Visualizing and Exploring Scientific Literature with CiteSpace

An Introduction to a Half-day Tutorial

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ABSTRACT

This half-day tutorial aims to introduce the fundamental concepts, principles and methods of visualizing and exploring the development of a scientific knowledge domain. The tutorial explains the design rationale and various applications of CiteSpace – a freely available tool for interactive and exploratory analysis of the evolution of a scientific domain, ranging from a single specialty to multiple interrelated scientific frontiers. The tutorial demonstrates the analytic procedure of applying CiteSpace to a diverse range of examples and how one may interpret various patterns and trends revealed by interactive visual analytics.magnetic field, applied along the easy axis of the elements[1].

CCS CONCEPTS

• **Human-centered computing** → **Visual analytics**; • **Information systems** → Information integration

KEYWORDS

CiteSpace, visual analytics, mapping scientific frontiers, visual exploration of scientific literature

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1 INTRODUCTION

This half-day tutorial aims to introduce the fundamental concepts, principles and methods of visualizing and exploring the development of a scientific knowledge domain. The tutorial explains the design rationale and various applications of CiteSpace – a freely available tool for interactive and exploratory analysis of the evolution of a scientific domain, ranging from a single specialty to multiple interrelated scientific frontiers [1,2,8]. The tutorial demonstrates the analytic procedure of applying CiteSpace to a diverse range of examples and how one may interpret various patterns and trends revealed by interactive visual analytics.magnetic field, applied along the easy axis of the elements.

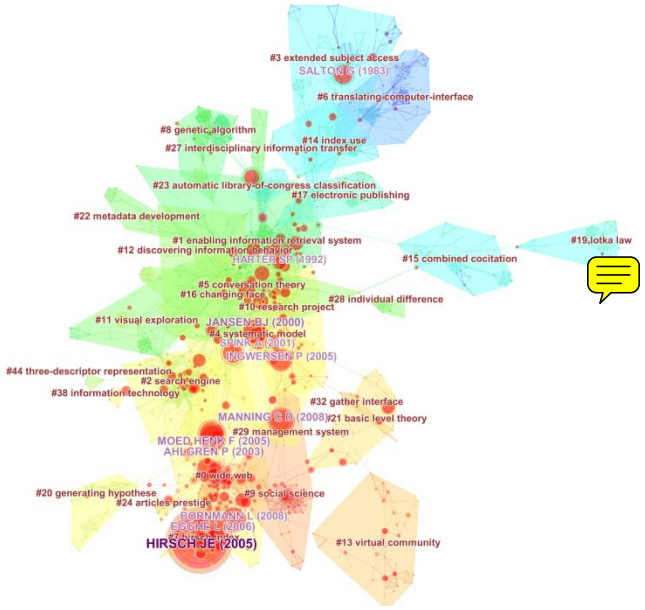

Figure 1: A network visualization showing citation burstness in CiteSpace.

The tutorial is suitable for anyone who is interested in learning and applying an effective method to generate a systematic review of the history and the state of the art of a scientific field. For example, doctoral students may gain an insightful understanding of a research topic by identifying landmark studies in the development of the field, critical contributions in the past, and potentially transformative ideas. Experienced researchers may repeatedly apply the same procedure to keep abreast new developments in a new field as well as in the field where they have established expertise.

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CiteSpace has been applied to the study of numerous scientific disciplines. CiteSpace has been instrumental in revealing insightful patterns from a set of relevant scholarly publications (Fig. 1-5). On the other hand, users may considerably improve the efficiency and effectiveness of the application of such a visual analytic procedure through demonstrations and interpretations offered by the tutorial.

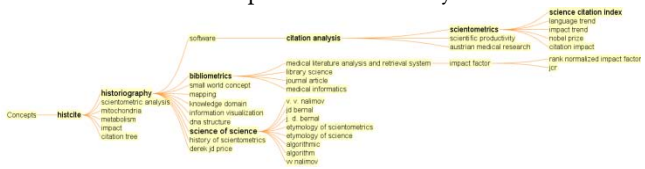

Figure 2: A visualization of a tree of keywords in CiteSpace.

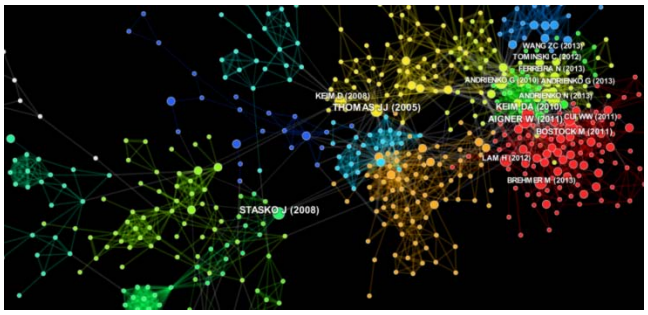

Figure 3: A visualization of clusters in CiteSpace.

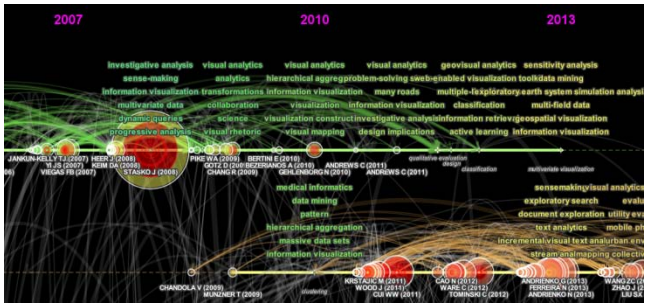

Figure 4: A timeline visualization in CiteSpace.

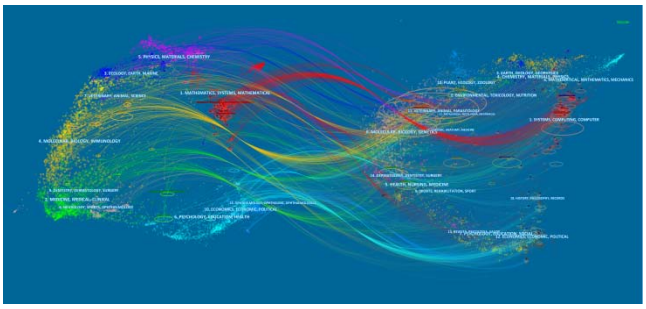

Figure 5: A dual-map overlay visualization in CiteSpace [5].

The half-day tutorial first introduces the basic concepts, relevant theories, and design rationale. Then the tutorial demonstrates several representative cases produced by CiteSpace, such as [3–7], so as to illustrate the breadth and depth of CiteSpace applications. Next, the tutorial guides the participants through step-by-step demonstrations from retrieving the initial input data to interpreting and summarizing the findings. On completion of the tutorial, participants should be able to apply the procedure to a domain of their own choice.

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REFERENCES

[1] Chen, C. (2017). Science Mapping: A Systematic Review of the Literature. Journal of Data and Information Science, 2(2), 1–40. DOI: 10.1515/jdis-2017-0006

[2] Chen, C. (2016) CiteSpace: A Practical Guide for Mapping Scientific Literature. Nova Publishers. ISBN: 978-1-53610-280-2.

[3] Chen, C., Dubin, R., Kim, M. C. (2014) Emerging trends and new developments in regenerative medicine: A scientometric update (2000-2014). Expert Opinion on Biological Therapy, 14 (9), 1295-1317.

[4] Chen, C., Dubin, R., Kim, M. C. (2014) Orphan drugs and rare diseases: A scientometric review (2000-2014). Expert Opinion on Orphan Drugs, 2(7), 1-16.

[5] Chen, C., Leydesdorff, L. (2014) Patterns of connections and movements in dual-map overlays: A new method of publication portfolio analysis.Journal of the American Society for Information Science and Technology, 65(2), 334-351.

[6] Chen, C., Hu, Z., Liu, S., Tseng, H. (2012) Emerging trends in regenerative medicine: A scientometric analysis in CiteSpace. Expert Opinions on Biological Therapy, 12(5), 593-608.

[7] Chen, C., Ibekwe-SanJuan, F., & Hou, J. (2010) The structure and dynamics of co-citation clusters: A multiple-perspective co-citation analysis. Journal of the American Society for Information Science and Technology, 61(7), 1386-1409. DOI: 10.1002/asi.21309.

[8] Chen, C. (2006) CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature. Journal of the American Society for Information Science and Technology, 57(3), 359-377.