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Ranking Advertisements Based On User Interactions With Virtual Assistant

ABSTRACT

In response to a user's request, a virtual assistant can direct the user to online resources that include relevant content. When the user follows a link to such a resource, the content shown to the user may include advertisements. However, the context of the user's interaction with the virtual assistant is not incorporated when selecting the advertisements. This disclosure describes techniques to incorporate the details of prior user interactions with the virtual assistant as a factor in relevancy ranking of advertisements shown with recommended external content, such as videos, webpages, etc. The described techniques are implemented with specific user permission and users are provided with options to turn off use of interaction data for selection of advertisements.

KEYWORDS

- Virtual assistant
- Display advertisement
- Online advertisement
- Ad ranking
- Ad matching
- Ad insertion
- Advertisement category
- Personalized advertising
- Interaction data

BACKGROUND

People often use virtual assistants to seek answers to questions or to perform tasks on their behalf. In some cases, the most appropriate response to a user's request is to direct the user to online resources that include relevant content, such as videos, webpages, etc. For example, if a user asks a virtual assistant for guidance on making latte art, an appropriate response can be to provide the user with links to video tutorials on latte art.

DESCRIPTION

In the example of the background, when the user follows the link to access the content, such content can include advertisements. Typically, the advertisements shown with the content are selected based on various criteria, e.g., relevance of the ad for viewers of the content based on analysis of what the content contains. Such advertisements may not always be a good match for a specific user consuming the content because of limited availability of pertinent information about the user.

For instance, if the user may have engaged in extended back-and-forth interaction with the virtual assistant that led to the user being sent to the content, details of the interaction with a virtual assistant prior to accessing the content can include important contextual information about the user.

This disclosure describes techniques to incorporate the details of prior user interactions with the virtual assistant as a factor in relevancy ranking of advertisements shown with recommended external content, such as videos, webpages, etc. With the user's permission, when the user accesses the external content, advertisements included with the content are selected by taking into account the user's recent interaction with the virtual assistant. The user is then shown the advertisement(s) with the highest relevance. The described techniques are implemented with

specific user permission and users are provided with options to turn off use of interaction data for such purposes. If the user denies permission, no interaction data is shared and advertisements are inserted into the content using a default mechanism that does not utilize interaction data.

As an illustrative scenario, consider the following interaction sequence between a user and virtual assistant:

User:	<i>“What does an espresso machine cost?”</i>
Virtual assistant:	The average cost for an espresso machine is \$100.
User:	<i>“How can I make latte art?”</i>
Virtual assistant:	You can view video tutorials on making latte art at <LINK>.

The user then visits the link that shows a list of video tutorials on latte art. The user selects a video from the list and starts watching. The page with the list of videos and/or the video content itself may include advertisements relevant to the content that the user is accessing. If the user permits, the techniques described in this disclosure can be used to re-rank advertisements to select specific advertisements to be shown with the content by taking into account the earlier interaction of the user with the virtual assistant. In this specific example, the inference can be that the user is likely to be interested in purchasing an espresso machine. Therefore, advertisements for espresso machines at nearby stores can be ranked higher.

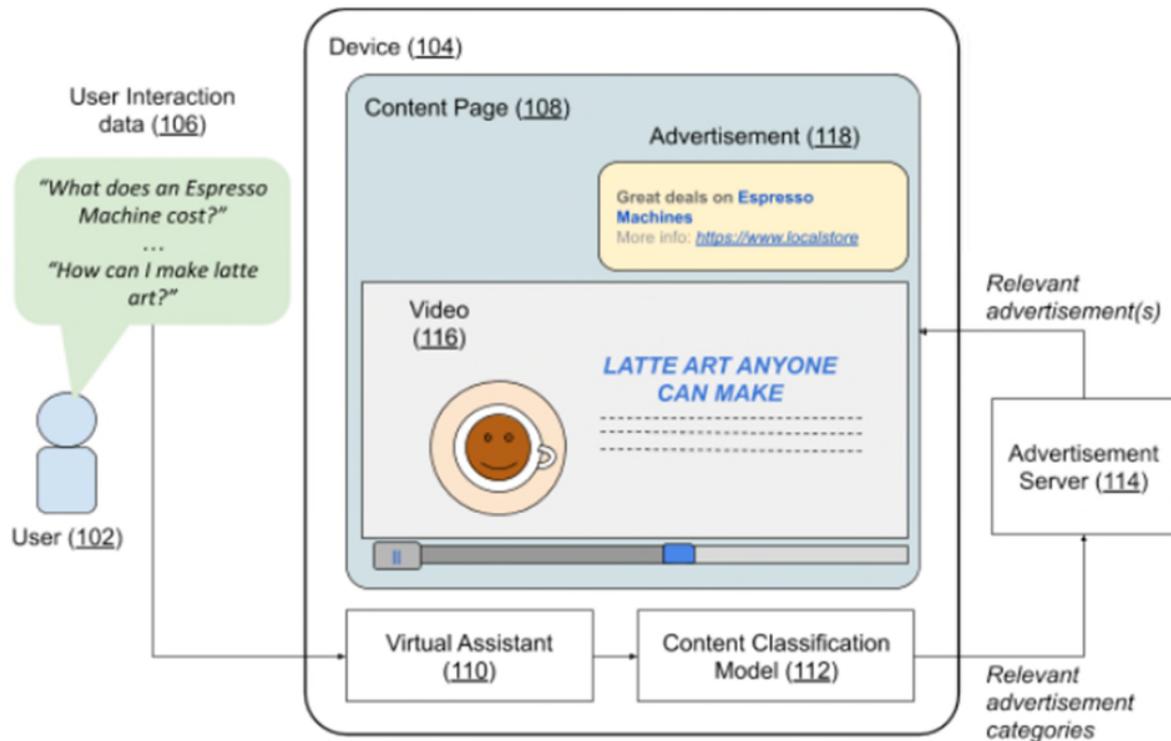


Fig. 1: Showing advertisements ranked based on interaction with a virtual assistant

Fig. 1 shows an operational implementation of the techniques described in this disclosure as illustrated in the above scenario. A user (102) interacts with a virtual assistant (110) on a device (104) via a series of commands (106) to which the virtual assistant provides responses. With user permission, the interaction data (including user commands and optionally, the virtual assistant responses, along with user actions with respect to the responses) are provided to a content classification model (112) to determine related relevant advertisement categories.

With user permission, the output of the classification model is provided to an advertisement delivery server (114) to select the advertisement(s) for displaying to the user in subsequent results. In selecting the advertisement(s), the advertisement server can re-rank candidate advertisements based on the relevant advertisement categories received from the content classification model.

Alternatively, or in addition, the output of the classification model can be applied locally on the device to select the advertisement(s) to display by re-ranking those received from the advertisement delivery server. Such local processing avoids the need to send information to an entity external to the device. When the user selects to view the online content suggested by the virtual assistant, the online content (content page 108, including video 116) is shown to the user. The highest ranked advertisement(s) (118) are inserted into the content.

Such re-ranking of advertisements enables personalized selection of advertisements for different users based on their respective interactions with the virtual assistant prior to accessing the content. For instance, advertisements shown to a user may relate to local classes on latte art while those for another user can relate to purchase of coffee beans, based on respective interaction data.

As mentioned above, the selection of advertisements as described above is enabled by user-permitted analysis of recent interactions between a user and a virtual assistant by a content classification model. The interaction messages provided as input to the classification model can be selected from the most recent interactions based on one of more approaches, such as: a specific time interval starting back from the current time, the latest interaction session, interactions based on the same topic, etc. The output of the classification model indicates the categories of advertisements most relevant to the recent interactions.

The content classification model can be implemented as any suitable trained machine learning model, such as a Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), etc. With user permission, the model can be trained on interactions with users and virtual assistants that are labeled with advertisement categories relevant to those interactions. The described techniques can be implemented to support any devices or applications that incorporate

the use of a virtual assistant. Interaction between the user and the virtual assistant can take place via any suitable mechanism, such as voice commands, text input (by the user) and displayed or spoken responses (by the virtual assistant).

With user permission, the selected advertisement(s) can be displayed to the user in one or more contextually appropriate ways, such as alongside page content, prior to starting content delivery, embedded within the content, overlaid on the content, after the user has finished content consumption, etc. Implementation of the techniques with user permission can improve the relevance of the displayed advertisements to the user's needs and goals.

Further to the descriptions above, a user is provided with controls allowing the user to make an election as to both if and when systems, programs or features described herein may enable collection of user information (e.g., information about a user's interactions with a virtual assistant, a user's preferences, or a user's current location), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user has control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

This disclosure describes techniques to incorporate the details of prior user interactions with the virtual assistant as a factor in relevancy ranking of advertisements shown with recommended external content, such as videos, webpages, etc. When a user accesses the external

content, the advertisements included with the content are selected using a content classification model that utilizes the user's recent interaction with the virtual assistant. Implementation of the techniques can improve the relevance of the advertisements to the user's needs and goals, and improve user engagement with the advertisements. The described techniques are implemented with specific user permission and users are provided with options to turn off use of interaction data for selection of advertisements.