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Modeling Rich Interactions for Web Search Intent Inference, Ranking and Evaluation

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Abstract: The thesis aims to enable more intelligent Web search engines by modeling and interpreting a wide range of searcher interactions, including queries, clicks, time, and finer grained interactions such as mouse cursor movements and scrolling behavior (or pinching, zooming and sliding with a touch screen). The thesis spans three key areas in Web search, namely, understanding information needs, ranking result documents, and evaluating search experience.

First, the thesis developed techniques for inferring the immediate searcher information needs through mining the rich interactions and context in a search session. The developed techniques improve the prediction of general search intent, commercial search intent and future ad clickthrough over the state-of-the-art methods that only exploit query and click signals.

Second, the thesis developed techniques for estimating document relevance to improve search result ranking. The Post-Click Behavior (PCB) relevance prediction model was introduced, which focuses on estimating the "intrinsic" document relevance from a rich set of fine-grained interactions on the viewed result documents in a search session, outperforming the state-of-theart methods that are based on the time information.

Third, the thesis developed techniques for automatically evaluating search experience or search engine performance at different levels. The first level is the query-level, where techniques for predicting query performance were developed, enabling evaluation and diagnostic for particular queries or query classes. The second level is the session-level, where techniques for predicting search success were developed, which include a principled framework to study Web search success, and fine-grained interaction models that improve prediction accuracies for both desktop and mobile settings. The third level is the level of using multiple search engines, where the developed techniques focus on understanding and predicting the rationales of engine switching in a search session.

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