kindle Edition \$9.99
---	---	--	---	---	---	---	---	--	--	--

After viewing product detail pages, look here to find an easy way to navigate back to pages you are interested in.

View or edit your browsing history

# Non-personalized vs Personalized RS

Screenshot of an Amazon personalized recommendation page:

[https://www.amazon.com/gp/yourstore/recs/ref=sv\\_ya\\_1](https://www.amazon.com/gp/yourstore/recs/ref=sv_ya_1)

The page shows "NEW & INTERESTING FINDS ON AMAZON" and "EXPLORE" categories.

The navigation bar includes "Hello, rachsuda Your Account", "Try Prime", "Lists", and a "Cart" icon.

The main content area is titled "Your Amazon.com > Recommended for You". This section is circled in red.

Below the title, it says "These recommendations are based on items you own and more." and provides filtering options: "view: All | New Releases | Coming Soon" and "More results".

The recommendations list four items:

- The Art of Monitoring** by James Turnbull (June 8, 2016)  
Average Customer Review: ★★★★☆ (5)  
Auto-delivered wirelessly  
Kindle Price: \$9.99
- 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
- Make Your Own Neural Network** by Tariq Rashid (April 16, 2016)  
Average Customer Review: ★★★★☆ (31)  
Auto-delivered wirelessly  
Kindle Price: \$3.99
- AWS Lambda: A Guide to Serverless Microservices** by Matthew Fuller (January 11, 2016)  
Average Customer Review: ★★★★☆ (19)

For each item, there are "I own it" and "Not interested" checkboxes, and a "Rate this item" button.

# Non-personalized vs Personalized RS

https://www.amazon.com/gp/yourstore/iyr/ref=sv\_yr\_2

NEW & INTERESTING FINDS ON AMAZON **EXPLORE**

amazon Try Prime

All Departments Browsing History rachsuda's Amazon.com today's Deals Gift Cards & Registry Sell Help Hello, rachsuda Your Account Try Prime Lists Cart

Your Amazon.com Your Browsing History Recommended For You Improve Your Recommendations Your Profile Learn More

Your Amazon.com > **Improve Your Recommendations** (If you're not registered, click here.)

Help us make better recommendations. You can refine your recommendations by rating items or adjusting the checkboxes.

**EDIT YOUR COLLECTION**

- 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"
- Items you've marked as gifts

**Need Help?** Visit our [help](#) area to learn more.

**Items you've purchased**

**Your Rating:**

1.  [Kindle for PC \[Download\]](#) by Amazon Digital Services LLC 5   This was a gift  Don't use for recommendations

2.  [Python Machine Learning](#) by Sebastian Raschka 5   This was a gift  Don't use for recommendations

3.  [Fundamentals of Database Systems \(7th Edition\)](#) by Ramez Elmasri 5   This was a gift  Don't use for recommendations

4.  [Getting Started with AWS: Hosting a Web Application](#) by Amazon Web Services 5   This was a gift  Don't use for recommendations

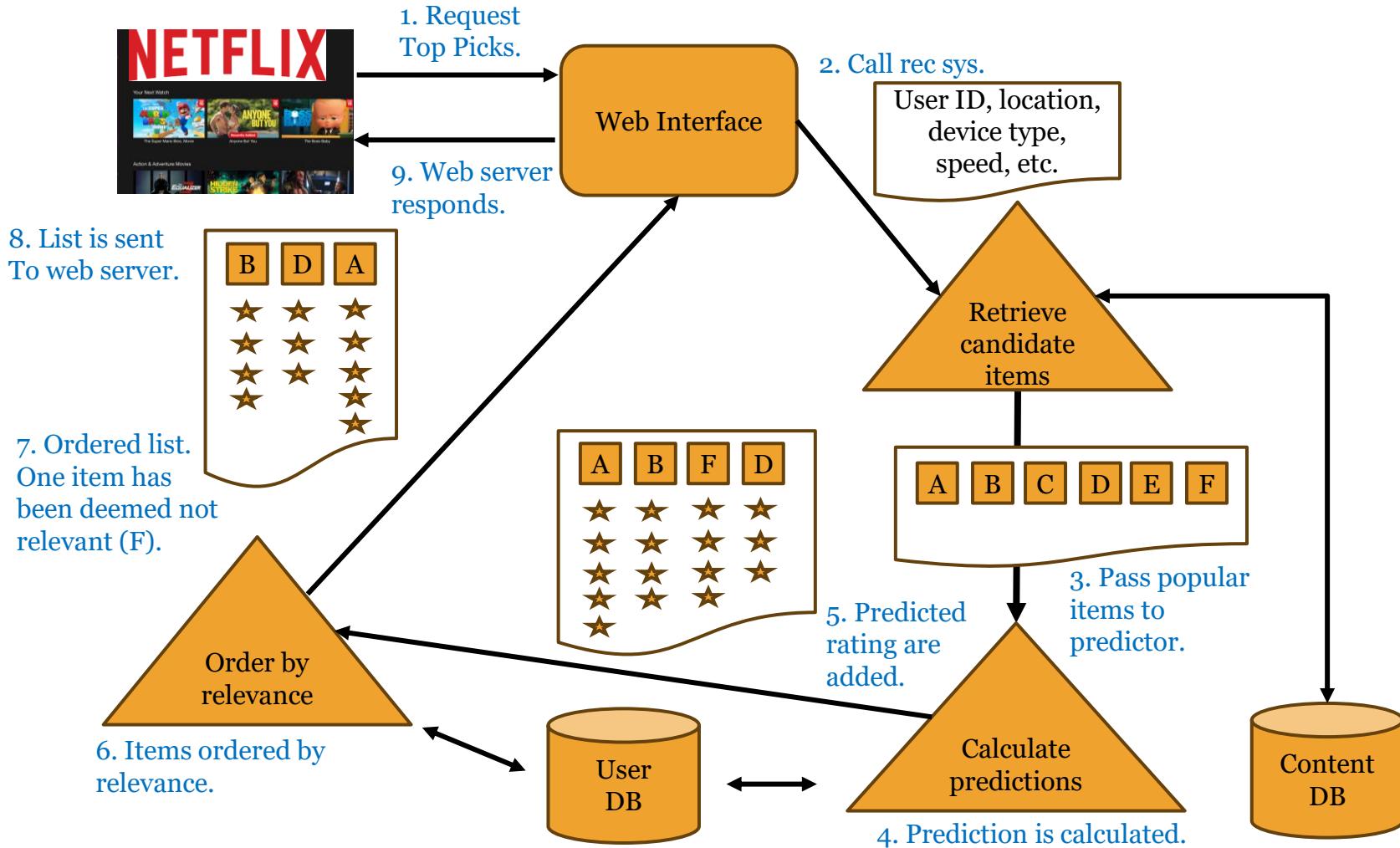
# Summarizing Non-personalized vs Personalized RS

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

- <http://www.deitel.com/ResourceCenters/Web20/RecommenderSystems/tabid/1229/Default.aspx>
- <https://www.coursera.org/learn/recommender-systems>
- How Does the Recommendation System Work on Tmall?:  
[https://www.alibabacloud.com/blog/how-does-the-recommendation-system-work-on-tmall\\_595335](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>