



Capturing User Relevance

Implicit Feedback techniques

Implicit Feedback

- ▶ Feedback information is derived implicitly by the system.
 - ▶ consists of observations of user behavior during normal interaction.
 - ▶ requires no extra work on the part of the user
 - ▶ avoids the lack of interest issues of explicit RF.
- ▶ Limitations:
 - ▶ “noisier” as it does not have explicit RF labels
 - ▶ the user’s judgments at best can be inferred only.

Implicit Feedback

- ▶ Derived based on –
 - ▶ Clickthrough data
 - ▶ User Query history
 - ▶ User's entire history
 - ▶ Reading time
 - ▶ Eye tracking

Click based Relevance Feedback

- ▶ Most suitable for Search Engine users, site search etc.
- ▶ Search engines use clickstream datasets to show
 - ▶ where a user has searched for a term,
 - ▶ when they have clicked on it
 - ▶ if they go back to searching after this.
- ▶ Websites use clickstream data to show
 - ▶ how a user progressed from an initial search landing page to buying an item or service.

Click based Relevance Feedback - Issues

- ▶ User may have stop clicking because info need has been met
 - ▶ Non-click is not indicative of non-relevancy.
- ▶ User may click on the top-k results simply because of trust in the search engine.
 - ▶ Indicates trust bias, not relevance judgement.
- ▶ User may get side-tracked and may click an unrelated results, simply because it looks interesting

Click based Relevance Feedback - Issues

- User may omit possibly relevant results because the source is not popular/authoritative.



web search

<https://www.startpage.com> ::

Startpage - Private Search Engine. No Tracking. No Search ...

Search and browse the internet without being tracked or targeted. Startpage is the world's most private search engine. Use Startpage to protect your ...

https://en.wikipedia.org/wiki/Search_engine ::

Search engine - Wikipedia

A search engine is a software system designed to carry out web searches. They search the World Wide Web in a systematic way for particular information ...

https://www.google.com/intl/en_in/howsearchworks ::

Discover how Google Search works

Wondering how Google Search works? Learn how Google looks through and organises all the information on the Internet to give you the most useful and relevant ...

Click based Relevance Feedback - Issues

- ▶ User clicks a web result based on the snippet that is presented
- ▶ Click actually judges the snippet rather than the document itself.

sallysbakingaddiction.com › chewy-chocolate-chip-coo... ▾

Chewy Chocolate Chip Cookies Recipe | Sally's Baking ...



13 May 2013 - These soft and chewy chocolate chip cookies are the most popular recipe on my website! Melted butter and an extra egg yolk guarantee a ...

★★★★★ Rating: 4.9 - 306 reviews - 3 hrs 22 mins

www.bakingmad.com › recipe › copycat-millie-s-cookies ▾

Copycat Chocolate Chip Millie's Cookies Recipe | How to ...



Whether you're a peanut butter cookie or choc-chip cookie fan, we have the perfect recipe for you. Try our cookie recipes and let us know how they go.

★★★★★ Rating: 5 - 287 reviews - 27 mins

tasty.co › recipe › the-best-chewy-chocolate-chip-cookies ▾

The Best Chewy Chocolate Chip Cookies Recipe by Tasty



These cookies are decadent, chewy, and oh so delicious! I used light brown sugar and salted butter. I highly recommend this recipe to any chocolate chip cookie ...

★★★★★ Rating: 94% - 25,760 votes - 1 hr 5 mins - Calories: 273

User Query History based RF

- ▶ Uses observations of the user's history of query submissions.
 - ▶ includes reformulations, or query rewrites
 - ▶ can be used to infer the user's dissatisfaction with the results returned for the original formulation.
 - ▶ An examination of the queries that immediately preceded a query can also be an indication of the user's interest
 - ▶ can be used to disambiguate queries that have meanings in multiple domains.

User Query History based RF

- ▶ E.g. a query “Java”, could refer to
 - ▶ Coffee
 - ▶ the Indonesian island
 - ▶ the programming language
- knowing that one of the previous queries was “C++”, another programming language would help pinpoint the context of this query.

User's Entire History based RF

- ▶ Observations on all information created, copied, or viewed by the user are collected for personalization
- ▶ includes everything from--
 - ▶ webpages viewed
 - ▶ Emails
 - ▶ calendar items
 - ▶ Documents in the user's file system.
- ▶ may be used to infer relevance judgments.

User's Entire History based RF

- ▶ Focus is on re-ranking the top search results locally.
 - ▶ ensures privacy
 - ▶ Not feasible to work on the big set of results returned by search engines
 - ▶ Re-ranking can be evaluated well using other methods.
- ▶ *Methods used:* Modified BM25 probabilistic weighting, Fuzzy ranking etc

Reading Time based RF

- ▶ Uses observations of the amount of time a user spends on each result.
 - ▶ Assumption: a user would spend more time on more relevant results.
- ▶ Not conclusively proved yet
 - ▶ Several researchers proved that this quantity correlates positively with the user's interest, while several more have refuted this claim!

Eye tracking based Relevance Feedback

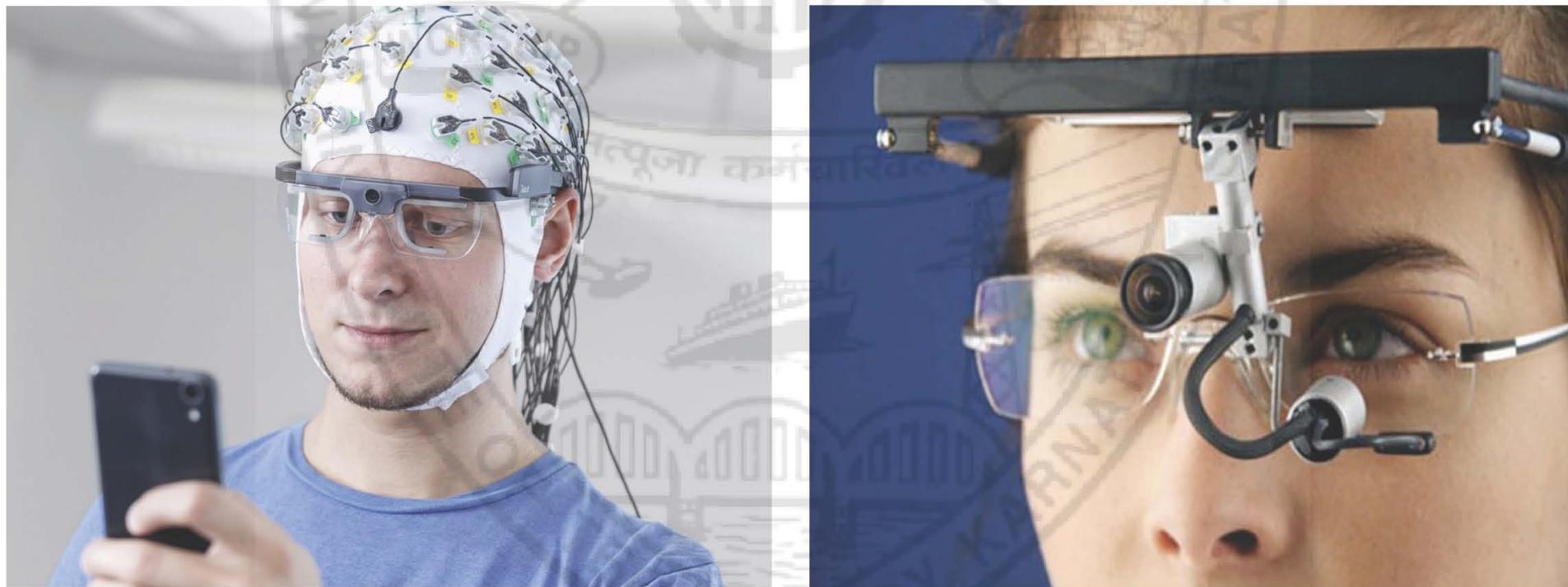


Eye tracking based Relevance Feedback

- ▶ Capture user behaviour using eye tracking devices
 - ▶ can be used to determine the area of the screen the user is focused on
 - ▶ allows correctly detecting user's area of interest in 60-90% of the cases
- ▶ Used for variety of purposes –
 - ▶ Placement of important information (images, revenue ads etc)
 - ▶ Prediction of user's topics of interest.
 - ▶

Eye tracking based Relevance Feedback

- ▶ Examples



Eye tracking based Relevance Feedback

► Examples



Eye tracking based Relevance Feedback

- ▶ Examples



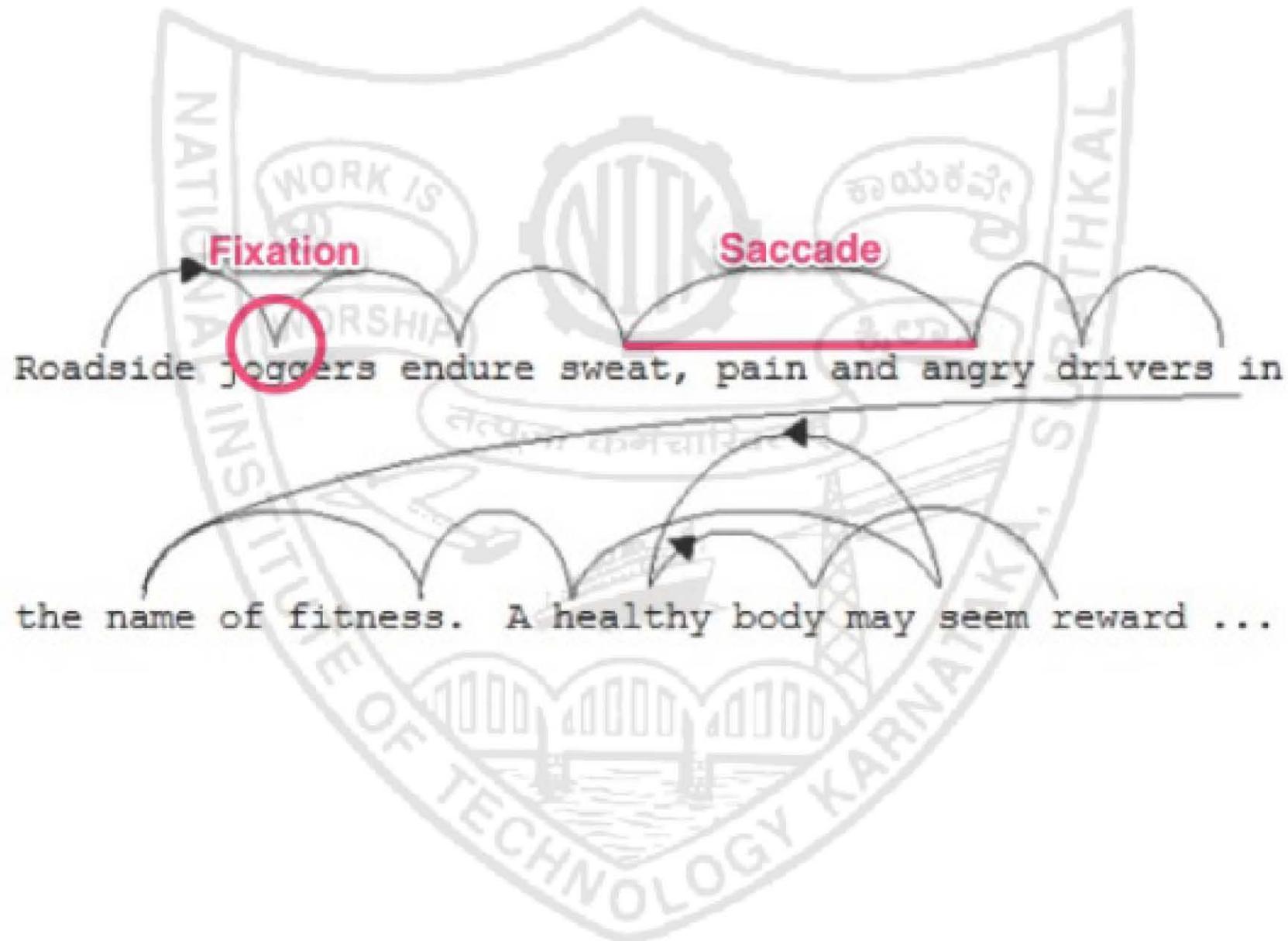
Eye tracking based Relevance Feedback (contd.)

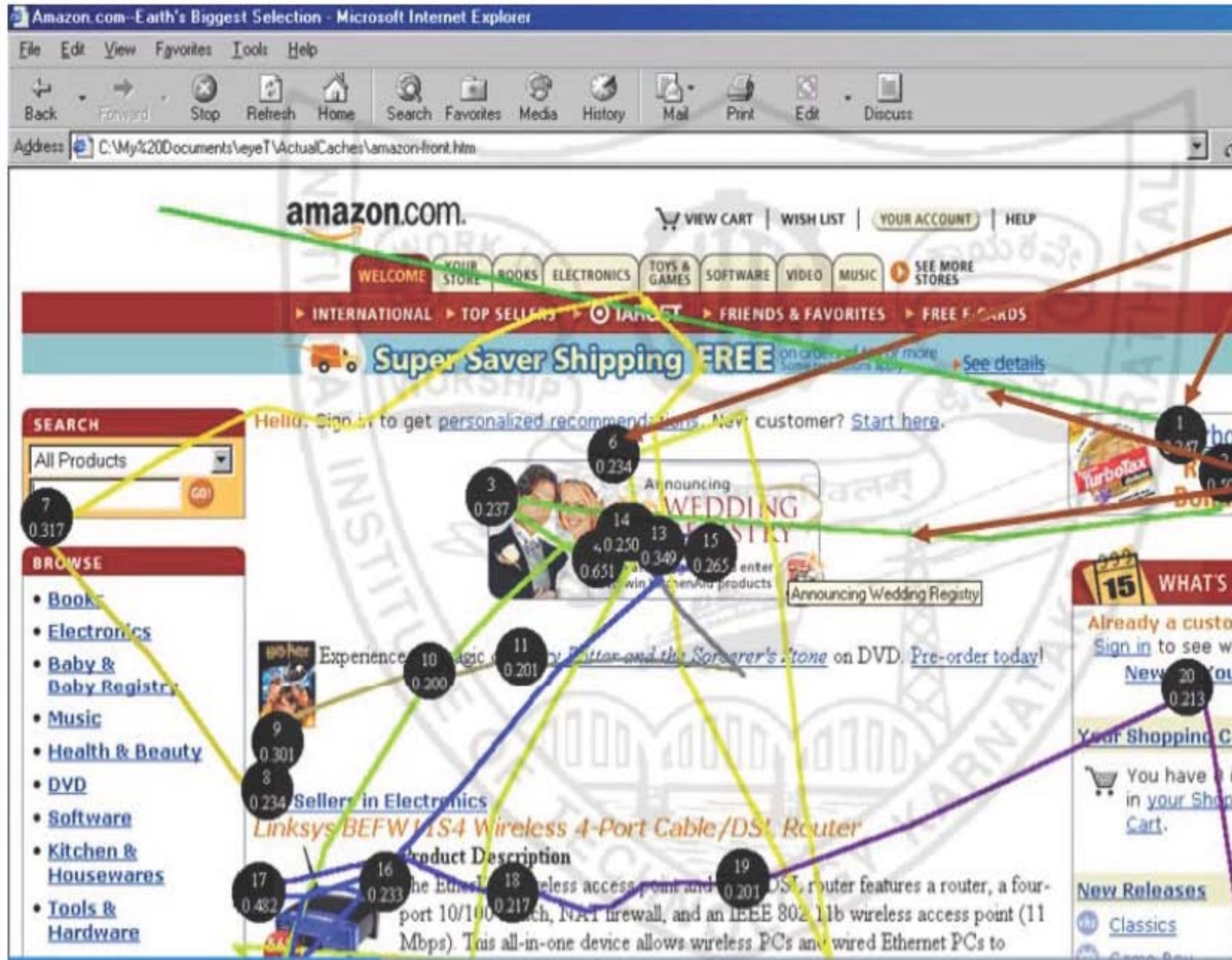
- ▶ Eye movements can be classified in four types:
 - ▶ Fixations
 - ▶ Saccades
 - ▶ Pupil dilation
 - ▶ Scan paths

Eye tracking based Relevance Feedback (contd.)

- ▶ Eye movements can be classified in four types:
 - ▶ Fixations
 - ▶ Intensive information processing during fixations (200-300ms), indicates **focused attention**
 - ▶ Saccades
 - ▶ Indication of **change of attention**, often due to involuntary change in object of interest.
 - ▶ Pupil dilation
 - ▶ **Increase/decrease in interest**
 - ▶ Scan paths

Eye tracking based Relevance Feedback (contd.)





Analytics -- Gaze Plot



Analytics -- Heatmap



Analytics -- Opacity Map



Analytics -- Areas of Interest Map

The screenshot shows a portion of an Apple website with a dark header bar containing links for Mac, iPad, iPhone, Watch, TV, Music, Support, a search icon, and a shopping cart icon.

The main content area features two iPhone 6s phones (one black, one rose gold) displayed prominently. To the right of the phones, the text "iPhone 6s" and "The only thing that's changed is everything." is visible. Below this, a red button contains the text "21%" and "Learn more > Trade up to a new iPhone >".

At the bottom of the page, there are four promotional boxes with red borders:

- 98% WATCH**
To wear it is to love it.
- 23% iPad Pro**
Thin. Light. Epic.
- 21%**
Better together.
Shop our collection of curated accessories.
- 22%**
An important message to our customers.

Analytics on Fixation Data

▶ **Visibility Score**

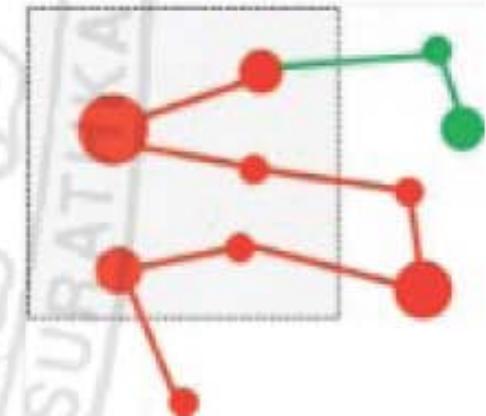
- ▶ percentage of participants that fixated at least once within an AOI
- ▶ calculated based on the highest heatmap value found inside the AOI region.
 - ▶ Also referred to as "Participant percentage" and "Seen By (%)"



Analytics on Fixation Data

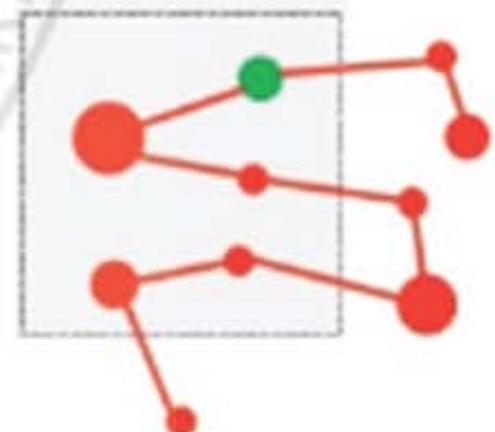
▶ Fixations Before

- ▶ number of fixations before the participant fixated within an AOI for the first time.



▶ Time To First Fixation (milliseconds)

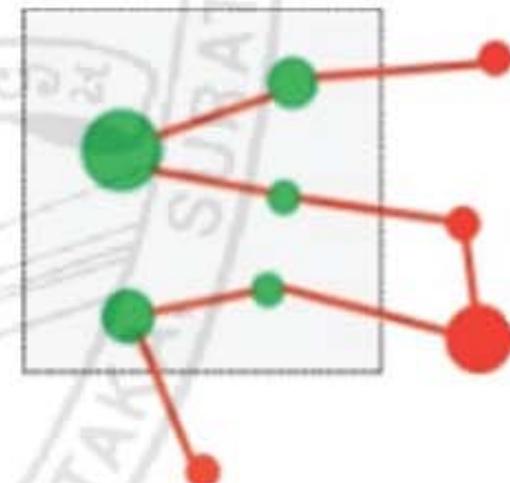
- ▶ From when the stimulus was shown until the start of the first fixation within an Area Of Interest (AOI).
- ▶ Also referred to as "Time Until Noticed"



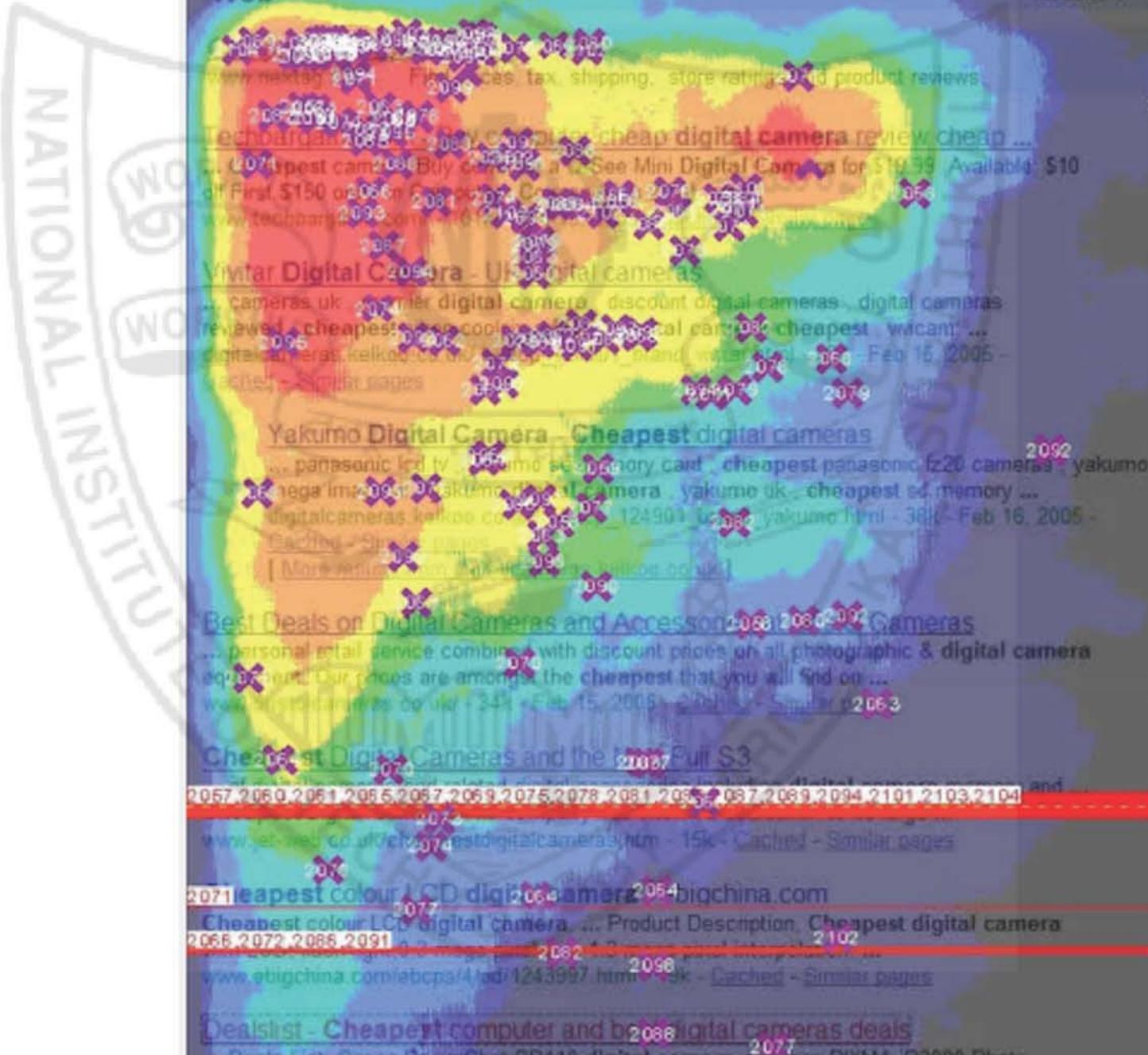
Analytics on Fixation Data

- ▶ **Fixation Count**
 - ▶ the number of fixations within an AOI.

- ▶ **Fixation Length (milliseconds)**
 - ▶ The length of the fixations in milliseconds within an AOI.



Google Search in 2005



During 2005
to 2015



Since 2015

All

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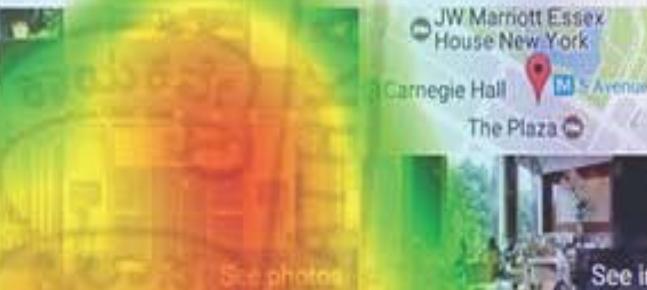
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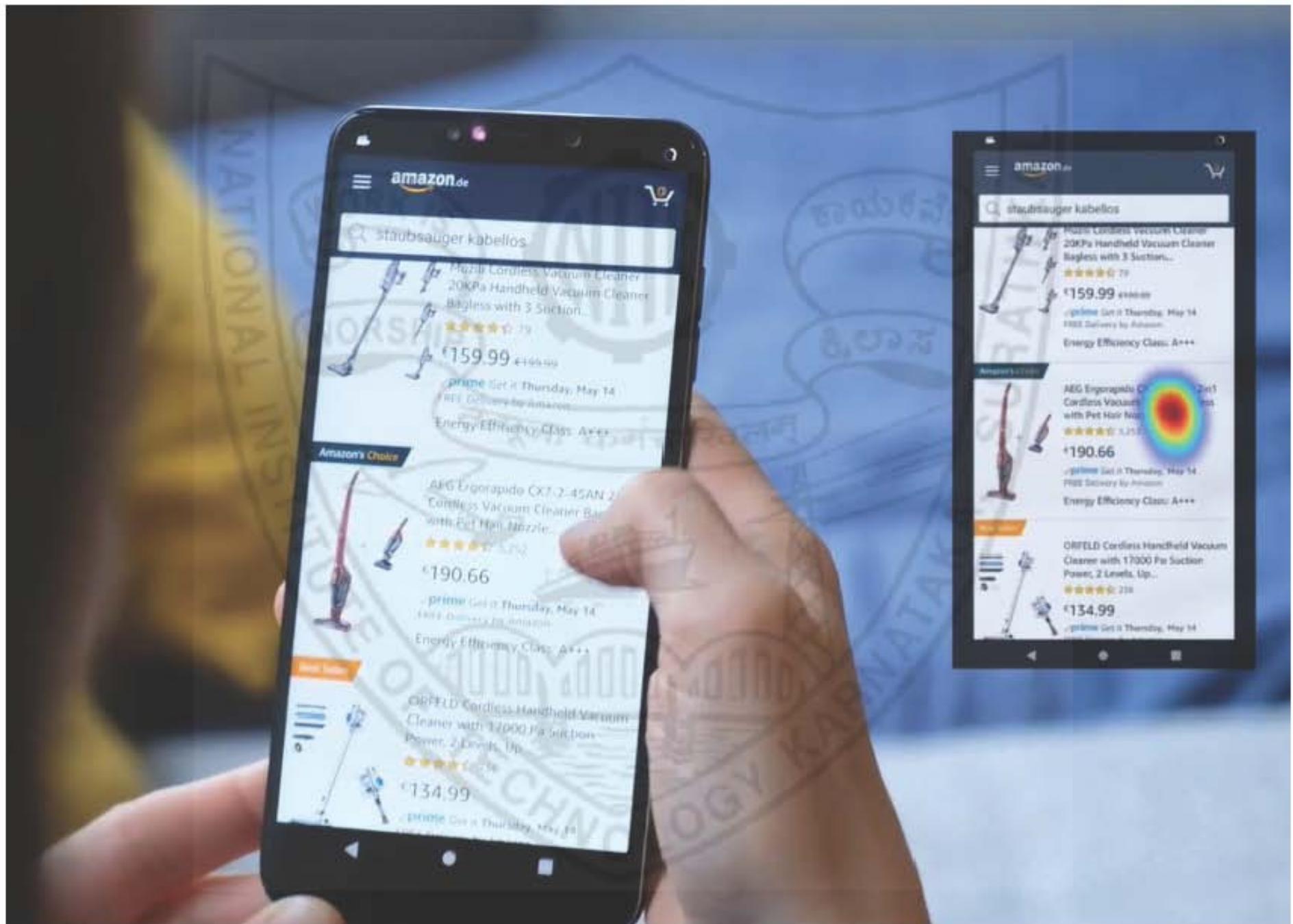
 Hotels.com New York

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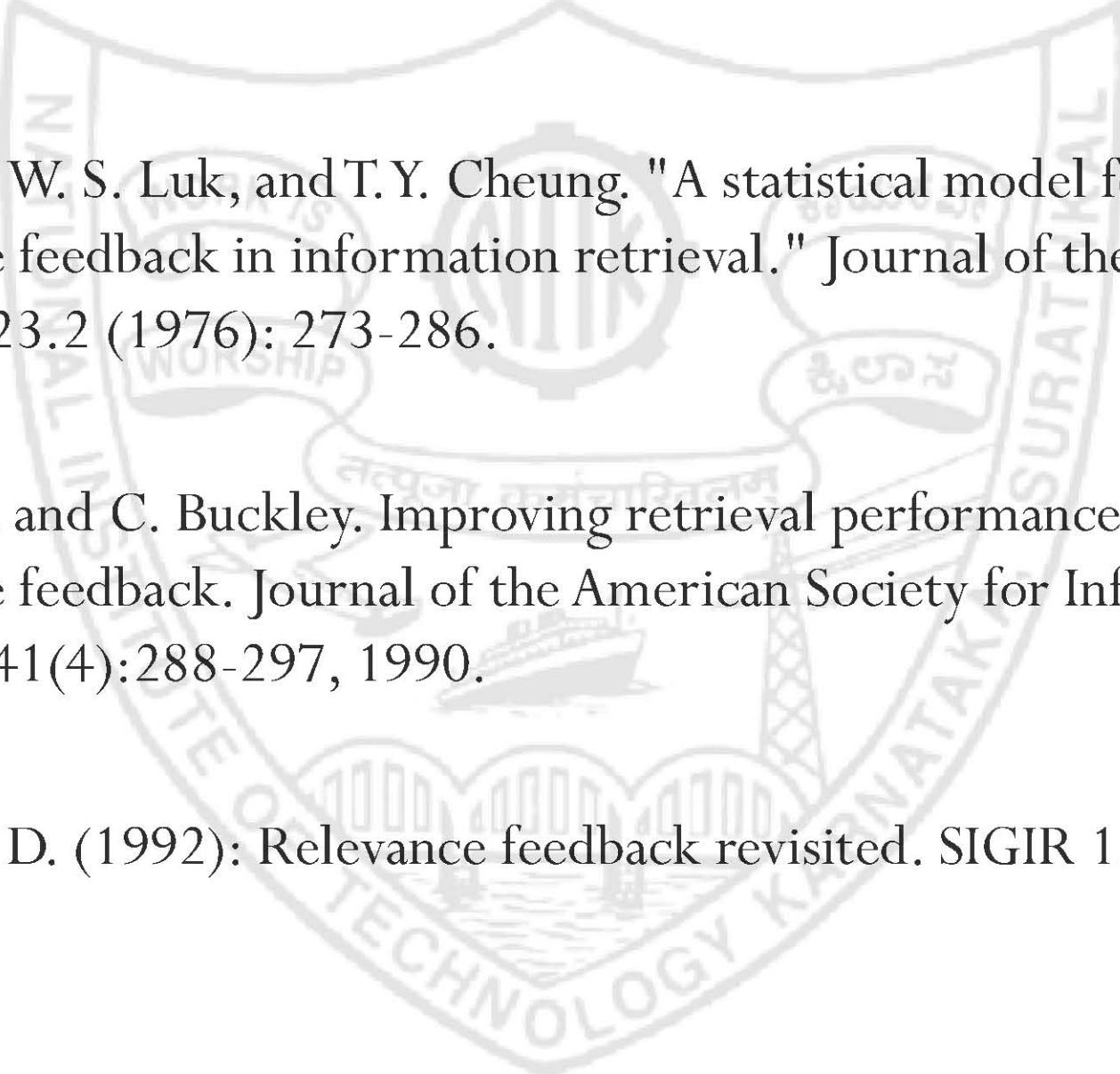
Recent developments



Eye tracking based Relevance Feedback (contd.)

- ▶ Eye tracking experiments have shown that
 - ▶ users typically scan results from top to bottom in very few fixations.
 - ▶ users inspect the first and second results right away, within the second or third fixation.
 - ▶ Users tend to scan the top 5 or top 6 answers thoroughly, before scrolling down to see other answers
 - ▶ Additional background information is also crucial.

Further Reading

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- ▶ Yu, C. T., W. S. Luk, and T.Y. Cheung. "A statistical model for relevance feedback in information retrieval." *Journal of the ACM (JACM)* 23.2 (1976): 273-286.
 - ▶ G. Salton and C. Buckley. Improving retrieval performance by relevance feedback. *Journal of the American Society for Information Science*, 41(4):288-297, 1990.
 - ▶ Harman, D. (1992): Relevance feedback revisited. *SIGIR* 15: 1-10
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- ▶ Dr. Sowmya Kamath S, Dept of IT, NITK Surathkal
 - 18-Oct-22