Effects of Foraging in Personalized Content-based Image Recommendation

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MOTIVATION

- 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 1: 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**.

BACKGROUND

- Attentive Collaborative Filtering (ACF) [Chen et al. 2017]
  - 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.

OUR APPROACH

- 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.
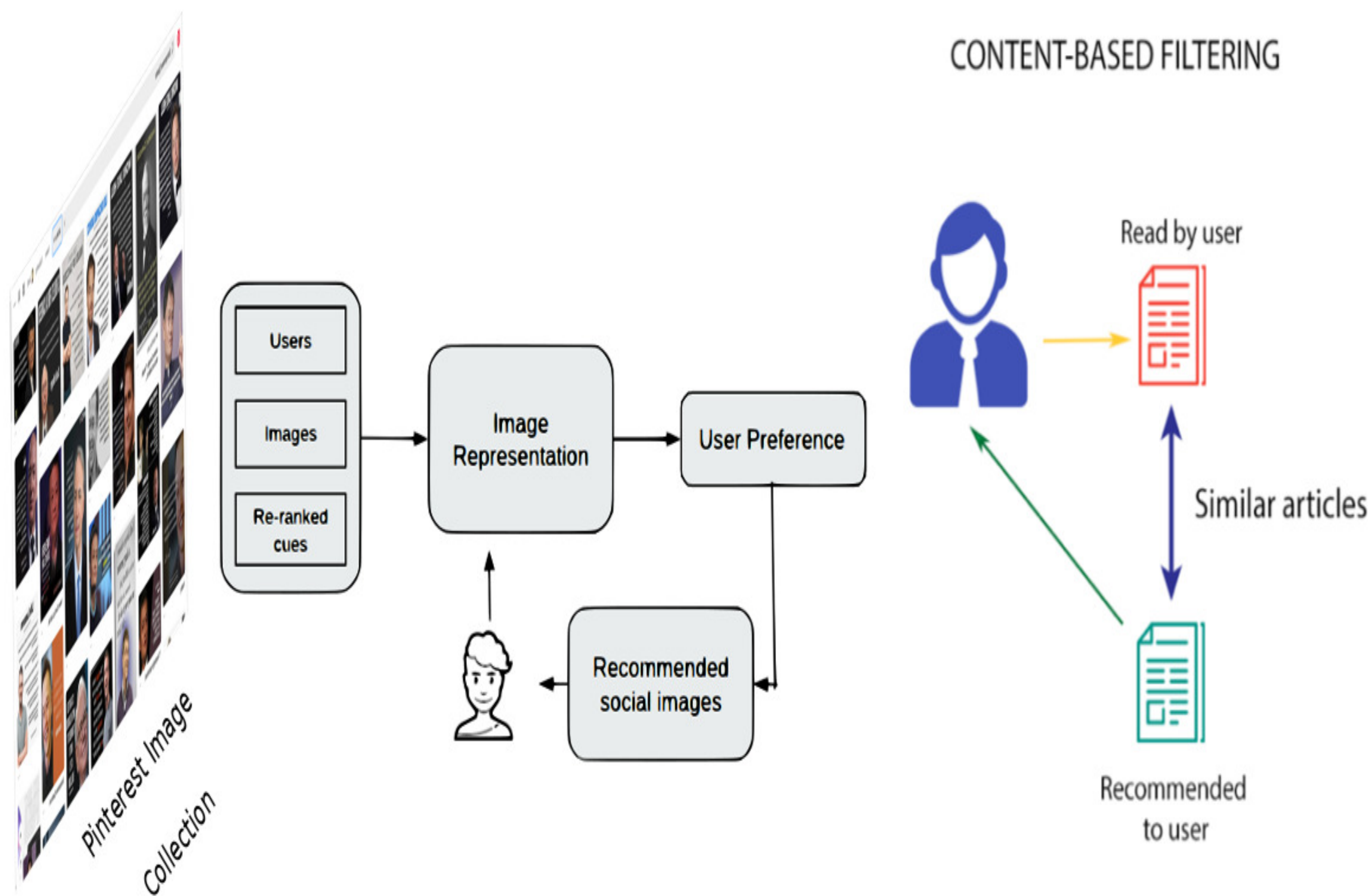 - Behavioural effects: The influence on the selection of interesting items.

Figure 2: The schematic architecture of Personalized Image RecSys

ADVANTAGES

- Information Foraging Theory for personalized content-based image recommendation
  - To illustrate how **users' exploit visual bookmarks**.
  - To help users' in locating valuable items by **reinforcing user attention**.
  - To illustrate foraging intervention which can be used for **explainable recommendation**.

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- "Attentive collaborative filtering: Multimedia recommendation with item-and component-level attention", Chen et al. 2017
- "Information foraging", Pirolli 1999
- "Using shortlists to support decision making and improve recommender system performance", Schnabel et al. 2016
- "This image smells good: effects of image information scent in search engine results pages", Loumakis et al. 2011
- "Using information scent to model user information needs and actions and the Web", Chi et al. 2001

CONTRIBUTIONS

- Information Foraging Theory 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.

PERSONALIZED CONTENT-BASED IMAGE RECOMMENDATION SYSTEM

Figure 3: Personalized Search Recommendation Interface

INFORMATION FORAGING THEORY
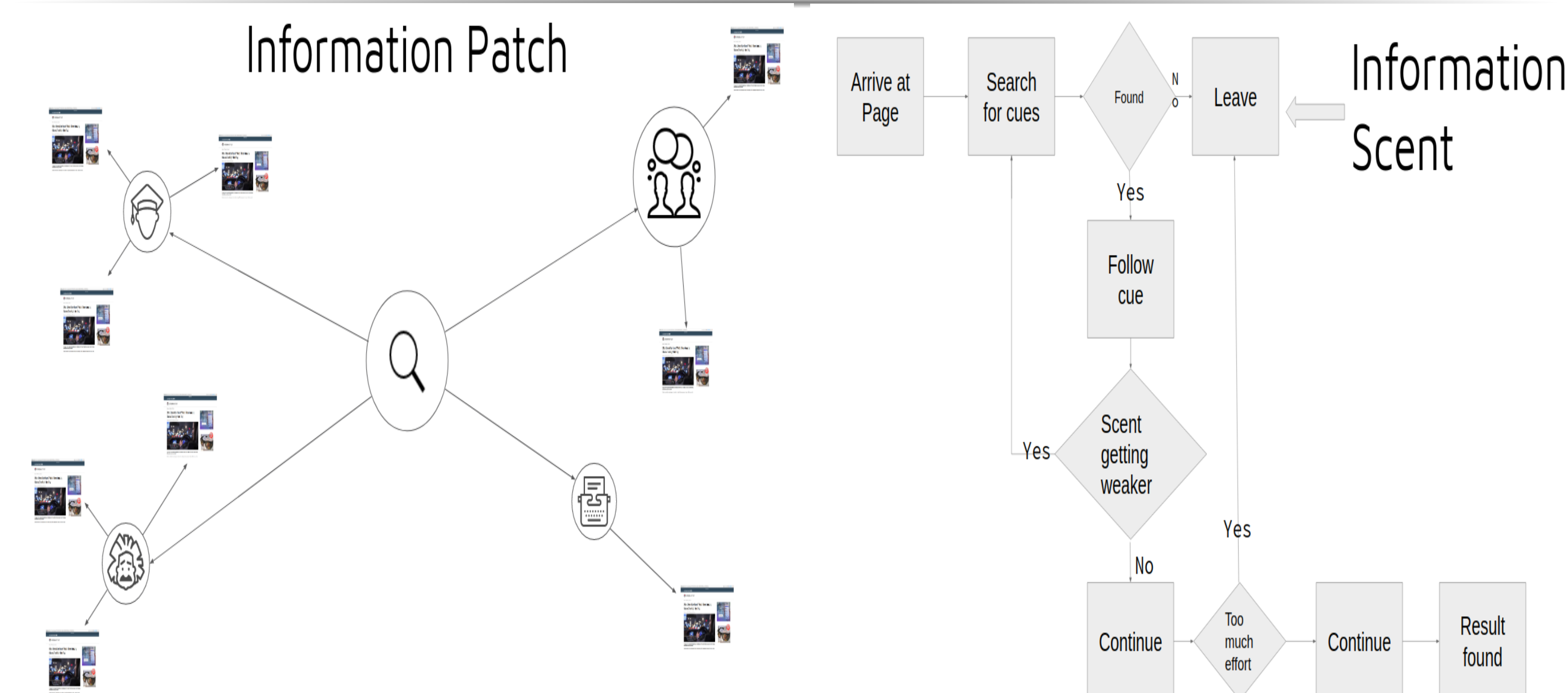
DATASET

The dataset is composed of 1116 images with pins collected from Pinterest.com. The image collection is of two food categories which includes *Spaghetti Bolognese* and *Zoodles*.

RESULTS: INFORMATION SCENT OF USER PREFERENCES

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

CONCLUSIONS

- 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 et al. 2011] becomes **stronger when adding cues**.
- Foraging-based observation shows that users more likely to **adopt visual bookmarks (visual cues)** with little effort by hovering over recommended images instead of memorising the items themselves [Schnabel et al. 2016].

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