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Linking search sessions for query processing and result presentation in joint search tasks

ABSTRACT

There are several situations in which two or more users jointly search for online information. In such cases, typically the search sessions of the users are completely independent of each other even though the users are engaged in a joint search task. Such independent and disjoint operation of a task being performed simultaneously by multiple users fails to leverage the collaborative nature of the joint online information search to provide improved user experience (UX) and result quality. This disclosure describes mechanisms for improving the UX, search quality, and search effectiveness for such tasks. The search sessions of the users are connected to each other upon obtaining permission from the users. The search platform then retrieves and delivers search results to each of the users based on the collective queries and query histories of other users whose sessions are connected.

KEYWORDS

- Joint search
- Joint query
- Collaborative search
- Linked search sessions
- Natural Language Processing (NLP)
- Query processing
- Search result
- Search result page
- Query embedding

BACKGROUND

There are several situations in which two or more users jointly search for online information. Often times, these situations involve users who are co-located. For instance, two individuals present in the same location, such as a meeting room or a coffee shop, can look up online information related to the topic(s) of their discussion. For example, such discussions could be related to facts and statistics, events that will take place during an upcoming joint trip, memories of prior situations, etc.

In such cases, each of the users starts independently searching for relevant information on their own device(s) by issuing independent queries. As such, the search sessions of the users are completely independent of each other even though the users are engaged in a joint search task. Consequently, typical search behaviors, such as query refinement based on retrieved results, result refinement based on query history obtained with user permission, etc. are enacted independently as well. Such independent and disjoint operation of a task being performed simultaneously by multiple users fails to leverage the collaborative nature of the joint online information search to provide improved user experience (UX) and result quality.

DESCRIPTION

This disclosure describes mechanisms to improve the UX, search quality, and search effectiveness for tasks that involve two or more users searching jointly for online information. The search sessions of the users are connected to each other with permission from the users. If the users deny permission, the sessions are not connected and individual search sessions are provided per user preferences. Users can selectively control how and when their search queries are shared in a connected session. Users are provided with options to revoke access to their query data and to expunge the data from the joint session, including from search provider systems and/or other user devices. Further, only such queries that are identified as being part of a joint

search are included in the connected search sessions. Users can limit connected search sessions to specific other users.

The connection can be realized in any of several possible ways. For instance, if the users use the same search platform and are included in each other's contact list, the search platform can provide mechanisms to identify joint search session. For example, such mechanisms can use trained semi-supervised machine learning models to detect if multiple users are engaged in a joint search task based on user-permitted information about the users and the issued search queries. The models can be built on top of pretrained user embeddings and natural language embeddings. The models are configured to work such that a variable number of users can be fed to the models. Appropriate models, such as recurrent networks with attention, transformers, etc. can be used to support variable number of users performing a joint search task.

Once the search sessions of users engaged in a joint search task are connected, the search platform can retrieve and deliver search results to each of the users based on the collective queries and query histories of other users whose sessions are connected. To this end, query information, e.g., query embeddings from users that share the session, together with the query provided by a current user, can be passed through a few multi-layer network blocks to determine their importance to the joint search task. Moreover, if the users permit, the retrieved results are ranked via a machine learned ranking model by taking into account the queries of other users whose search sessions are connected.

With user permission, such an implementation can effectively identify the queries in the connected user sessions that are connected to the joint task. Individual user queries that are irrelevant to the joint task, such as those that result from a user search for another topic in the

middle of the joint task, are not utilized for the purposes of retrieving, ranking, and presenting results to the other users of the connected search sessions.

The search results retrieved and ranked based on the search sessions connected with user permission are presented to each individual user in the joint search session in a way that meaningfully leverages the collaborative aspects of the joint search task. Such presentation of retrieved and ranked search results can be achieved in any of several possible ways. For instance, if the users permit, each of the results of a user's own query that is processed jointly with the queries of other users of the connected sessions can be shown to the user with additional information that marks other users that see the same result. For example, consider two users jointly searching for income information with similar queries, e.g., a first user issuing the query "Average income in Switzerland" and the other querying "How much do people in Switzerland earn?" When presenting results to the two users whose search sessions are connected with their permission, the result list presented to each user can indicate whether the other person is seeing each of the retrieved results.

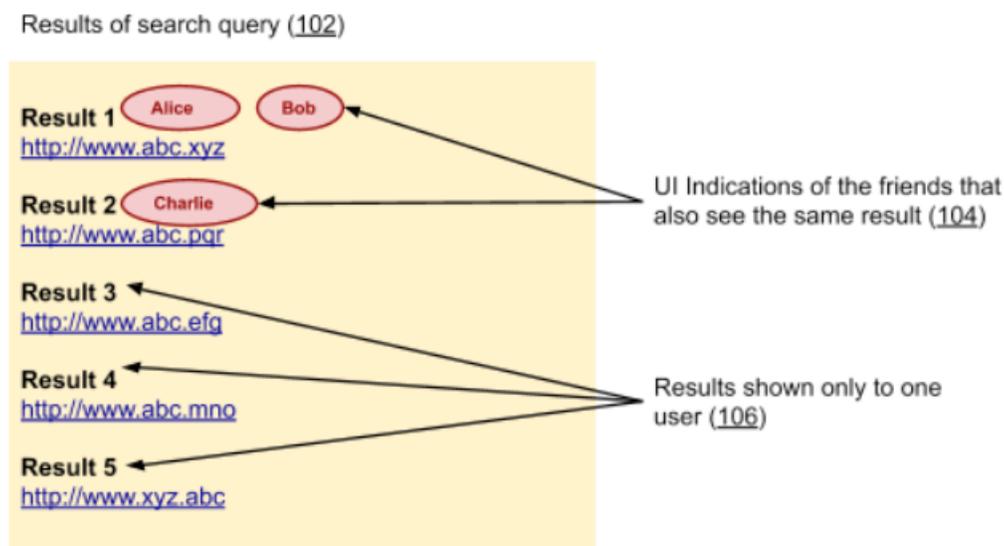


Fig. 1: Results of an online search for a task being performed jointly by multiple users

Fig. 1 shows the results of a search query (102) issued by a user (Dan, not shown) for a task being performed jointly with three of his friends: Alice, Bob, and Charlie. With permission from the users, the search platform used commonly by the four users connects their search sessions for the purposes of the joint task, e.g., to obtain information about a particular topic via search queries. If the users permit, the search results are retrieved and ranked based on joint processing of the queries. When presenting the results individually to the user, each entry in the result list user interface(UI) includes indicators (104) that inform the user which of the others engaged in the joint task are shown the same result. The entries in the result list without such indicators (106) are shown only to a single user and not others in the joint session.

As mentioned earlier, linking of search sessions for the purposes of a joint search task can be done explicitly by the users involved and/or detected and initiated automatically by the underlying search platform with permission of the users. Implementation of the described mechanisms can improve the quality and speed of the retrieved search results for all users engaged in a joint search task. Further, the improved UI for presenting individual search results with user-permitted markers to indicate others who see the same result entries can raise the efficiency and effectiveness of the joint search task, thus improving the UX for collaborative interaction around the task.

Further, each user can adapt and refine individual search queries based on what was found by others with whom the user is performing the search task jointly. In fact, if the users permit, the described techniques can be extended to suggest relevant results and queries to an individual user based on the queries and results of all users in the connection search session. Moreover, with user permission, mechanisms can be provided to share and communicate queries and results with other users of the connected search session. For instance, appropriate UI

mechanisms, such as a button, can enable a user to share specific queries or result entries with one or more of the other users in the connected search session.

The techniques described in this disclosure can support joint search tasks in a variety of situations such as users who are physically co-present, users who are co-present within a virtual platform despite being in separate physical location, etc. The techniques can be used to support any joint search task performed by multiple users.

For instance, the techniques can support collaborative search tasks such as exploring information on a given topic, deciding on an event to attend together, working on a joint project, combining individual content into a single document, searching for relevant materials in a shared storage space, finding a specific photo within a collection, etc. As such, the techniques can be implemented within any platform or system that includes search capabilities, including search engines, social media, maps, file repositories, etc.

Further to the descriptions above, a user may be 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 social network, social actions or activities, profession, 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 may have 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 mechanisms for improving the UX, search quality, and search effectiveness for tasks that involve two or more users searching jointly for online information. To this end, the search sessions of the users are connected to each other upon permission from the users. Once the search sessions of users engaged in a joint search task are connected with user permission, the search platform retrieves and delivers search results to each of the users based on the collective queries and query histories of other users whose sessions are connected. The search results retrieved and ranked in this manner are presented to each individual user in the joint search session in a way that meaningfully leverages the collaborative aspects of the joint search task. The user interface presents individual search results with user-permitted markers to indicate others that see the same result entries. The UI can raise the efficiency and effectiveness of the joint search task.

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