

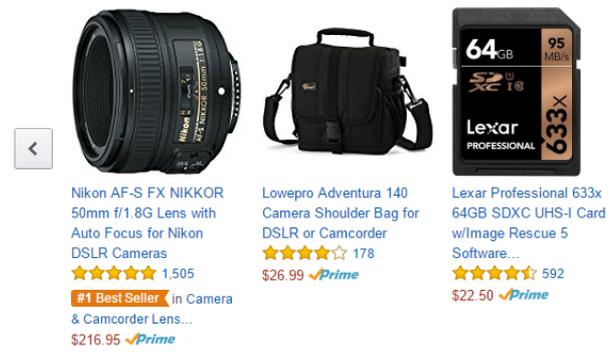
# Personalized, interactive explanations of recommendations in eTourism

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# Recommender Systems

- ▶ Automated recommendations
  - ▶ A pervasive part of our online user experience
  - ▶ Explicitly recommend us shopping items, movies, music, news, friends, jobs, groups or people to follow, restaurants, hotels...

## Customers Who Bought This Item Also Bought



The screenshot displays three recommended items with their respective images, descriptions, ratings, and prices. A left-pointing arrow is visible on the far left of the product grid.

Item	Image	Description	Rating	Price	Prime
Nikon AF-S FX NIKKOR 50mm f/1.8G Lens with Auto Focus for Nikon DSLR Cameras		Nikon AF-S FX NIKKOR 50mm f/1.8G Lens with Auto Focus for Nikon DSLR Cameras	★★★★★ 1,505	\$216.95	✓ Prime
Loweprro Adventura 140 Camera Shoulder Bag for DSLR or Camcorder		Loweprro Adventura 140 Camera Shoulder Bag for DSLR or Camcorder	★★★★☆ 178	\$26.99	✓ Prime
Lexar Professional 633x 64GB SDXC UHS-I Card w/Image Rescue 5 Software...		Lexar Professional 633x 64GB SDXC UHS-I Card w/Image Rescue 5 Software...	★★★★★ 592	\$22.50	✓ Prime

# Recommender Systems

- ▶ Once you see them, they are everywhere

You may also like



Jack & Jones  
JAMIE - Polo shirt - orange  
£21.00  
Free delivery & returns

Jobs you may be interested in *Beta* [Email Alerts](#) | [See More »](#)

-  **Technical Sales Manager - Europe** ×  
Thermal Transfer Products - Home office
-  **Senior Program Manager (f/m)** ×  
Johnson Controls - Germany-NW-Burscheid

Related hotels...



**Hotel 41**  
★★★★★ 1,170 Reviews  
London, England

[Show Prices](#)

Read Commented **Recommended**

-  Germany Just Rejected The Idea That The European Bailout Fund Would Buy Spanish Debt ×
-  There Is Almost No Gold In The Olympic Gold Medal ×

You may also like

-   
★★★★☆ (109)
-   
★★★★☆ (53)
-   
★★★★☆ (33)

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# Recommender Systems

- ▶ Automated recommendations
  - ▶ Less obvious: Silently select and rank the items
    - ▶ News feeds, ads (in some sense)



Because of your interest in Trump

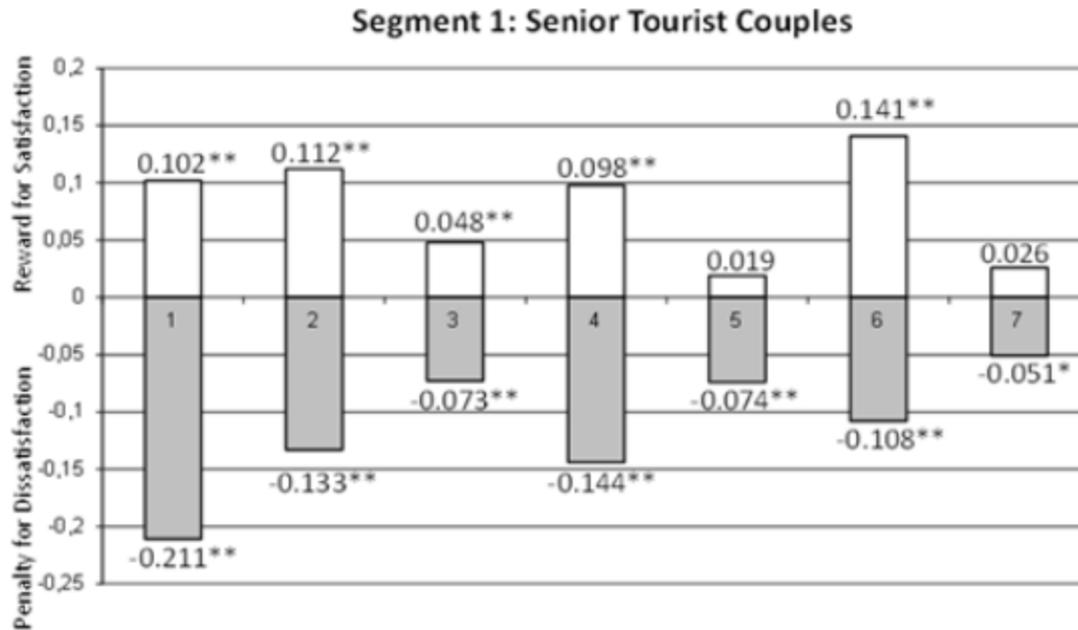
...



# Recommender Systems in e-Tourism

- ▶ Potential value for different stakeholders
- 
- ▶ For tourists, e.g.,
    - ▶ Pre-trip information gathering and decision making
    - ▶ Add-on service during the trip (e.g., POI recommendation)
  - ▶ For service providers, e.g.,
    - ▶ Differentiation from the competition
    - ▶ Influencing user behavior
    - ▶ Means for information gathering (user preferences)

# Penalty-Reward Models



# Particularities in e-Tourism

- ▶ “Customers who bought ... also bought”
  - ▶ Can only be applied for some e-Tourism scenarios
    - ▶ E.g., “People who visited the Eiffel Tower, ....”
  - ▶ Recommendations often based on complex machine learning models and monitoring user behavior
- ▶ In many other scenarios, more fine-grained and **interactive** approaches are required
  - ▶ Need to **understand the detailed customer preferences**, e.g., regarding the desired amenities of a hotel
  - ▶ Need to **explain the recommendations** to the tourist to be adopted (trusted)

# Ultimately ...

- ▶ Interactive recommendation and advisory as part of future **tourism experience**
- ▶ Services during different phases, e.g.,
  - ▶ Pre-trip decision making
  - ▶ POI selection and tour planning during the trip
  - ▶ Activity recommendation (e.g., sports, restaurants)
  - ▶ Location-based services
  - ▶ Proactive notifications
- ▶ Explicit preferences and context are relevant
- ▶ Requires more elaborate interaction mechanisms
- ▶ Side effect also:
  - ▶ New opportunities for analytics

# An interactive recommender



Jannach, D., Zanker, M. and Fuchs, M.: "Constraint-based recommendation in tourism: A multi-perspective case study". Information Technology & Tourism. Springer Nature, 2009, pp. 139-156

# An interactive recommender

The screenshot shows a web browser window with the URL <http://www.configworks-gmbh.online.de>. The page title is "VIBE - the virtual adviser for the Warmbad-Villach spa reso...". The page features a logo for "VIBE VIRTUAL ADVISER" and a navigation bar with links for "HOME", "CALL BACK SERVICE", and "RECOMMENDATIONS".

On the left side, there is a woman in a red dress with a speech bubble that says: "Wonderful, we've now got to your final selection. Here's my recommendation for you ...".

The main content area displays a recommendation for a "Feel well week" package. The details are as follows:

Length of stay:	per week (7 nights) per person	
Meals:	Half board	
Accommodation:	The Warmbaderhof	<a href="#">Details</a>
Dates:	At any season	<a href="#">Why?</a>
Rate in single room:	from € 1595	
Rate in double room:	from € 1595	

Below this package, there is an information icon and a section titled "I can also recommend the following packages:" with a sub-recommendation: "You can book a personal massage or a whole massage programme for your stay at any time."

Below this, there is another recommendation for a "Golf & Spa" package. The details are as follows:

Length of stay:	per week (7 nights) per person	
Meals:	Half board	
Accommodation:	The Warmbaderhof	<a href="#">Details</a>
Dates:	01.04.2008-31.10.2008	<a href="#">Why?</a>

At the bottom of the page, there are four buttons: "Back", "Restart", "Print", and "Online-request". The status bar at the bottom left shows "Fertig" and a green checkmark icon.

# An interactive recommender

http://www.configworks-gmbh.online.de - VIBE - the virtual adviser for the Warmbad-Villach spa reso...

VIBE  
VIRTUAL ADVISER

HOME CALL BACK SERVICE RECOMMENDATIONS

*You're bound to ask yourself why I recommended the following. I'll be happy to explain...*

**My arguments specially for you.**

- I am happy to have found autumn packages for you, as you wished. If you want more suggestions for a specific date, you'll have to use the detailed advice option (more questions).
- We have a whole range at the Warmbad-Villach spa resort to suit your request Leisure and activities programme & Long walks. Ask about them.
- Our comprehensive supporting programme of cultural events (Carinthian Summer Music Festival, Villach Carnival, exhibitions at the Warmbad culture club, Jazz Over Villach, etc.) all year round and attractions in the vicinity will round off your stay at the
- Do you want to feel fit and healthy? Our sports and activities programmes respond to your wishes

Back

Fertig

# Everything solved?

- ▶ Just add some speech recognition, natural language understanding, and language generation features
  - ▶ And (deep) machine learning, to avoid knowledge engineering bottlenecks
- 

- ▶ Probably not
- ▶ Interacting is not only asking for preferences
  - ▶ How to help the user understand the range of options?
  - ▶ How to determine what to ask in which way?
  - ▶ How to help the user express the preferences?
  - ▶ How to convince or persuade the user or make them trust in the recommendations?

# User interaction in recommenders

- ▶ In Computer Science, at least, a niche topic
  - ▶ Complex machine learning models dominate
  - ▶ Research is very scattered
- ▶ A number of dimensions discussed in the literature
  - ▶ **Dialog aspects - Critiquing** : Present an option and let user give feedback (e.g., “less expensive”)
  - ▶ **User modeling - Personality-based approaches**: Try to find destinations that match the tourists personality (e.g., work at TU Wien)
  - ▶ **Visualization**: Use 2D or 3D landscape to help users understand the range of options
  - ▶ **Explanations**: e.g., to persuade a user

# Customers who bought ...



Roll over image to zoom in

Minnow Sports

## Minnow Sports Aluminum Baseball Bat For Baseball & Teeball

★★★★☆ 8 customer reviews

Price: \$29.99

Sale: \$19.99

You Save: \$10.00 (33%)

**In Stock.**

This item does not ship to **Germany**. Please check other sellers who may ship internationally. [Learn more](#)

Sold by **BBro Store** and **Fulfilled by Amazon**. Gift-wrap available.

Item Display Length:

32.0 inches

- Made from lightweight high grade Aluminum alloy for faster swing speed
- Ultra-thin 32" handle with All Sports grip for increased stability and accuracy
- Stylish design featuring full rolled-over end for ultimate performance
- Ideal for all levels of baseball players from practice to matches
- 32 inches in length & 24 ounces



# Explaining Recommendations

- ▶ Explanations can serve various purposes, e.g., (Tintarev and Masthoff)
  - ▶ Increase the (perceived) **transparency** of the recommendations, help users develop trust, increase their satisfaction
  - ▶ **Justify** the recommendations, and thereby increase the persuasiveness of the system
  - ▶ Help users make better decisions (**effectiveness**)
  - ▶ Help users make decision faster (**efficiency**)
- ▶ What we consider particularly important here:
  - ▶ Explanations as a starting point to **user control**
  - ▶ Generally important for future applications

# User Control

- ▶ Let users influence the recommendations
  - ▶ Explicitly define their **preferences**, e.g., on Google News
  - ▶ Giving **feedback** to recommendations, as is possible, e.g., on Spotify
  - ▶ Let users **choose** the recommendation **strategy** (only in academia)
  - ▶ **Explain the** user the recommendation rationale and **let users correct** assumptions
    - ▶ Complex visualizations in academia
    - ▶ More simple approaches in industry

# Why this is challenging

## ► At Amazon

amazon.com

[Help](#) | [Close window](#)

### Recommended for You



#### **Tosca Women's Dual Strap Fashion Handbag Style 9200**

Tosca (November 15, 2012)

**Price: \$23.50 - \$36.95**

Rate this item



I own it

Not interested

[See all buying options](#)

[Add to Wish List](#)

### Because you said you owned...



#### **NNEE® Water Resistance Nylon Tote Bag & Multiple Pocket Design**

NNEE Inc



Don't use for recommendations



# More research is required

- ▶ Preliminary survey among CS students
- ▶ Research questions:
  - ▶ Do people know about the feedback and control functionality?
  - ▶ Do they use it?
  - ▶ If not, why not?
- ▶ Two-stage study based on questionnaire
  - ▶ 75/26 participants
  - ▶ 1<sup>st</sup> stage: "Do you know/use it?"
  - ▶ 2<sup>nd</sup> stage: "Why do you not use it?"  
(Free-text answers)

# Outcomes

- ▶ 93% say they know there are possibilities to influence recommendations
- ▶ 16% are aware of the special page with feedback/control functionality
- ▶ 8% have ever used the feedback/control functionality
  
- ▶ Even though
  - ▶ 53% said the functionality was clear or very clear, and
  - ▶ 24% said it could be guessed

# But why not using it?



# Opportunities and Challenges

- ▶ Interactive and context-aware recommendation helpful in various tourism scenarios
  - ▶ Hotel search, itinerary planning, POI selection, in-trip proactive recommendations
  - ▶ Can improve the **tourism experience** in general
- ▶ Huge potential in two ways:
  - ▶ Allows for better, **personalized services** in the future based on tourism analytics.
  - ▶ Much more fine-grained knowledge about the user becomes available for analytics
    - ▶ E.g., unknown or unexpected preference patterns

# Opportunities and Challenges

## ▶ But:

- ▶ Appropriate user interface mechanisms required
- ▶ Usability on mobile devices
- ▶ Perhaps the UI has to be adapted to the individual users (beyond “basic” and “expert” modes)

## ▶ In the future:

- ▶ Better integration of various information sources, including social ones
- ▶ Usage of capabilities of modern smartphones
  - ▶ Various sensors

# Summary

- ▶ RS as a means to enhance the tourism experience
- ▶ Next generation of interactive recommenders (in tourism) should address the open issues
  - ▶ Needs interdisciplinary approach
  - ▶ And the user in the loop
  
- ▶ Thank you - Questions?

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