A Study on Effective Measurement of Search Results from Search Engines

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ABSTRACT

This article describes how as internet technology continues to change and improve lives and societies worldwide, effective global information management becomes increasingly critical, and effective Internet information retrieval systems become more and more significant in providing Internet users worldwide with accurate and complete information. Search engine evaluation is an important research field as search engines directly determine the quality of information users’ Internet searches. Relevance-decrease pattern/model plays an important role in search engine result evaluation. This research studies effective measurement of search results through investigating relevance-decrease patterns of search results from two popular search engines: Google and Bing. The findings can be applied to relevance-evaluation of search results from other information retrieval systems such as OPAC, can help make search engine evaluations more accurate and sound, and can provide global information management personnel with valuable insights.

KEYWORDS


1. INTRODUCTION

As more and more people worldwide depend on the Internet to fulfill their information needs (Khatwani & Srivastava, 2017), and as the impact of Internet on people and societies have become increasingly profound (Teo, 2007; Lane et al., 2017), researchers throughout the world have studied factors maximizing successes of information technology implementations or global information management (Roztocki & Weistroffer, 2011, Lee et al., 2014; Caprio et al., 2015; Hung et al., 2016; Silic & Back, 2016; Soja, 2016; Chatterjee et al., 2017). One such technological implementation is the employment of search engines. Because of the critical role search engines play in bridging Internet information resources and information users, it is particularly important to evaluate effectiveness of search engines through effective measurements of their search results, as different search engines utilize different retrieval and ranking algorithms and therefore respond to search queries with different search results.

Average Internet searchers tend to take the search results presented by the search engines as a list of decreasing relevance, and they tend to browse only the first 20-30 items on a results list from a search engine. Moreover, business intelligence systems also seem to base many of their decisions.
on search results as returned by Internet search engines. If the most relevant results are not properly positioned on the result list, important information would be missed, and the decisions could be impaired. Therefore, precise relevance ranking of search result items as returned by search engines is extremely important.

However, because what resides on the Web is an ever-changing and extremely heterogeneous data collection (Jansen & Pooch, 2001), Web page ranking algorithms have become very complicated and dynamic (Dean 2016; Barysevich 2017). It is important to know that ranking algorithms of different search engines handle variables differently. Consequently, the degree of search result relevance varies from search engine to search engine. Ideally, if all returned items are ranked in terms of relevance to the search query, and the ranked data are captured in a two-dimensional chart where the X-axis represents the ranked items and the Y-axis represents the relevance score, then a decline curve appears. Understanding the downward curve is critical to evaluating the quality of search results because the downward curve serves as a yardstick in measuring relevance of search results of a search engine.

The primary purpose of this study is to explore effective measurement of search results from search engines through investigating relevance-decrease patterns of search results from two major search engines: Google and Bing. To accomplish the purpose, 4 domain categories were defined, and 24 search queries with 6 from each category were formulated and submitted to both Google and Bing. Retrieved results were then collected, and their relevance was judged by 32 subjects independently. A group of possible regression models were developed for regression analysis, and the performances of the regression models were tested. The best-fit regression model was identified through ANOVA analyses. The findings of this study help people better understand the relevance-decrease patterns of search results produced by search engines. The best-fit regression model identified in this study provides a way for people to evaluate search result relevance of search engines.

2. RELATED RESEARCH

2.1. Importance of Search Engines

The Web has become a primary source of information due to the continued development of information and communication technology. It was reported that there were over 2.9 billion Internet users all over the world in 2014 (Internet live stats, 2015http://www.internetlivestats.com/internet-users/). Because of the richness and diversity of Web information (Zhang & Fei, 2010), it has become more and more challenging to efficiently and effectively search and find the needed information on the Internet. Fortunately, we have search engines to tackle this problem. Search engines have become the primary means in retrieving Web information. It was reported that over 91% of Internet users used search engines to find Web information and 54% of them were loyal users (who used search engines at least once a day) (Purcell, 2012). According to a more recent study (comScore, 2015), the top three search engines in use today are Google, Bing, and Yahoo, with respective market shares of 63.9%, 20.9%, and 12.5%, making Google and Bing the two most popular search engines in the world.

2.2. Relevant Aspects of Search Engines

The same search terms in a query constrained by different search features of a search engine such as returned result format or time period may result in different search results. Search engine interface design affects search results because the interface design has a strong impact on users’ selection of search features. Retrieval algorithm of a search engine directly determines positions of returned items on a results list and is therefore the basis of search result ranking evaluation analysis. Search engine result ranking evaluations and methods require that a clearly-defined relevance measurement method be used in judging relevance of returned items on a results list.
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