

# Effects of Foraging in Personalized Content-based Image Recommendation

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QUARTZ

Quantum Information Access and Retrieval Theory

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- Recommender systems depend heavily on learning algorithms which improve with more and better data.
- Personalized image recommendation system usually leverages user feedback which later **increases the user visual attention** to enhance recommendation.



**Figure:** What gets your first attention?

- We investigate and explore a personalized image recommendation scenario with the usage of **Information Foraging Theory** to characterize the effects of user attention.

Chen et al. (2017)<sup>1</sup>:

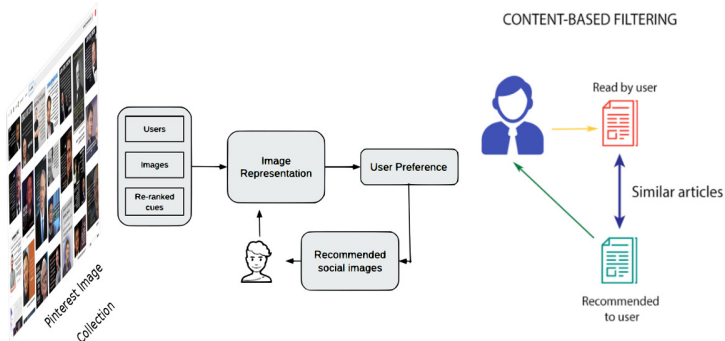
## Attentive Collaborative Filtering (ACF)

- An **attention network side-by-side**, which **capture image segments** with comparative importance.
- Introduces **item-** and **component-level attention module** in **multimedia recommendation**.
- These two attention modules learns to **score the item preferences**.
- Weighted sum to construct the content representation.
- User information is more effective than the items to enhance recommendation.

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<sup>1</sup>Chen et. al. (2017, August). Attentive collaborative filtering: Multimedia recommendation with item-and component-level attention. In Proceedings of the 40th International ACM SIGIR conference on Research and Development in Information Retrieval (pp. 335-344). ACM.

- Information Foraging Theory (IFT) [Pirolli 1999] to describe **information retrieval behaviour** which includes:
  - Information seeking: to locate interesting items.
  - Seeking strategies: to drive the users' attention over a specific item.
  - Behavioural effects: The influence on the selection of interesting items.



**Figure:** The schematic architecture of Personalized Image RecSys

## Advantages

IFT for personalized content-based image recommendation

- To illustrate how **users' exploit visual bookmarks**.
- To help users' in locating valuable items by **reinforcing user attention**.

## Contributions

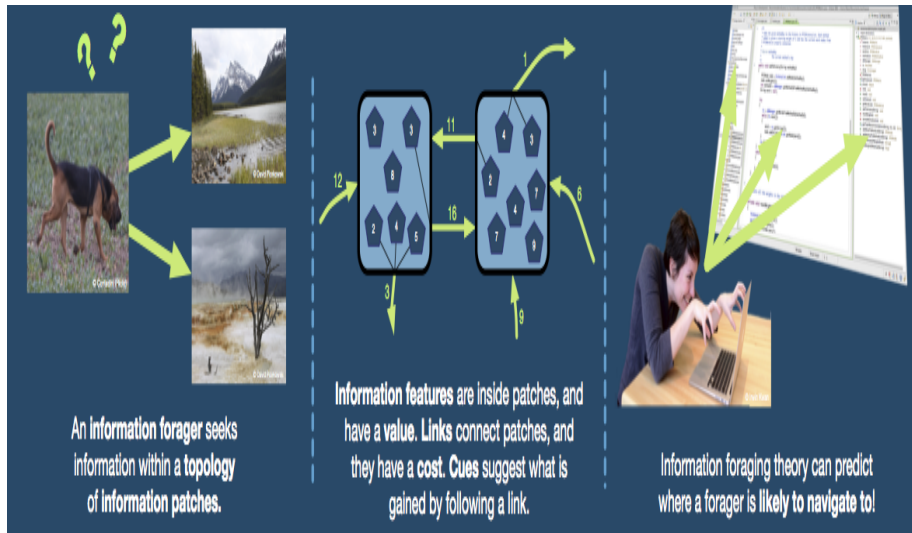
IFT to investigate a personalized content-based image recommendation system that

- manifests an image search scenario which **incorporates users' visual attention** to recommended items.
- illustrates the user-dependent aspects observed during **foraging intervention** across various effects of scent on a recommendation.

# Information Foraging Theory



Quantum Information Access and Retrieval Theory



**Figure:** From left to right: Foraging, Information Patch and Information Scent  
**Source:** Irwin Kwan

$$\text{Image } (I) = \{I_{p_{i,1}}, I_{p_{i,2}}, \dots, I_{p_{i,n}}\}$$



Figure: Personalized Search Recommendation Interface



## Results

Food Categories	Spaghetti Bolognese		Zoodles	
	User Preferences	IS	User Preferences	IS
$R_1$	<b>Bolognese</b>	<b>10</b>	<b>Zoodles</b>	<b>9</b>
$R_2$	Spaghetti	7	Zucchini	8
$R_3$	Recipe	6	Easy	6
$R_4$	Sauce	6	Pasta	5
$R_5$	Easy	3	Chicken	5

**Table:** Information scent of User Preferences



- Information scent of an image has user-dependent aspects and **users' scent of the same image can differ** (For instance; "Bolognese" and "Spaghetti").
- The overall information scent of an image [Loumakis 2011] becomes **stronger when adding cues**.
- Reinforcing visual attention has a strong information scent [Chi 2001], however, in some situations, the **images' scent can exceed the cues' scent**.
- Scale-up this study on large datasets by exploring interactions between information scent and cue strength.
- To explore non-classical effects such as order effect (image -> cue Vs cue -> image) during seeking process.



Ed H Chi, Peter Pirolli, Kim Chen et James Pitkow.

*Using information scent to model user information needs and actions and the Web.*

In Proceedings of the SIGCHI conference on Human factors in computing systems, pages 490–497. ACM, 2001.



Faidon Loumakis, Simone Stumpf et David Grayson.

*This image smells good: effects of image information scent in search engine results pages.*

In Proceedings of the 20th ACM international conference on Information and knowledge management, pages 475–484. ACM, 2011.



Peter Pirolli et Stuart Card.

*Information foraging.*

Psychological review, vol. 106, no. 4, page 643, 1999.