

# Effective and Efficient Approaches to Retrieving and Using Expertise in Social Media

Reyyan Yeniterzi  
Özyeğin University, Çekmeköy, İstanbul, Turkey  
*reyyan.yeniterzi@ozyegin.edu.tr*

## Abstract

The recent popularity of social media is changing the way people share and acquire knowledge. Companies started using intra-organizational social media applications in order to improve the communication and collaboration among employees. In addition to their professional use, people have been using these sites in their personal lives for information acquisition purposes, such as community question answering (CQA) sites for their questions. In such environments the interactions do not always occur between users who know each other well enough to assess expertise of one another or trust the accuracy of their created content. This dissertation solves this problem by estimating topic-specific expertise scores of users which can be also used to improve the expertise related applications in social media.

Expert retrieval has been widely studied using organizational documents; however, the additional structure and information available in social media provide the opportunity to improve the developed expert finding approaches. Such additional information includes the availability of different types of user created content, the underlying social network structure constructed from the interactions among users, such as commenting or replying, and the available temporal information coming from the timestamped user interactions. This available information is explored and approaches which use this information for more effective expertise estimation have been proposed. In particular, the main contributions of this dissertation can be summarized as follows:

- *Content-based Retrieval:* What to search for and where to search are two important factors in retrieval tasks. This dissertation focused on these questions for the expert finding task in CQA sites. Available and different types of content-based evidence are explored to find effective and also approach independent representations for both the information need (query) and user expertise. The proposed representations returned statistically significant improvements when tested with different expert retrieval algorithms.
- *Authority Estimation:* Web page authority estimation approaches have been widely adapted to user interaction networks which are constructed by using the interactions between users. Understanding the interaction and structure behind these user graphs showed us some of the limitations of these adaptations when applied to these networks. Based on these analyses, more topic-specific authority graph construction and estimation approaches, which provided consistent improvements in both accuracy and efficiency, are proposed.

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- *Temporal Modeling:* Humans are dynamic in nature with changing levels of interest, expertise and availability. In order to model this dynamic nature of users, we explored the available timestamp information within social media. With using that information, a more dynamic expert identification approach, which takes into account the recent topic-specific interest of users as well as their availability, is proposed. This move from static to dynamic modeling of expertise returned statistically significant improvements, due to more effective modeling of expertise of the constantly changing users.

These proposed approaches are combined in an expert identification system which has been tested on an intra-organizational blog data and a popular community question answering site's data, for three expertise estimation related tasks: identification of topic-specific expert bloggers, routing questions to users who can provide accurate and timely replies, and ranking replies based on responders question specific expertise. Statistically significant improvements are observed in all three tasks. In addition to improving the effectiveness of expert identification applications in social media, the proposed approaches are also more efficient which makes the proposed expert finding system applicable to real time environments.

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Available at: <http://www.cs.cmu.edu/~reyyan/Dissertation/Thesis-ReyyanYeniterzi.pdf>