A Bibliometric Research on International Pragmatic Inference based on Web of Science

Xiaochun Li[1,2]

[1]College of International Studies, Southwest University, Beibei District, Chongqing, China, 400715;
[2]Department of Foreign Language Teaching and Research, Yangtze Normal University, Fuling District, Chongqing, China, 408100

Abstract: With the help of the bibliometric software CiteSpace, this paper combs and analyzes the pragmatic inference research in the core periodicals retrieved in core collection of Web of Science from 1977 to 2018. Co-author network, the keywords co-occurrence network and co-citation network in the field of international pragmatic research were displayed in the form of knowledge map, for the purpose of detecting research hotspots and trends in this field. The results reveal that: 1) International research on pragmatic inference has been steadily increasing for over forty years and keeps vigorous. 2) Researchers combine theoretical research and empirical research and pay special attention to adult's utterance, children's utterance as well as patients' utterance. 3) The interdisciplinary phenomenon is quite obvious. Issues on linguistics, pragmatics, philosophy, psychology and pedagogy are involved in.

Keywords: Pragmatic inference, Bibliometrics, CiteSpace

1. Introduction

In 1967, Paul Grice put forward the term "conversational implicature" in a series of James Williams lectures in Harvard University. He distinguished conversational implicature and conventional meaning in his article "Logic and Conversation", developing a new mode of inferencing, namely "pragmatic inference"(Xu, 1993:7), which raised the curtain of research on pragmatic inference.

Pragmatic inference(Hirschberg, 1985; Horn, 1972; Levinson, 1983), or pragmatic reasoning(Bell, 1995), being context-dependent(), refers to the inferential process in which the hearer elicits a conclusion beyond the speaker's literal meaning by using knowledge about context(Grice, 1975). Horn(1972) thought that there are several principles of pragmatic inference，like Q-Principle and R-Principle. Sperber and Wilson(1986；1995) developed the theory and pointed out that a hearer follows a relevance-based procedure in the inferencing process. Consequently, more and more researchers paid special attention to this new field. They explored the inferencing process(Xu, 1991; Xiong, 1994), children's inferencing models(Currie & Cain, 2015; Skordos & Papafragou, 2016) and so on. So far, research on pragmatic inference has been conducted for more than forty years. Researchers mostly focused on some specific issues related to pragmatic inference, but few of them has ever paid any attention to macroscopic description of this field. To what extent is this field developed? What research hotspot is there? What is the trend of future research on pragmatic inference across the world? It seems impossible to answer the above questions due to the constantly updated large amounts of literature. Consequently, we are determined to give a panoramic view of research on pragmatic inference, which is of great necessity for green hands in this field, and also provide comprehensive references for future research on pragmatic inference.

In order to offer an objective representation of the research on pragmatic inference, we made use of the well-known bibliometric software---CiteSpace, which was developed by Chen Chaomei, a professor from Drexel University.

CiteSpace has been a very popular visual software to analyze literature. As Liu Zeyuan pointed out in the prologue for *CiteSpace: Text Mining and Visualization in Scientific Literature*(Li & Chen, 2017), CiteSpace helps people know about the key information, clarify the developmental process and identify the frontiers as well as trends in a research field. Based on this, we take advantage of CiteSpace to probe into the field of pragmatic inference, aiming to provide an overview of this field, clarify the key authors and key journals, identifying research hotspot and trends. We firstly analyzed the annual literature distribution. Next, we clarified the overall research status from three dimensions --- micro, medium and

macro dimensions, including the cooperation network of authors, institutions and countries (or regions). Then keywords co-occurrence cluster analysis is used to anchor the hotspots in the research field. Finally, co-citation analysis is carried out to identify the frontiers of pragmatic inference research.

2. Methodology

Database: Core Collection of Web of Science

Collection of the data: We retrieved "pragmatic inference" OR "pragmatic reasoning" as topics, with the text type "article" and no time limitation on the time of publication years. Data was collected on December 25th, 2018. For the sake of convenience, we excluded 2 publications whose published time was 2019. We filtered irrelevant publications manually and removed duplicates by CiteSpace(version 5.3.R8), obtaining 2704 valid publications, the published time of which was from 1977 to 2018(The earliest publication retrieved in WOS was published in 1977). All data were filed for back-up.

Parameter setting of data analysis: The time span is from 1977 to 2018 and the time slicing is 1 year. Top 30 most cited or occurred items from each slice were selected and the pruning method is pathfinder, i. e., the top 30 cited or occurred publications in each year were counted in the process. For the sake of our research purpose, we chose "Author", "Keyword" and "Reference" as the node type. All other parameters were left in their defaults.

3. Results and Discussion of the Visualization

3.1 An Overall Picture of Research on International Pragmatic Inference

The change in the number of publications in a research field can directly reflect the accumulation of knowledge in this field to some extent, providing us with a qualitative reference in the development of the field.

3.1.1 Overall Number of Published Papers

Our preliminary statistical analysis of 2704 publications retrieved in the Web of Science core collection revealed that the paper on the study of pragmatic inference in the international core journals was first published in 1977. After more than forty years of development, the international research of pragmatic inference has been in growth. Especially since 2005, the volume of publication s has grown rapidly. The number of papers published peaked in 2016 at 290 (see figure 1), accounting for 10.7% of the total number of papers issued during 40 years. The increasing volume of essays indicates that the study of pragmatic inference has been paid more and more attention by scholars, which also shows that this is a very dynamic research field.
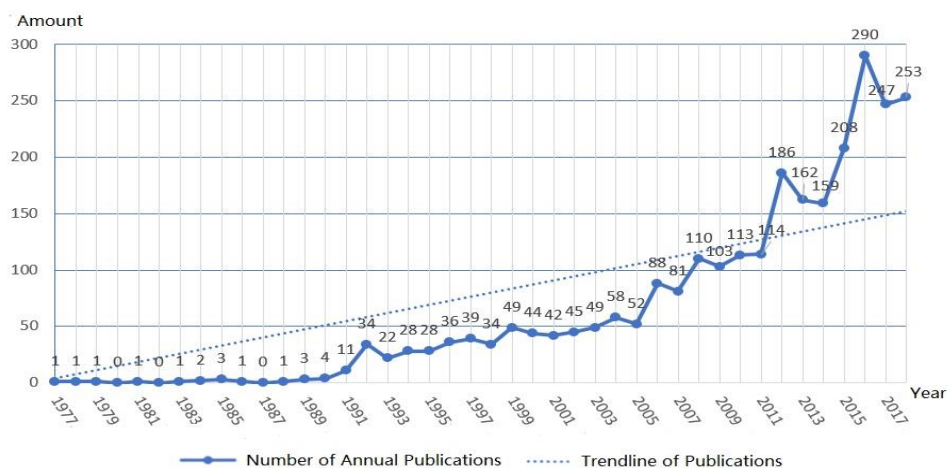

Figure 1. Annual Distribution of Publications from 1977 to 2018

3.1.2 Status of Core Authors

We analyzed the core contributors as well as the cooperation between authors.

The core contributors are the backbone of promoting academic innovation and development, and one

of the important factors to enhance the academic influence and competitiveness of periodicals. The excavation and analysis of the academic activities of this scientific research group can effectively identify the research status and development of different disciplines. According to Price's Law(Price, 1963:46), "…Half the work is done by those with more than 10 papers[1] to their credit,...the number of high producers seems to be the same order of magnitude as the square root of the total number of authors", which was finally converted to the formula m≈$0.749\sqrt{n_{max}}$(Hao 2016).In this formula, m means the threshold of a core author's publications, while n_{max} refers to the number of the most prolific author's publications. In our research, it has been calculated that m=$0.749\times\sqrt{10}$≈2.37，indicating that only if an author published 3 articles on pragmatic inference, can he/she become a core author in this field. We counted 22 core authors(see Table 1 The top five core authors), and they published 100 papers in all, accounting for 3.7% of the total number of publications, which is less than 50%, demonstrating that the core author group hasn't been formed in the field of pragmatic inference.

Table 1 Top 5 Core Authors

No.	Name	Amount of Publications
1	Fabrizio Macagno	10
2	Alessandro Capone	7
3	Emmanuel Chemla	7
4	Jean-Francois Bonnefon	6
5	Michael C. Frank	6

As can be seen in the table, the most prolific author is Fabrizio Macagno (writing 10 articles), an associate professor at the Institute of Linguistic Philosophy at the University of Lisbon, Portugal. He pays special attention to law, education, and doctor-patient dialogue, focusing on implicatures, presupposition, dialogue types, emotive language and argumentative schemes. Alessandro Capone and Emmanuel Chemla, both of whom wrote 7 articles, ranked the second in the table. Capone, an Italian linguist, received his doctorate from oxford University and is now a full professor at the University of Messina, focusing on linguistic and philosophical issues, such as speech acts, presupposition, explicatures, quotation and reporting, legal pragmatics, etc. Chemla is a semanticist and psycholinguist at the French National Centre for Scientific Research. He focuses on semantic-pragmatic interface research, including types of implicatures, presupposition and polarity items. Jean-Francois Bonnefon and Michael C. Frank, ranked the fourth, both published 6 papers on pragmatic inference. Bonnefon is now a Research Director at National Centre for Scientific Research in France, studying reasoning, decision-making, moral psychology and behavioral economics. Michael C. Frank is an associate professor and developmental psychologist working at the Department of Psychology at Stanford University. His research interests lies in the relationship between language and cognition with the methods of head-mounted cameras, behavioral experiments, eye-tracking and so on.
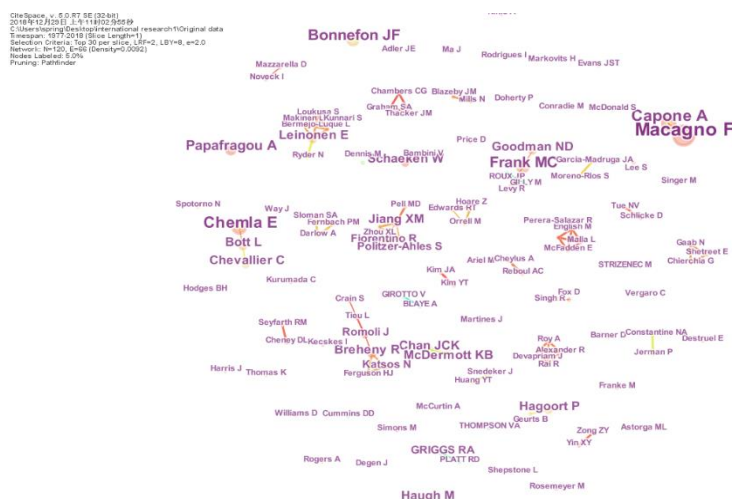

Figure 2. Joint Mapping of Productive Authors

---

[1] Price gave an example, "If there are 100 authors, and the most prolific has a score of 100 papers, half of all the papers will have been written by the 10 highest scorers, and the other half by those with fewer than 10 papers each."

CiteSpace was also used to map the authors' cooperation(see Figure 2). The node size in the mapping parallels the number of publications, while the line weight reflects the intensity of authors' partnership (Li & Chen, 2016:78). As can be seen, the most productive author, Macagno F, has cooperated much with Capone A. Frank MC, Goodman ND, Levy R, McFadden E, Perera Salazar R and English M have strong partnerships to form a research group. There are also strong partnerships between Fiorenting R, Politzer Ahles S, Jiang XM, Zhou XL and Pell MD. Overall, there are 27 cooperative groups in the study of international pragmatic inference, among which the authors cooperate frequently. However, it's obvious that there is little inter-group cooperation and communication. The distribution of authors is quite scattered, and there is little interaction between different authors.

3.2 Analysis of Hotspots of Research on International Pragmatic Inference

Research hotspot refers to one or more topics that are commonly concerned by scholars in a research field. The key words are the scholars' high concentration and generalization of their research topics, reflecting their concerns in this field (Li Jie, Chen Chaomei, 2016:78).

We selected "Keyword" as the node, setting the time slice "3", while the remaining parameters are set unchanged. Meanwhile, the words "pragmaticinference", "pragmatic reasoning", "conversational implicature" and "scalar implicature" are merged into the key word "pragmatic inference". We finally got a key word map consisting of 156 nodes together with 231 links as follows (Figure 3).

Figure 3. Co-occurrence Map of Keywords

Figure 3 shows that the most commonly used keywords in pragmatic inference studies were pragmatic inference (330 times), pragmatics (312 times), language (164 times), and comprehension (121 times), children (117 times), model (87 times), discourse (85 times), knowledge (81 times), adults (74 times), communication (74 times). There is no doubt that the study of pragmatic inference is closely related to the study of pragmatics, the frequency of the two keywords "pragmatic inference" and "pragmatics" is over 300 times. What's more, the Betweenness Centrality of the key words such as "pragmatic inference", "comprehension", "children", "model", and "discourse" is more than 0.1, each of which has purple apertures in the mapping, indicating that those nodes are rather important.

Figure 4. A Landscape View of the Co-citation Network

CiteSpace was further used to make an automatic cluster analysis of keywords, extracting clustering labels by Latent Semantic Indexing (LSI), and a clustering map was then obtained (Figure 4). The network module value of the map (Modularity Q) is 0.7678, indicating that the modular structure of the network is very reasonable, which means the clustering results are rational. The Silhouette value, which measures the homogeneity of the clustering network, is 0.5293 (greater than 0.5), demonstrating that the cluster results are reliable and the visualizations mapping are of positive reference value.

The size of the cluster in the visualization is directly related to the number of members in the cluster. The larger the size is, the more members there are and the smaller the cluster number is(Li & Chen, 2016:98). As can be seen in Figure 4, cluster #0 is the largest while cluster #10 is the smallest. Due to space limitations, we mainly analyze the first five clusters.

There are 19 members in cluster #0, labeled as "Asperger Syndrome". The cluster also includes keywords such as "self-esteem", "psychiatric disorder" and "language disorder". Asperger syndrome, mental disorder and language disorder are all difficulties that people may encounter in their lives, which shows researchers take practical difficulties in life as their research project, trying to solve practical problems. Branden (2001:110) points out that self-esteem includes two dimensions, one is a sense of personal efficacy, and the other is a sense of personal value." "It can be seen that value is one of the contents of self-esteem, and it is related to personal cognition.

With 14 members, cluster #1 has a label "Severe Child Head Injury", in which "children" is the most frequently cited keyword in the literature, cited up to 117 times, with a half-life index of 19, meaning that children, as a particular group, receive continuous attention of researchers. This cluster also includes "surgeons experience", "different emergency department healthcare professional", "memory-based processing", "pragmatic development", etc., indicating that the study of discourses between doctors and patients has drawn great attention. L égar ée et al(2010) pointed out that when choosing the best treatment for a patient, the doctors should take into account the patient's values and conduct Shared Decision Making[2](SDM). Therefore, it is of great necessity to analyze the value dimension of patients' discourses.

"Rationality" is the label of cluster #2, including 14 members. Key words such as "cognitive decision theory", "religious ethics" and "speaker" are also included in the cluster, indicating that researchers focused on speakers and explored the meaning of language from the perspectives of cognition and religious ethics.

There are 13 members in cluster #3, with a label "class inclusion", involving "doing mixed methods research", "teacher education", "institution" and so on, showing that researches made use of a variety of research methods and paid special attention to highly educated people.

Cluster #4 consists of 13 members, labelled as "uncertainty", including keywords like "acceptability", "idealism", "career change", and "qualitative research", demonstrating that discursive acceptability and qualitative research are focused on in the study of pragmatic inference.

3.3 Trend of International Research on Pragmatic Inference

When the amount of bursting nodes in CiteSpace clusters appears larger, the researching area is more active or the emerging researching trend(Li & Chen, 2017:131) .

Combining the network graph drawn by CiteSpace with its internal logic relationship, we found that the characteristics and trend of international research on pragmatic inference was as follows. Firstly, discussions on pragmatic inference get more and more refining. Geurts(2010) focused on quantity implicatures and probed into embedded implicatures. Macagno & Zavatta(2014) explored the complex reasoning process during reconstruction of metaphorical meaning. Secondly, researchers are inclined to conduct empirical research. Breheny et al(2006) presented 3 online studies and found that scalar implicatures relied on the conversational context and the Default view predicted none of their autonomies. Grodner et al(2010) adopted a visual method and investigated when and how people computed scalar inferences, finding that people computed scalar inference immediately and had literal interpretation of "some" without any delay. Katsos & Bishop(2011) investigated 20 5-to-6-year-old children and 20 college students and proved that children, like adults, were tolerant of pragmatic violations. Thirdly, the subjects are becoming more diverse, such as children's utterance, adults' utterance, patients' utterance and so on. Skordos and Papafragou (2016) investigated pre-school children and concluded that children's alteration of their vocabulary plays an important role on conversational relevance in the process of

---

[2] Shared decision making (SDM) is a process by which a healthcare choice is made jointly by the practitioner and the patient and is said to be the crux of patient-centered care.

computing scalar implicatures. Fourthly, the trend of interdisciplinary research is more and more obvious. Many disciplines like linguistics, philosophy, psychology, neurology and pedagogy were involved in research on pragmatic inference.
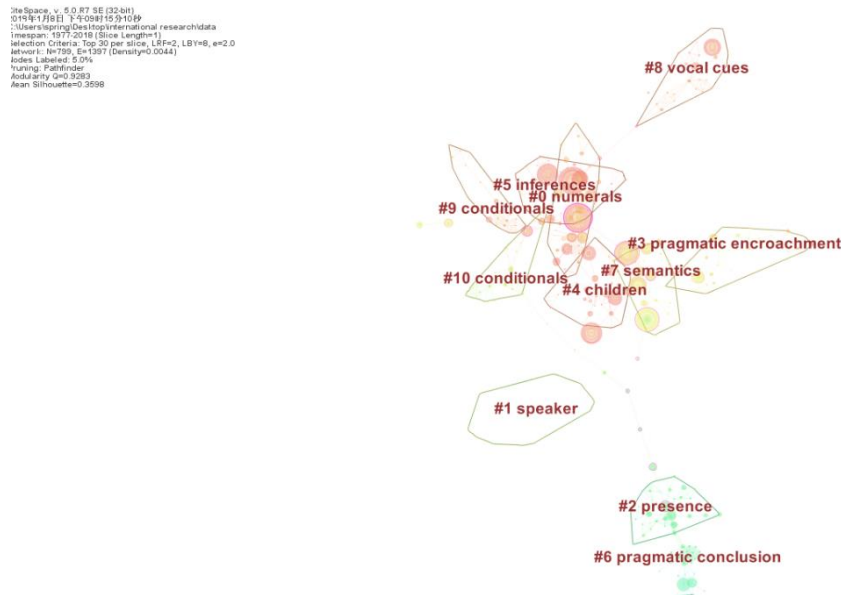

Figure 5. Clusters of Co-citation Network of International Research on Pragmatic Inference

4. Conclusion

Taking advantage of CiteSpace, this paper made a visual analysis of 2704 journal papers with the topic of pragmatic inference retrieved in core collection of WOS from 1977 to 2018, and intuitively clarified the current research situation, research hotspots as well as the trend in this field. Three conclusions are drawn as follows.

Firstly, pragmatic inference is a vigorous research field. It has been steadily increasing and thousands of researchers have committed themselves to pragmatic inference research for over forty years.

Secondly, international researchers pay special attention to empirical research. They combine theories with practice of pragmatic inference, thus solving practical problems in daily life. They not only pay attention to adult's utterance, but also lay emphasis on children's utterance as well as patients' utterance, greatly enriching the pragmatic inference research.

Thirdly, analysis of current hotspots and trend shows that the interdisciplinary phenomenon is quite obvious. Research on pragmatic inference can't be confined to linguistics or pragmatics. Conversely, philosophy, pedagogy, cognitive science and psychology should be taken into account.

Even though current international pragmatic inference research is abundant, and the range of topics is wide, it's researchers' indispensable duty to expand the research dimensions and deepen the research issues. We found that researchers focused on speakers' utterance epistemically, but they neglected the inner drive for speakers' speaking. In the future, more ontological research on pragmatic inference should be carried out, such as the discussion of ethical starting point of speakers.

References

[1] Bach, K. 1994. Conventional implicature[J]. Mind & Philosophy, 9: 124-162.
[2] Bach, K. 1999. The myth of conventional implicature[J]. Linguistics & Philosophy, 22(4): 327-366.
[3] Bell, J., 1995. Pragmatic Reasoning; a model-based theory. In Polos L. and Masuch M. (eds.) Applied Logic: How, What and Why?, pp. 40-55, Amsterdam: Kluwer Academic Publishers.
[4] Bell, J. 2001. Pragmatic Reasoning Pragmatic Semantics and Semantic Pragmatics. 2116. 45-58. 10.1007/3-540-44607-9_4.
[5] Borner K. et al. 2012. Design and Update of a Classification System: The UCSD Map of Science[J]. PLoS One, 7(7):10.

[6] Breheny, R. & Katsos, N. & Williams, J. 2006. Are generalised scalar implicatures generated by default? An on-line investigation into the role of context in generating pragmatic inferences[J]. Cognition.100, 434-63.

[7] Carston, R. 2002. Thoughts and utterances: The pragmatics of explicit communication[M]. Oxford, England: Blackwell.

[8] Currie N. K. & Cain K. 2015. Children's inference generation: The role of vocabulary and working memory [J]. Journal of Experimental Child Psychology, 137, 57-75,

[9] Geurts, Bart. 2010. Quantity Implicatures. 10.1017/CBO9780511975158.

[10] Grice, P. 1975, "Logic and Conversation", in P. Cole and J. Morgan (eds.), Syntax and Semantics, pp. 41–58, New York: Academic Press.

[11] Grice, P. 1991. Studies in the Way of Words[M]. Massachusetts: Harvard University Press.

[12] Hao Ruoyang. 2016. How to Measure Core Authors[N]. Chinese Journal of Social Sciences. 0920(001).

[13] Horn, L. R. 1984. Toward a New Taxonomy for Pragmatic Inference: Q-Based and R-Based Implicature[M], Washington D. C.: Georgetown University Press.

[14] Katsos N. & Bishop DV. 2011. Pragmatic tolerance: implications for the acquisition of informativeness and implicature[J]. Cognition. 120(1):67-81.

[15] Légaré, F. et al. 2010. Interventions for Improving the Adoption of Shared Decision Making by Healthcare Professionals. Cochrane database of systematic reviews (Online).

[16] Li Jie & Chen Chaomei. 2017. CiteSpace: Text Mining and Visualization in Scientific Literature(2 edition)[M]. Beijing: Capital University of Economics and Business Press.

[17] Levinson, S. 1983. Pragmatics[M]. Cambridge, England: Cambridge University Press.

[18] Levinson, S. 2000. Presumptive Meanings: The Theory of Generalized Conversational Implicature[M]. Cambridge: MIT Press.

[19] Macagno, F. 2017. Defaults and inferences in interpretation[J]. Journal of Pragmatics, 117:280-290

[20] Macagno, F. 2018. Assessing relevance[J]. Lingua, 210:42-64.

[21] Macagno, F. & Zavatta, B. 2014. Reconstructing Metaphorical Meaning[J]. Argumentation, 28, 453-488.

[22] Price D. J. 1965. Networks of scientific papers[J]. Science. 149:510–5.

[23] Recanati, F. 2002. Does linguistic communication rest on inference?[J]. Mind & Language, 17(1/2), 105–126.

[24] Rees, A. & Bott, L. 2018. The role of alternative salience in the derivation of scalar implicatures[J]. Cognition, 176, 1-14.

[25] Searle, J. R. 1992. Conversation [A]. In John Searle, H. Parret et al. (eds.). (On) Searle on Conversation [C]. Amsterdam: John Benjamins Publishing Company.

[26] Sidnell J. & Stivers T. 2012. The Handbook of Conversation Analysis[M]. Wiley Blackwell.

[27] Sperber, D., & Wilson, D. 1986/1995. Relevance: Communication and Cognition[M]. Oxford: Blackwell.

[28] Skordos, D., & Papafragou, A. 2016. Children's derivation of scalar implicatures: Alternatives and relevance [J]. Cognition, 153, 6-18.

[29] Tannen, D. Hamilton, H. E. & Schiffrin D. 2015. The Handbook of Discourse Analysis[M].Wiley Blackwell.

[30] Xiong Xueliang. 1994. On pragmatic inference [J]. Journal of Tianjin Foreign Languages University, 1, 1-6.

[31] Xu Shenghuan. 1991. Pragmatic inference [J]. Journal of Foreign Languages, 6, 1-7.

[32] Verschueren, F. 2000. Understanding Pragmatics[M]. Beijing: Foreign Language Teaching and Research Press .