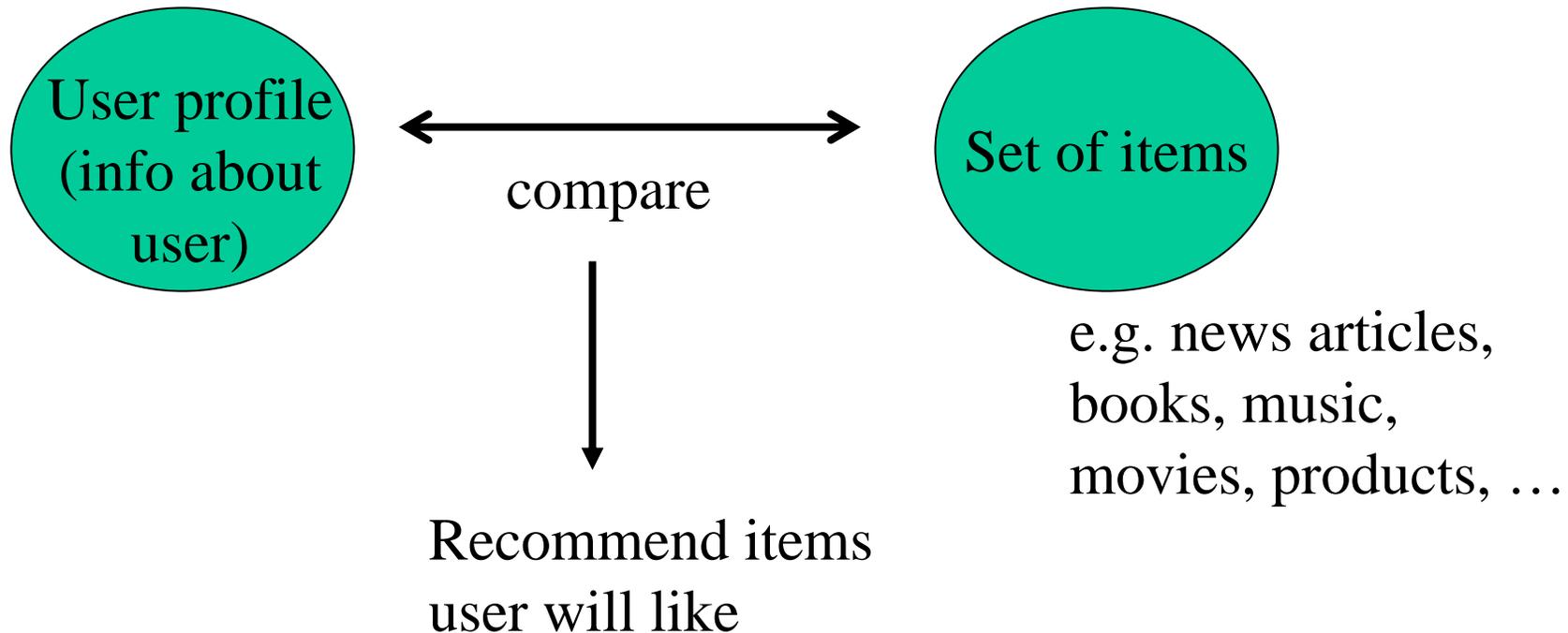


User Modeling, Recommender Systems & Personalization

Pattie Maes

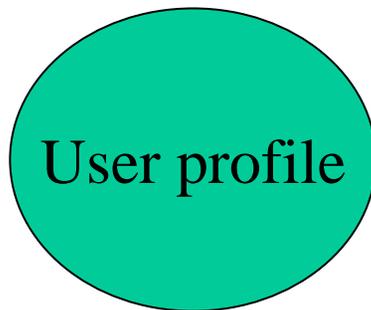
MAS 961- Week 6

Recommender Systems: General idea



Personalization: General Idea

Personalization = user adaptive systems



interaction is adapted based on data about an individual user
Eg personal websites,
personalized tutoring,
personalized recommendations,
etc.

Why relevant to this class?

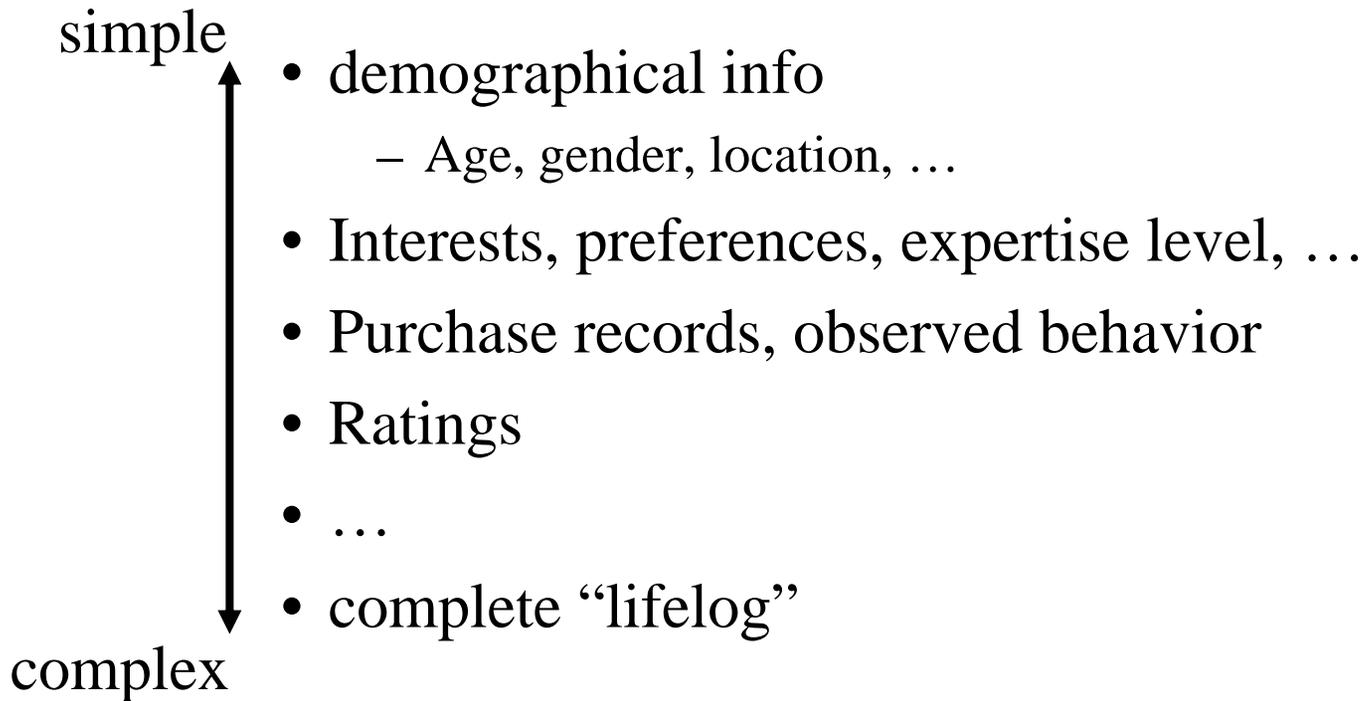
Ambient Intelligence =

Ubiquitous Computing

+

Intelligent Interfaces (eg personalization)

User Profile



Source of User Profile

- Entered explicitly by user (questionnaire)
- Gathered implicitly by system
 - Observing/recording person's behavior
 - Learning/infering interests/preferences/level...
- Combination of both approaches
- Another dimension: public/private

Acquired User Profiles

Form:

- raw data
- generalization (find patterns & generalize)
 - statistical ML methods
 - knowledge based ML methods
- keep both forms (to relearn/adapt over time)
 - keep “window” of raw data

Generic User Modeling

- Separate user modeling from applications/use
 - Reusable across applications
- Still mostly theory, not practice
- State of art: every application does its own user modeling specific to the task at hand

Recommendation algorithms

- Case-based/Stereotype based
- Feature-based/Content-based
- Collaborative Filtering

Case-Based/Stereotype-Based

- Acquire info about user
- Classify user in a bucket (as a particular “case” or stereotype) based on facts about user
 - Eg soccer moms, poor grad student, ... (there may be a hierarchy, rather than list of stereotypes)
- Certain assumptions about what appeals to a certain stereotype
 - Eg which items appeal to certain case/category of users
- Recommend those to the user
- Example: demographics-based recommendations

Feature-based/Content-based Filtering

- One approach: learning from item examples
 - Look at all items a user likes
 - Features of items
 - Find patterns among items and generalize (often also involves clustering)
 - Then recommend more items that fit same pattern(s)
 - Eg recommend movies based on features of those movies (genre, actors, ...)

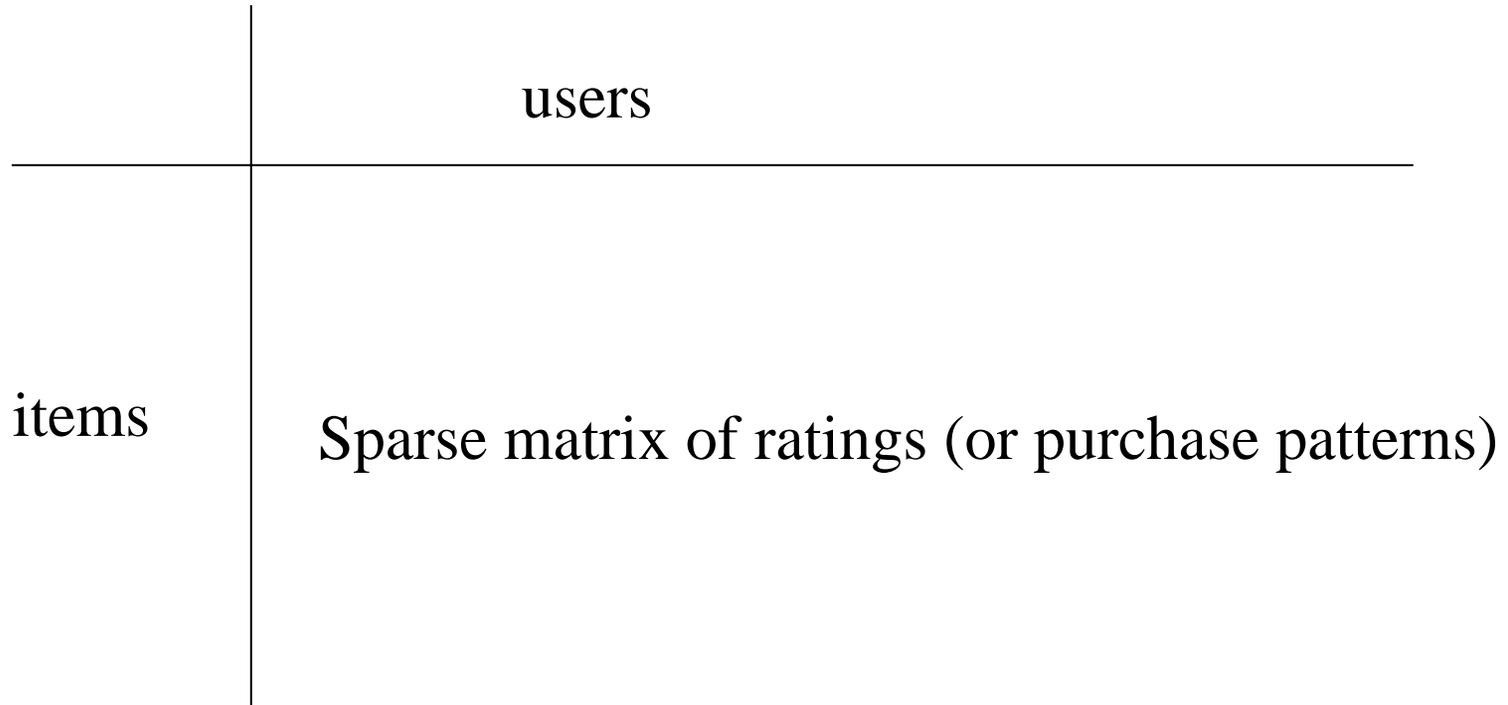
Feature-based/Content-based Filtering

- Another approach: learning stereotypes from user examples
 - Given a category of items
 - Given set of users with features & values
 - Given information on which users like what items
 - Generalize on what types of users like a category of items
 - Recommend items based on what case user falls into

Knowledge-based Techniques

- Special case of feature-based where background knowledge of item space or user space is used to generalize
- Eg use ConceptNet or Interest Map
 - Know what people are related (InterestMap)
 - Know what items are related (ConceptNet)

Collaborative Filtering



Algorithms: recommend items based on item similarities (rows) or based on user similarities (columns), typically weighted average of K nearest neighbors, with weight inverse proportional to distance

Pros & Cons different techniques

- Collaborative filtering
 - Pros:
 - Does not require analysis of the items (features)
 - Better at qualitative judgements
 - Cons:
 - Bootstrapping
 - Ratings required
 - Critical mass required

Mixed Techniques

- Use ratings as additional features in the generalization task
 - ML algorithm can learn what features are best predictors (content features or ratings by others or both)

User Profile

- Short term information
 - Eg current context, current activity/focus
- Long term info
 - Eg longer term interests
- You typically want to use both
- Update them on different timescale

Location of User Profile

- Centralized
 - Generic
 - Device & application independent
 - Easier to apply generalization across users
- Distributed
 - Mobile use
 - Better privacy
- Mixed forms

Tunnel vision problem & importance of serendipity

- Feedback loop:
 - Systems recommends items of type X
 - User consumes items of type X
- Importance of “exploration” or “serendipity” (recommending items outside user’s interest space)

Avoiding the tunnel vision problem

AMERICAN COLUMBIAN & TRISTAR INC. **Columbus Sunday Press** THE INDEPENDENT CITY PAPER

Marble Cliff, Beautiful Suburb of the Capital City



View Down the Terrace from Marble Cliff Station, Showing the Handsome Home of Mr. John C. Dink.

Delightful Scenery.

OF the beauty of the location of the Marble Cliff, no word has been said in this paper. It is located on a high plateau overlooking the city, and the scenery is so beautiful that it is hard to believe that it is only a few miles from the city. The view from the station is so beautiful that it is hard to believe that it is only a few miles from the city. The view from the station is so beautiful that it is hard to believe that it is only a few miles from the city.

Will Tomorrow Assume, In Reality, All the Dignity of an Incorporated Village--Election of Officers to be Held.

MARBLE CLIFF, the newly formed village, will begin its official life on the 1st of July. Its incorporation as a hamlet and all other necessary legal steps have already been taken, and Monday its citizens will gather in the park and elect the first set of village officers. When these take charge, many things will be done, but the most important is to have a distinctive emblem for the village.

The first of the suburbs has been created in reality, though not in name. It is now a village, and it will be a village in name. It is now a village, and it will be a village in name. It is now a village, and it will be a village in name.



Improved Street, Viewed from the Stone Bridge in Waco, Texas.

The Hamlet's Dimensions. The hamlet is bounded on the north by the city limits, on the south by the city limits, on the east by the city limits, and on the west by the city limits. It is a beautiful suburb of the capital city.



In the Heart of the Hamlet, Showing a Village Store, Public School, Railway and Village Home.

The Hamlet's Name. The name of the hamlet is Marble Cliff. It is a beautiful suburb of the capital city. The name is so beautiful that it is hard to believe that it is only a few miles from the city.

Handsome New Buildings. The building boom is on in Marble Cliff. There are many handsome new buildings being built. The buildings are so beautiful that it is hard to believe that they are only a few miles from the city.

George Urbin the Pioneer. George Urbin is the pioneer of Marble Cliff. He is a beautiful man and a beautiful man. He is a beautiful man and a beautiful man. He is a beautiful man and a beautiful man.

The Subdivisions Included. The subdivisions included in the hamlet are the Marble Cliff subdivision, the Marble Cliff subdivision, and the Marble Cliff subdivision. They are all beautiful subdivisions of the capital city.

The Country Club. The country club is a beautiful place. It is a beautiful place.



J. E. PINNER, A Pioneer Resident.

Highlight recommendations but present all choices



Winds Around

Municipal Candidates

School Building

Marble Cliff Station and Postoffice



Marble Cliff Station and Postoffice.

Personal of the Prospective Officers. The prospective officers are so beautiful that it is hard to believe that they are only a few miles from the city. They are so beautiful that it is hard to believe that they are only a few miles from the city.

Other problems

- Noisy/incorrect data used in user modeling
 - User needs to be able to inspect & “correct” user model
- Trust
 - Recommendation system needs transparency!!
- Privacy
- Control

Variant: one person as recommender

- E.g. see world through Marvin's eyes
- Have a famous critic as your guide

Next Week: Ambient & Tangible Interfaces

- Required reading:
 - Ishii & Ullmer, Media Lab, Tangible bits, Chi 97,
<http://web.media.mit.edu/~anjchang/ti01/ishii-chi97-tangbits.pdf>

Next Week: Ambient & Tangible Interfaces

- Gross' work- Fraunhofer - **Amy**
 - Ambient Interfaces: design challenges & recommendations
http://ieeexplore.ieee.org/xpl/abs_free.jsp?arNumber=994231
 - Ambient Interfaces in a web-based theater of work
- Cohen & McGee, Tangible Multi-modal Interfaces - **Amy**
<http://www.cse.ogi.edu/CHCC/Publications/cacm-actual.pdf>
- Personal & Ubiquitous Computing Journal Vol 8 Nr 5
Special Issue on Tangible Computing – selection – **Edison (2) & Minna (2)**