Inferring User Needs & Tasks from User Interactions

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Abstract

The need for search often arises from a broad range of complex information needs or tasks (such as booking travel, buying a house, etc.) which lead to lengthy search processes characterised by distinct stages and goals. While existing search systems are adept at handling simple information needs, they offer limited support for tackling complex tasks. Accurate task representations could be useful in aptly placing the user in the task-subtask space and enable systems to contextually target the user, provide them better query suggestions, personalization and recommendations and help in gauging satisfaction.

The major focus of this thesis is to work towards task based information retrieval systems - search systems which are adept at understanding, identifying and extracting tasks as well as supporting user's complex search task missions. This thesis focuses on two major themes: (i) developing efficient algorithms for understanding and extracting search tasks from log user and (ii) leveraging the extracted task information to better serve the user via different applications. Based on log analysis on a tera-byte scale data from a real-world search engine, detailed analysis is provided on user interactions with search engines [5,8]. On the task extraction side, two bayesian non-parametric methods are proposed to extract subtasks from a complex task [6] and to recursively extract hierarchies of tasks and subtasks [1]. A novel coupled matrix-tensor factorization model is proposed that represents user based on their topical interests and task behaviours [9,10].

Beyond personalization, the thesis demonstrates that task information provides better context to learn from and proposes a novel neural task context embedding architecture to learn query representations [3]. Finally, the thesis examines implicit signals of user interactions [4] and considers the problem of predicting user's satisfaction when engaged in complex search tasks. A unified multi-view deep sequential model is proposed to make query and task level satisfaction prediction [2].

Beyond the analysis, algorithmic and empirical contributions, work done as part of this thesis also contributed to the overall research community as (i) TREC Tasks tracks (2015-2017) [11], CIKM 2017 & WWW 2018 tutorials on *Understanding & Inferring Tasks* [13] and WSDM 2018 workshop on *Learning from User Interactions* [12].

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Available from: `http://discovery.ucl.ac.uk/10047203/`

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13 URL: `https://task-ir.github.io/Task-based-Search/`