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Ranking of daily deals with concept expansion



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ABSTRACT

Daily deals have emerged in the last three years as a successful form of online advertising. The downside of this success is that users are increasingly overloaded by the many thousands of deals offered each day by dozens of deal providers and aggregators. The challenge is thus offering the right deals to the right users i.e., the relevance ranking of deals. This is the problem we address in our paper. Exploiting the characteristics of deals data, we propose a combination of a term- and a concept-based retrieval model that closes the semantic gap between queries and documents expanding both of them with category information. The method consistently outperforms state-of-the-art methods based on term-matching alone and existing approaches for ad classification and ranking.

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1. Introduction

Daily deals have become a popular advertising model in recent years. The first and to date largest company to promote a business model based on daily deals has been Groupon. Founded in 2008, Groupon has been the first company ever to reach a revenue of over 500 million dollars in its first three years of existence and in 2011 it completed the largest IPO in Internet history since Google's initial offering in 2004.¹

Soon adopted by a number of competitors, Groupon's business model is based on a novel form of advertising offered to businesses. In this model, advertisers offer significant discounts on products or services, but impose certain limitations. The offers presented are time-bound and consumers often need to make a decision within the day, hence the name daily deals. Further, the offer only becomes valid if a minimum number of buyers agree to purchase (also known as an assurance contract). Other limitations may exist e.g., the offers may be limited to particular geographies or store locations, which allows merchants to target particular markets where they face competition. Daily deals are a form of direct-response marketing, in that the results are directly measurable. From the consumers perspective, the limitations of daily deals increase the thrill of participating in a deal and favor impulse buying. This also means that daily deals are typically offered for products and services that a consumer is willing to agree to buy instantly. As in the case of coupons, daily deals are known to attract price-conscious customers.

In the original business model, the *deal provider* such as Groupon finds merchants who are willing to advertise, and helps them to formulate the creative (deal text and image). The deal provider is also responsible for finding the customers and for this it maintains a mailing list of subscribers, along with a website and mobile application where visitors can search and browse the deals. The right targeting i.e., matching the subscribers to the deals that might interest them is critical in that the advertiser does not pay in advance, but provides a revenue share; Groupon and competitive deal providers typically take

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about 50% of the revenue from the deal. Lately, a second business model is emerging as well, in which a *deal aggregator* receives data from multiple deal providers or other aggregators and shows the combined set of deals to its users. Deal aggregators work in an affiliate model, forwarding customers to the original deal provider and receiving a fixed price per click or a share of the revenue. General purpose web search engines such as Bing, Google and Yahoo also act as either deal providers, aggregators or both and show deals among their web search results.

The information retrieval problem of ranking deals is critical to the success of all participants. There is a limited space to show deals on both search engines, provider and aggregator websites and the mailing lists, and users are quickly overloaded with offers. Thus deal providers and aggregators need to find the most relevant deals to show for each user. We note that deal providers (but not aggregators) also have the allocation problem of making sure each deal gets enough users for the deals to get activated i.e., that each deal attracts enough users to at least hit the minimum number of buyers required. In this paper, we restrict ourselves to the problem of relevance ranking.

In the following, we study the problem of ranking deals from the perspective of a deal aggregator, Yahoo Deals which maintains its own website and mailing list, and integrates deals into Yahoo Search, a web search engine. For deal aggregators such as Yahoo Deals, the ranking problem is particularly acute given the (1) larger number of deals and (2) the heterogeneous collection of deals. Fig. 1 shows an example of how deal search is integrated into the user experience in web search. When the user is searching for a product, we show relevant products, buying guides as well as ways to save through deals and coupons. Selecting the top-4 deals for this display is one of the implementations of our work.

The problem of ranking daily deals as a response to a user query can be regarded as similar to that of ranking creative ads or Tweets. In fact some particular aspects of the solution we provide here could potentially be helpful in any situation in which term-sparsity is a severe issue, such as sentence, tweet or ad ranking.

There are, however, some differences that are particular for deals. First of all, deals contain metadata that hints important signals for ranking, provenance, dates in which the deal is active, location, merchant among others. Secondly, deals are textual units that should be related to a particular business category, and as such there is a precise correspondence to which deals could be surfaced to particular information needs. Deals are aggregated in a final end system through a plethora of different sources; metadata, and categorization must be reconciled first into a classification taxonomy that is well understood by the search engine. In addition, these categories might be not completely reliable so a prior classification step is mandatory. Secondly, deals have longer text than typical ads, which contain a few keywords for triggering. Language-wise, deals are written with a narrow set of words, specific per business domain, unlike text that is found in social media or micro-blogging sites (Ounis, Macdonald, Lin, & Soboroff, 2011).

To our knowledge, ours is the first paper to study the problem of ranking deals, and therefore we begin by characterizing the data and the most common retrieval tasks. In this work, we study in detail the task of ranking deals for an ad hoc query. To solve this problem, we propose a novel retrieval model that combines text-based retrieval with concept-based retrieval, in particular taxonomy-based matching. We will show that this model is particularly adept in addressing the deals ranking problem because semantic matching effectively deals with the sparsity of deal text and the resulting semantic gaps between the query intent and document content. The model also exploits some of the metadata associated with deals, in particular

The image shows a search engine interface for the query "digital cameras". At the top, there is a search bar with the text "digital cameras" and a yellow "Search" button. Below the search bar, it indicates "377,000,000 results". There are several navigation tabs: "WEB", "IMAGES", "VIDEO", "NEWS", "SHOPPING", "APPS", "BLOGS", and "MORE". The "WEB" tab is selected. Below the tabs, there are four deal cards displayed in a grid. Each card has a dark background with white and green text. The first card says "Save \$10-\$100 On Select Digital Cameras" by "Radio Shack". The second card says "Save 20-50% On Digital Cameras" by "Geeks.com". The third card says "\$15 off Olympus Stylus 5010 14MP digital camera" by "Mertado" with a code "Code: STYLUS15". The fourth card says "10-40% Off on Select Digital Cameras" by "Shopko".

Fig. 1. Integration of deals retrieval in a web search engine.

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