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Zhiguang Zhou, Chen Shi, Miaoxin Hu, Yuhua Liu

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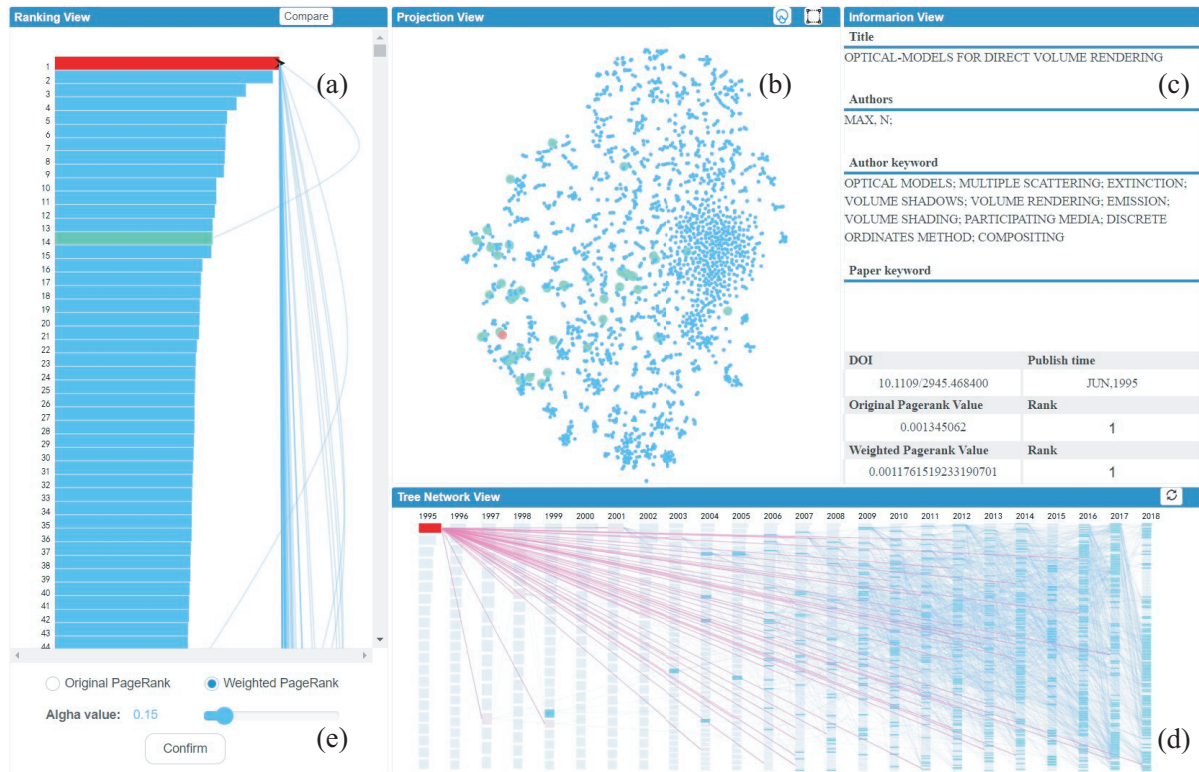


Fig. 1. The visualization interface is comprised of five primary views: (a) a ranking view, showing the result of ranking algorithms. (b) a projection view, that displays each article as a point and implies their citation similarity by means of distance. (c) an information view, presenting the essential information of an article of interest. (d) a network view, showing the direct and indirect citation links of articles. (e) a control panel allowing users to control and tune the damping factor and ranking model.

**Abstract**—With rapid growth of digital publishing, a great deal of document datum has been published online for a widely spread of knowledge innovations, which is an important resource for human survival and social development. However, it is a time-consuming and difficult task to conduct a high-efficiency access of valuable papers from an extremely large document database. A set of ranking techniques have been proposed to evaluate the influence of articles by counting the number and quality of citations, such as PageRank. In fact, the influence of an article does not merely depend on the account of citations, which is also highly related to the citation network. In this paper, we propose a visual analytics system for visual ranking of academic influence of articles, based on an insightful analysis of citation network. Firstly, a characterization of articles is established through word2vec model, based on an analogy between the articles in citation network and natural language processing (NLP) terms. Then, the difference between articles in the vectorized space is employed to optimize the PageRank model and achieve desired influence ranking results. A set of meaningful visual encodings are also designed to present the relationships among articles, such as the visualization of high-dimensional vectors and time-varying citation networks. At last, a visualization framework is implemented for visual ranking of academic influence of articles, with the ranking models and visual designs integrated. Case studies based on real-world datasets and interviews with domain experts have demonstrated the effectiveness of our system in the evaluation of academic influence of articles.

**Index Terms**—Visual Analysis, Citation Network, Word2Vec Model, PageRank Model

## 1 INTRODUCTION

- Zhiguang Zhou, Chen Shi, Miaoxin Hu, and Yuhua Liu are all with School of Information, Zhejiang University of Finance and Economics. E-mail: {zhgzhou1983, ChenShi4066}@163.com, {humiaoxin, liuyuhua}@zufe.edu.cn.

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With the development of online academic services, such as advanced academic digital libraries, online academic social networks and academic search engines, scholars can easily get access to their desired knowledges [14, 42]. However, scholarly information usually contains millions of raw data such as authors, papers, citations, and scholarly networks [19]. It becomes a time-consuming and tedious task for users

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