

Information Foraging for Enhancing Implicit Feedback in Content-based Image Recommendation

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QUARTZ

Quantum Information Access and Retrieval Theory

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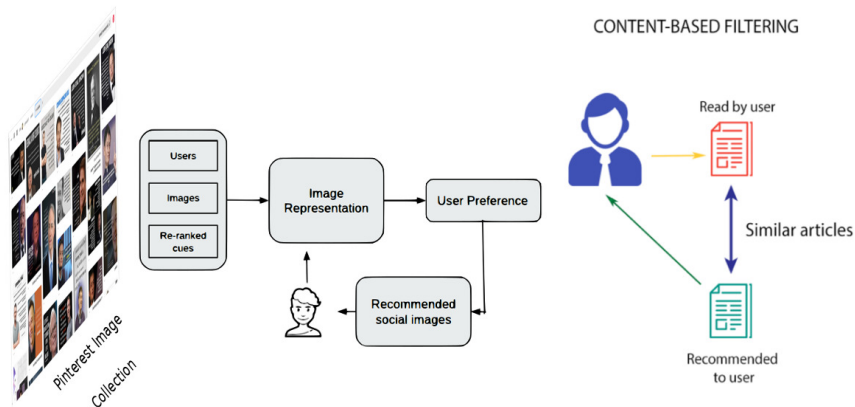
Goal: Identifying users' preferences via implicit behavioural signals for Content-based Image Recommendation to effectuate the information seeking process.

Implicit Feature Detection Task: Consider a binary prediction task of recommended images with user interested in as “1” and uninterested as “0” delineating implicit behavioural signals.

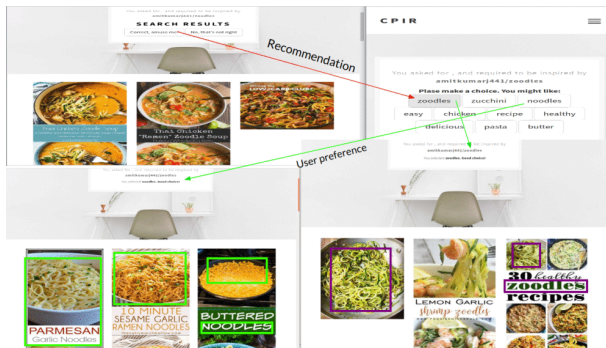
Information Foraging strategy that

- Magnifies implicit feedback when user pick their interesting images traced via visual cues.
- Provides an information scent model to evaluate the strength of implicit behavioural signals (or visual cues) for user-item interaction relevance.
- Generalise the presentation context of a content (i.e., an image) with the help of information scent-driven implicit features.

A pictorial representation of Content-based Image RecSys [Jaiswal 2019]:



The schematic architecture of Content-based Image RecSys [Jaiswal 2019]:



Implicit Feedback Signals:

- **Hypothesis:** User perception can be enriched via visual cues in the images.
- Cues allow searchers to assess information contents and navigate between information spaces as per their information scent.
- Cues usually delineated by web elements that act as a visible representation of users' mental beliefs.
- Cues provide information scent by means of user preferences to reconstruct searchers' internal mental representation.
- Searchers can gain different information scent from similar cues.

Information Foraging Theory

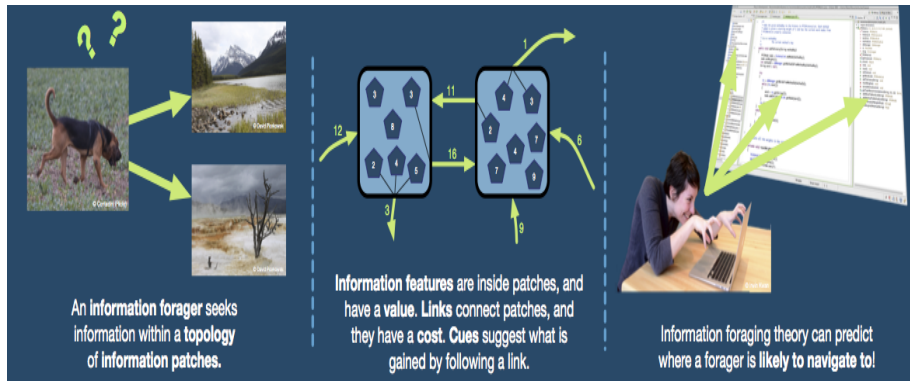
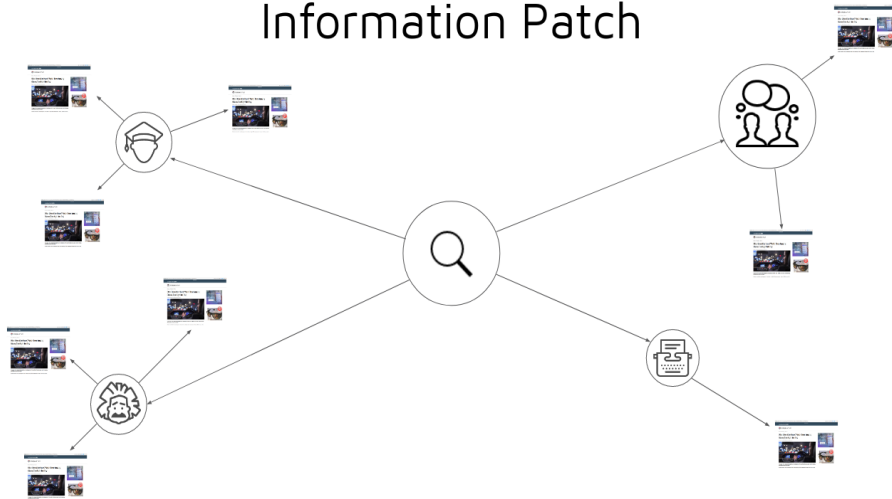
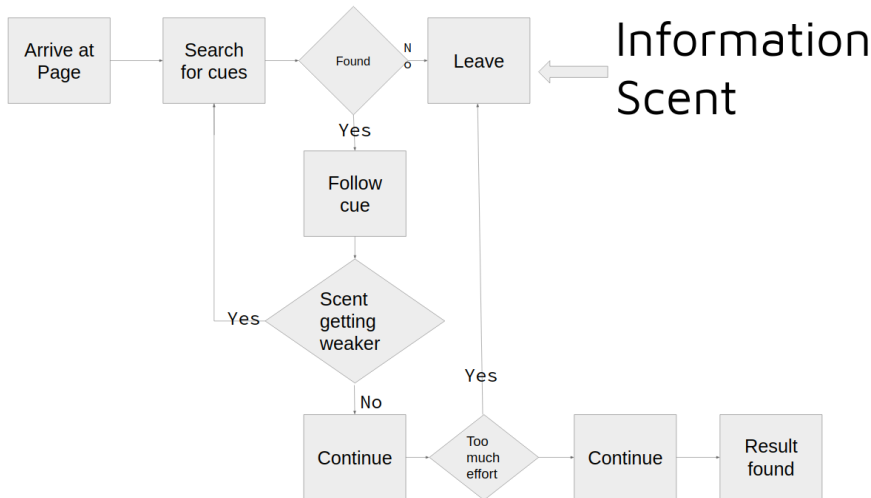


Figure: From left to right: Foraging, Information Patch and Information Scent
Source: Irwin Kwan

Information Patch

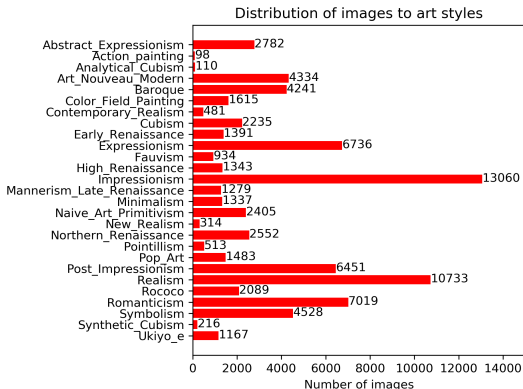




Datasets

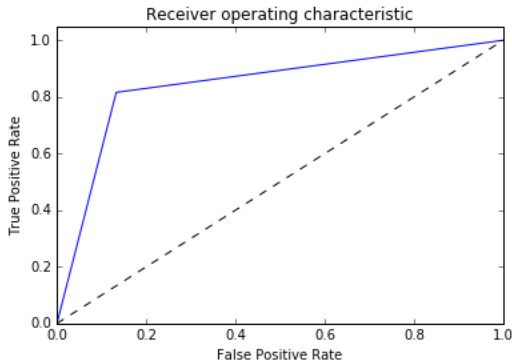
- The dataset is composed of 1,116 images with pins collected from Pinterest.com. The image collection is of two food categories which includes **Spaghetti Bolognese and Zoodles**.
- A small subset of images from the WikiArt dataset [Saleh 2015] where 1k images as train set and approximately 500 images as test set from over ten different categories which are abstract_painting, cityscape, genre_painting, illustration, landscape, nude_painting, portrait, religious_painting, sketch_and_study, and still_life.

WikiArt Dataset



Classification Report

Model Class		Pinterest Collection						WikiArt Dataset		
		GS-SVM			GS-Random Forest			XGBoost		
		Scores								
		Precision	Recall	F1	Precision	Recall	F1	Precision	Recall	F1
uninterested (0)		0.77	0.85	0.81	0.80	0.89	0.84	0.81	0.62	0.70
interested (1)		0.81	0.70	0.75	0.85	0.74	0.79	0.47	0.53	0.50



We proposed an Information Foraging-based [Pirolli 1999, Pirolli 2007] strategy to find implicit features during user-item interaction scenario in Content-based Image RecSys.

- Visual cues can be incorporated to recommend images which reinforces user interest [Jaiswal 2019].
- Image features such as shapes and colors in artwork collection significantly increase (decrease) the performance of information scent artifacts.

Thank You!

**Shoot me an email if you have any questions/suggestions at
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Amit Kumar Jaiswal, Haiming Liu et Ingo Frommholz.
Effects of Foraging in Personalized Content-based Image Recommendation.
arXiv preprint arXiv:1907.00483, 2019.



Peter Pirolli et Stuart Card.
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Psychological review, vol. 106, no. 4, page 643, 1999.



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Information foraging theory: Adaptive interaction with information.
Oxford University Press, 2007.



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Large-scale classification of fine-art paintings: Learning the right metric on the right feature.
arXiv preprint arXiv:1505.00855, 2015.