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Automatic Insertion of Hot Keywords to Drive Traffic on Advertisements

ABSTRACT

Product titles and descriptions that include appropriate keywords, when used in an online advertisement, can improve the shopping feed quality and resultant traffic to the advertiser. However, online merchants lack knowledge of currently trending or popular keywords, and lacking keyword ideation, may choose suboptimal product titles. This disclosure describes techniques that enable online merchants to automatically optimize product titles or descriptions, e.g., as used in online ads. Trending or popular keywords relevant to the product are automatically added to the product title or description. Unique, product-specific insights gleaned from searched terms are utilized to improve title effectiveness automatically and at scale.

KEYWORDS

- Hot keyword
- Product title
- Product description
- Title optimization
- Shopping feed
- Entity detection

- Keyword mapping
- Difference-in-Difference
- A/B testing
- Causal impact testing
- Shadow product

BACKGROUND

Product titles and descriptions that include appropriate keywords, when used in an online advertisement, can improve the shopping feed quality and resultant traffic to the advertiser. Optimally, the information in an ad is comprehensive yet compact to capture user attention. Businesses that utilize online advertising, e.g., online merchants, often have little knowledge of users' search behavior, e.g.,

currently trending or popular keywords, etc. Lacking keyword ideation, the product title chosen for an advertisement can be suboptimal, e.g., keywords included in the product title in an advertisement often fail to match user queries.

Moreover, even if an advertising network, e.g., operated by a search engine or other advertising provider, provides a merchant with user queries or search behaviors (in compliance with data-sharing policies), it is impractical for the merchant to change product titles or descriptions for products in their inventory (which may run into a very large number, e.g., hundreds of thousands of products) based on the provided user queries and search behaviors.

Existing techniques to amplify the impact of an online advertisement include provision of guidelines and best practices to the advertiser such that they can optimize the title and product description. Best practices are not automatic and do not scale well. Besides, best practices are often too general and unrelated to the actual performance of ads. Guidelines do not actually provide keywords, while the ask from the merchant is for specific, product-related, or impactful keywords to insert into an advertisement, e.g., as part of the product title.

Guidelines often suggest adding as many attributes or keywords as possible to the title; if such guidance is followed too literally, the resulting content can include clunky, even unattractive titles. Guidelines only recommend the title structure, not actual titles, whereas most

advertisers already have title patterns in use, e.g., sourced from their operations or copywriter teams. Recommendations on title structure by vertical, e.g., "brand + gender + product type + attributes" do not provide additional valuable information to the advertisers. Guidelines only deliver insights or suggestions and do not solve the problem of optimizing shopping titles on a large scale.

Existing fashion-concept discovery techniques cluster product attributes into multiple groups to form concepts, e.g., the concept "neckline" may be determined to comprise attributes like V-neck, round-neck, etc. Although such techniques can be applied in attribute-feedback or product retrieval tasks, the problem of enriching existing product titles is not addressed.

DESCRIPTION

This disclosure describes techniques to enable online merchants to generate better descriptions for their products by obtaining search data with user permission and leveraging the data to improve the descriptions. For example, hot keywords (e.g., trending or popular keywords) that are relevant to a product are automatically added to the product title or description. The techniques automatically detect the product being sold and the relevance of a given keyword to the product, even when there are no keyword synonyms in the original title.

Fig. 1: An image of a product (a dress)

For example, given an image of a product as illustrated in Fig. 1, the original title as provided by the merchant and as amplified by the described techniques are as follows:
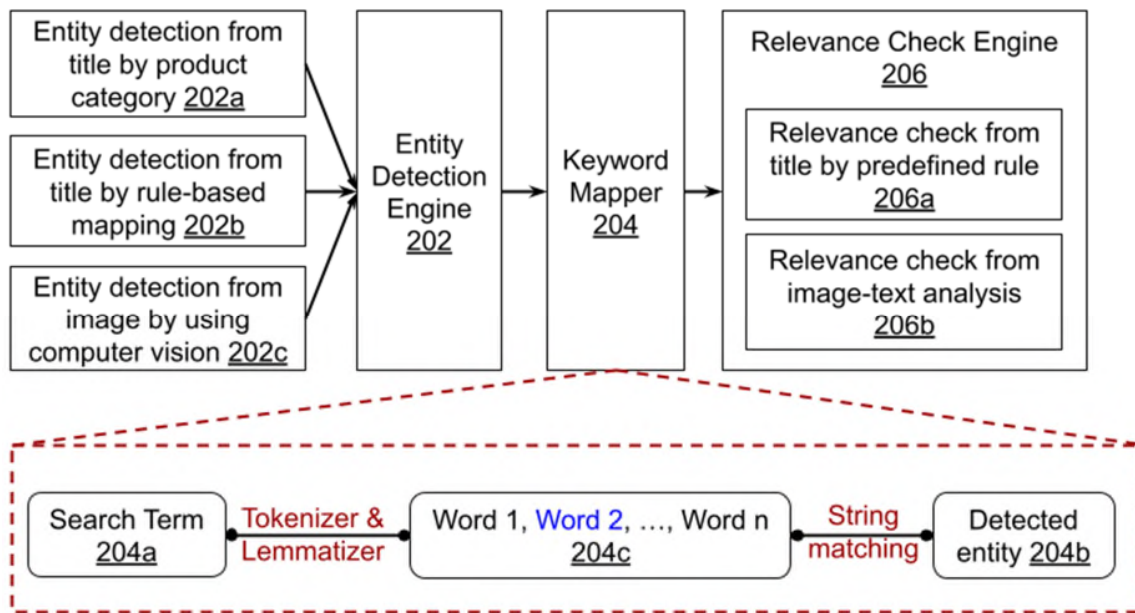
Original title: "floral shirred neck drawstring dress lime green by Brandname"

Amplified title: "floral shirred neck drawstring *long sleeve maxi* dress lime green by Brandname"

While the original title includes the pattern, the neckline, the size, the color, and the brand, the automatically amplified title adds the sleeve length and the dress length (shown in italics for

emphasis, but appearing in uniform font in the actual ad) by leveraging the observation that

sleeve length and dress length are parameters that are specified in high volumes in user searches.

Architecture

Fig. 2: Automatic insertion of hot keywords to drive ad traffic

Fig. 2 illustrates the automatic insertion of hot keywords to drive ad traffic, per the

techniques of this disclosure. An entity detection engine (202) detects an entity, e.g., the larger

category, within a given ad. For example, given the example of Fig. 1 - "floral shirred neck

drawstring dress lime green by Brandname" - the detected entity can be "dress." Similarly, a title

"flap pocket front drip shoulder curved hem tartan coat XS regular fit" may result in a detected

entity "coat." The entity detection engine can use one or more of the following techniques,

applicable to the product title and/or image, to detect the entity:

- Based on the title, the entity can be retrieved from default product category information

  available in online databases (202a).

- Based on the title, the entity can be retrieved by predefined rule-based mapping (202b). An example predefined rule can be to declare the entity as "bikini" when the title includes the phrase "bikini."

- Considering that an image is typically a dominant part of the ad, computer vision techniques can be used to extract the entity from the image (202c).

Each of the above techniques identify candidate entities, which are combined and ordered by frequency. The highest frequency word is chosen as the detected entity.

A keyword mapper (204) accepts as input search terms (204a) after tokenization and lemmatization, and, by comparing with the detected entity (204b) using string matching, puts out hot keywords (204c) that can be used in an ad title or description.

A relevance check engine (206) tests the keywords generated by the key mapper for relevance to the ad. For example, a keyword "red" for an ad for a green dress is deemed irrelevant. The relevance check engine tests for relevance using one or more of the following techniques:

- Predefined rules test hot keywords produced by the keyword mapper with product attributes like color, material, style, gender, etc. and filter out mismatching keywords (206a). An example predefined rule can be to reject keywords that describe the product as "menswear" (or similar terms) when the product in the ad is actually women's wear (or similar).

- Relevance is tested using image-text analysis as follows (206b). Embeddings of images within the ad and of search-terms (keywords) are separately encoded using pre-trained machine-learning (ML) model inference. A relevance score is calculated using the dot-product (correlation) between each (image, search-term) pair. Alternatively, computer

vision techniques are leveraged to describe product images within the ad and similarity is checked between product images and lists of ranked images returned by using the search terms. The top searched terms are ranked from highest to lowest indicating the most relevant term to be inserted into the original shopping product title.

Workflow
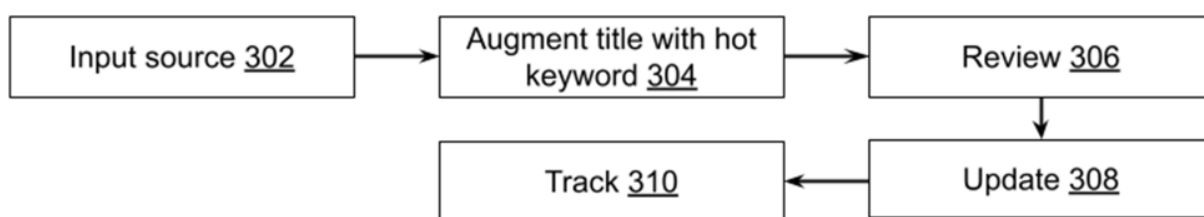
Fig. 3: Workflow

Fig. 3 illustrates an example workflow. An input source (302) provides search terms and product information. Search terms include top and rising queries from organic and non-brand searches from search engines, sites hosting user-generated content, video hosting websites, advertising networks, etc. Search terms can also include web analytics reports, which include keywords that users searched when visiting merchants' websites.

Product information includes titles, images, descriptions, impressions, clicks, etc. For example, for the product illustrated in Fig. 1, its title "floral shirred neck drawstring dress …," its image, and other attributes constitute product information input. The top search terms in the women's apparel category, e.g., "skirts, leather pants, black T-Shirts, sweater dress, white dress, long sleeve maxi dress..." constitute search term input.

The title and description of the ad is amplified with hot keywords (304). As explained earlier, product information is analyzed by an entity detection engine to detect the main entity. Candidate terms that describe the entity are obtained by comparing the entity with the list of top

search terms. In the example of the product of Fig. 1, the main entity extracted from the product image and the product title "floral shirred neck drawstring dress …" is "dress." The hot keywords, e.g., popular search terms correlated with the product, are automatically added to the title and/or description. Terms in the description that include the detected entity are tested for relevance. In the example of the product of Fig. 1, an example list to test for relevance is as follows: sweater dress, white dress, long sleeve maxi dress, etc. As explained earlier, the relevance check engine ranks entity-containing terms by relevance score. In the example of Fig. 1, the "long sleeve maxi dress" has the highest score, and it is selected to replace the original entity word "dress" to get the new title "floral shirred neck drawstring long sleeve maxi dress lime green by Brandname."

The merchant can review the amplified title for approval or rejection (306). During review, the merchant has the opportunity to check for accuracy, brand-targeting, compliance with ad policy, etc. The client-approved, amplified titles are uploaded to the ad network (308).
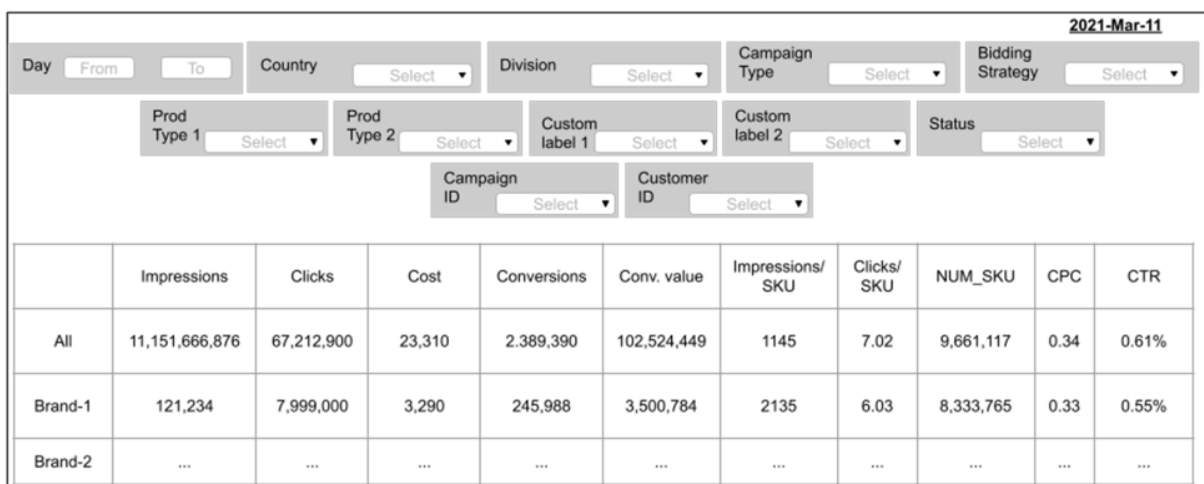
	Impressions	Clicks	Cost	Conversions	Conv. value	Impressions/ SKU	Clicks/ SKU	NUM_SKU	CPC	CTR
All	11,151,666,876	67,212,900	23,310	2.389,390	102,524,449	1145	7.02	9,661,117	0.34	0.61%
Brand-1	121,234	7,999,000	3,290	245,988	3,500,784	2135	6.03	8,333,765	0.33	0.55%
Brand-2	...	...	...	...	...	...	...	...	...	...

Fig. 4: An example performance-tracking dashboard

Ads with the amplified title can be tracked for performance (310). Fig. 4 illustrates an example performance tracking dashboard that can track various performance metrics, e.g., impressions, clicks, conversions, cost-per-click (CPC), click-through rate (CTR), etc., at the feed or campaign level. Performance tracking can use difference-in-difference (DD) techniques, such that a test group comprises ads optimized using the described techniques and a control group includes other items in categories covered by the described techniques.

The control and test groups can be advantageously constructed using shadow products. The performance uplift is given by the pre-minus-post uplift of the test group less the pre-minus-post uplift of the control group. As compared to a straightforward pre-minus-post, the DD approach (comparing pre-minus-post of test vs. control group) enables standardization, scaling, and the accommodation of other sources of performance variations, e.g., local trends, seasonality, holiday effects, etc. Other testing techniques such as causal impact can also be used.

In this manner, augmenting product titles can enable online merchants and advertisers to use unique, product-specific insight from searched terms to improve title effectiveness automatically and at scale. Advertisers can leverage trending searches relating to their products and craft comprehensive and attractive shopping titles. The techniques leverage natural language processing and machine learning technology to determine keywords that are both relevant and hot. The described performance tracking mechanisms enable experimentation and market research to discover detailed product features across categories that constitute commercially important information and that can be linked to the search term. The amplified titles are tested for relevance before release.

CONCLUSION

This disclosure describes techniques that enable online merchants to automatically improve product titles or descriptions, e.g., as used in online ads. Trending or popular keywords relevant to the product are automatically added to the product title or description. Unique, product-specific insights gleaned from searched terms are utilized to improve title effectiveness automatically and at scale.

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