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Identifying Citation Classics in Fuzzy Decision Making Field using the Concept of H-Classics

M.J. Cobo[a,*], M.A. Martínez[b], M. Gutiérrez-Salcedo[c], M. Herrera[d], E. Herrera-Viedma[e]

[a]*Dept. Computer Science, University of Cádiz, Spain*
[b]*Dept. Social Work, International University of La Rioja (UNIR), Spain*
[c]*Dept. Management and Marketing, University of Jaén, Spain*
[d]*Dept. Sociology III, Distance Learning University of Spain (UNED), Spain*
[e]*Dept. Computer Science and A.I. (CITIC-UGR), University of Granada, Spain*

Abstract

Citation classics identify those highly cited papers which are an important reference point in a research field. Identifying citation classics in a research field is one of the main approaches used to conduct a systematic evaluation of research performance. Highly cited articles are interesting due to the potential association between high citation counts and high quality research.

The aim of this study is to identify and analyze the most frequently cited papers published into the Fuzzy Decision Making research field, using the H-Classics approach which is based in the well-known H-index. The Fuzzy Decision Making is represented by 70 highly citations classics which where published from 1981 to 2010. Furthermore, authors, affiliations, journals and the concept covered by those 70 highly cited documents are analyzed.

We identify three countries that have contributed substantially to development of the Fuzzy Decision Making research field: Spain, Peoples Republic of China and USA. Regarding the journals, *Fuzzy Sets and Systems*, *European Journal of Operation Research*, *IEEE Transactions on Fuzzy Systems* and *International Journal of Intelligent Systems* are the ones where the citations classics have been mainly published. Finally, the concepts covered by those citations classics are related with techniques and tools used in Fuzzy Sets theory and Fuzzy Decision Making research field, and terms related with Decision making theory and its developments.

Keywords: Citation classics; bibliometric measures; h-index; fuzzy decision making.

1. Introduction

Systematic evaluation of research performance has been emphasised for optimising research allocation, reorientating research support, rationalising research organisations, restricting research in particular fields, or augmenting research productivity [1]. Identifying citation classics in the field is one of the key methodologies to achieve these goals.

* Corresponding author.
E-mail address: manueljesus.cobo@uca.es

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Citation classics is a bibliometric concept introduced by Eugene Garfield[2] to designate those highly cited papers of a scientific discipline. It is currently defined as a highly cited publication as identified by the Science Citation Index, the Social Sciences Citation Index, or the Arts and Humanities Citation Index[3]. Citation classics help to discover potentially important information for the development of a discipline and also to understand the past, present and future of its scientific structure. According to[4] an analysis of the citation classics of a research field, i) allows to recognize the major advances in the discipline and to discover the hot topics to inspire other works in the area, ii) gives a historical perspective on the scientific progress of the speciality and iii) identifies also the main intellectual markers of the research field, such as journals, researchers, countries, universities, institutions or research groups.

Although the citation classics is a concept well understood by the scientific community, there is still no standard way to identify them[4]. There are two main approaches: setting citation thresholds[5] or choosing a number of papers in the top of the list of highly cited papers[2]. Although both methods have been widely used by the research community[6,7,8,9,10,11,12], they have as main drawback the identification of the specific threshold which will change depending on the analyzed field.

To overcome this drawback, recently M.A. Martínez et. al. proposed a method[4] to identify the citation classics based on the robust bibliometric measure H-index[13,14].

The main aim of this contribution is to identify the papers (articles and reviews) considered as classic in the Fuzzy Decision Making research field. Furthermore, the universities or institutions, authors, countries and journals which more have contributed to those citation classics are analyzed. Moreover, the thematics covered by those highly cited papers are shown.

The Fuzzy Decision Making[15,16] research field born from the synergy of the Decision Making and Fuzzy Sets research fields. Decision Making is a common task carried out by humans each day. Its goal is to find a best decision from among some possible options[16]. A lot of real world decision making processes take place in an environment in which the aims, the constraints and the consequences of possible actions are not precisely known. Thus, Fuzzy Sets theory[17,18] is a common tool used to deal with imprecision and vagueness problem, and also to represent the concept in a natural way through linguistic terms. In this sense, to deal with imprecision in the Decision Making research field, fuzzy set theory are employed.

This contribution is organized as follows: Section 2 describes the method used to identify the citation classics and the data used in this analysis. Section 3 shows the obtained results. Finally, some conclusions are drawn in Section 4.

2. Methodology and corpus

Bibliometrics is a science based on the citation analysis of the research documents and used mainly to evaluate research performance[4,3]. A basic assumption of citation analysis is that the more often a paper becomes cited the greater its influence on the field[19]. So, a higher citation rate indicates a higher quality[1]. In this sense, citation classics identify those highly cited papers which are an important reference point in a research field. Awareness of the citation classics in a field is advantageous to identify the authors who have published significant findings on particular research topics as well as the short- or long-term impact of their work from the literary perspective[1].

As aforementioned, the classic methods to identify the citation classics consist on to set a specific threshold (number of documents or citations count)[2,5]. The documents which exceed this threshold will be considered to belong to the set of citation classics. The selection of the threshold will depend on the research field to analyze, but there is no rigorous scientific argument to select it. In order to overcome this drawback a new approach based on the H-index is proposed in[4], called H-Classics.

Formally, the H-Classics is defined as[4]: "*H-Classics of a research area A could be defined as the H-core of A that is composed of the H highly cited papers with more than H citations received.*"

The identification process of the H-Classics of the Fuzzy Decision Making research field consists on the the following steps[4]:

- Selection of the bibliographic database to retrieve the scientific production and citations. ISI Web of Science (ISIWoS) was selected as bibliographic database due to it contains the most reliable and accurate citations data.
- Set the research area under study by defining a query to retrieve the articles and reviews of whole research field. Usually, the research are is delimited using the most important journal of the field, and filter those documents

by a set of terms or keywords[4]. In others case, the journals are complemented with those documents containing a set of keywords. In this contribution, we select the most important journals (JCR 2012) related to the field of Fuzzy Decision Making research field. Since, those journals publish documents related with other topics, a set of keywords was used in order to filter the papers to the research field under study. The query used to retrieve the corpus is: *SO=("FUZZY SETS AND SYSTEMS" OR "IEEE TRANSACTIONS ON FUZZY SYSTEMS" OR "INTERNATIONAL JOURNAL OF UNCERTAINTY FUZZINESS AND KNOWLEDGE BASED SYSTEMS" OR "JOURNAL OF INTELLIGENT FUZZY SYSTEMS" OR "INTERNATIONAL JOURNAL OF FUZZY SYSTEMS" OR "IRANIAN JOURNAL OF FUZZY SYSTEMS" OR "FUZZY OPTIMIZATION AND DECISION MAKING" OR "FUZZY LOGIC AND APPLICATIONS" OR "ROUGH SETS FUZZY SETS DATA MINING AND GRANULAR COMPUTING" OR "INFORMATION FUSION" OR "INFORMATION SCIENCE" OR "INTERNATIONAL JOURNAL OF INFORMATION TECHNOLOGY & DECISION MAKING" OR "IEEE TRANSACTIONS ON SYSTEMS MAN AND CYBERNETICS PART A-SYSTEMS AND HUMANS" OR "IEEE TRANSACTIONS ON SYSTEMS MAN AND CYBERNETICS PART B-CYBERNETICS" OR "INTERNATIONAL JOURNAL OF GENERAL SYSTEMS" OR "APPLIED SOFT COMPUTING" OR "SOFT COMPUTING" OR "KNOWLEDGE-BASED SYSTEMS" OR "CONTROL AND CYBERNETICS" OR "COMPUTERS & MATHEMATICS WITH APPLICATIONS" OR "EUROPEAN JOURNAL OF OPERATIONAL RESEARCH" OR "EXPERT SYSTEMS WITH APPLICATIONS" OR "INTERNATIONAL JOURNAL OF APPROXIMATE REASONING" OR "INTERNATIONAL JOURNAL OF INTELLIGENT SYSTEMS") AND TS=("fuzzy decision making" OR "fuzzy group decision making" OR "fuzzy preference*" OR "aggregation operator*" OR "fuzzy AHP*" OR "fuzzy analytic hierarchy process" OR "fuzzy majority" OR "fuzzy quantifier*") NOT TS="FUZZY QUERYING"*, which returns an amount of 1146 documents (articles and reviews).

- Calculate the H-index of the research field. Using the ISIWoS capabilities, the list of returned documents was ordered by citations count in order to compute the H-index of the Fuzzy Decision Making research area, obtaining a H-index of 70.
- Recover the H highly cited papers that are included in the H-Core. Then, we retrieve the 70 documents belonging to the H-Core in order to analyze the affiliation, publications data, and the topics covered by those documents. The list of full references is shown in Appendix A.

We should point out that the retrieved raw data was imported into the science mapping analysis open source software SciMAT[20,21] in order to build a knowledge base and perform a preprocessing step. In particular, a deduplication step was carried out over authors, affilliations and keywords in order to merge into one entity those items that represent the same author, affiliations, or concept, respectively. Finally, Wordle[1] was used to build the cloud tags.

3. Results and quantitative analysis

In this section, an quantitative analysis of the H-Classics of the Fuzzy Decision Making research field is done. Four aspects have been analyzed: i) longitudinal, ii) affiliations (authors and universities), iii) journals, and iv) most used terms or keywords.

The research conducted by the Fuzzy Decision Making community has a H-index of 70, thus, we identify as citation classics the top 70 highly cited papers. The first classics appears in 1981, in it Zadeh L.A described the fuzzy quantifiers in the context of natural language[15]. During the period 2000-2010 there are a great increase in the number of citations classics. In fact, 2000 is the year when more citation classics were published. The last citation classics were published in 2010. In Figure 1, the distribution of citation classics per year is shown.

The quantitative measures of authors and their affiliations are shown in Tables 1–3, where only those authors, universities or countries with more than two citation classics are shown.

Taking into account Tables 1–3, we should remark that Spain, its institutions and researchers are ranked in the first positions. In fact, the Spanish University of Granada have almost three times more citation classics that the second institutions in the rank (Iona College). Regarding the authors (Table 1), the Professors E. Herrera-Viedma (Spain),

[1] http://www.wordle.net/

F. Herrera (Spain), F. Chiclana (England), and Z.S. Xu (Peoples Republic of China) are the authors that more have contributed to de development of the Fuzzy Decision Making research field. Regarding the institutions or universities (Table 2), with the Spanish university of Granada, four of them stand out: Iona College (USA), De Montfort University (England), Southeast Univerity (Peoples Republic of China) and University of Jaén (Spain). Finally, we should remark that Peoples Republic of China and USA have published a high number of citations classics as can be shown in Table 3. They together with Spain are the three countries that more have contributed to the field of Fuzzy Decision Making.

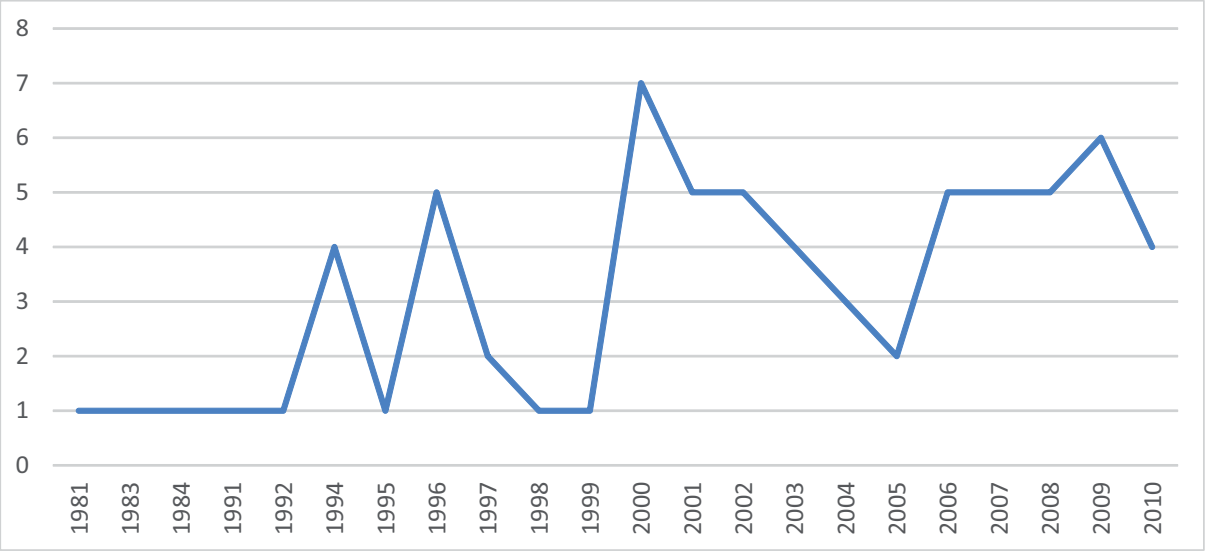

Fig. 1. Distribution of classics per year

Table 1. Authors with more than two classics.

Authors	**#documents**
Herrera-Viedma, E	16
Herrera, F	15
Chiclana, F	10
Xu, ZS	10
Yager, RR	6
Martínez, L	5
Alonso, S	4
Cheng, CH	3
Kacprzyk, J	3
Wei, GW	3
Chang, DY	2
Da, QL	2
Fedrizzi, M	2
Grabisch, M	2
Mata, F	2
Mikhailov, L	2
Nurmi, H	2
Szmidt, E	2

In Table 4 the journals that have published more than two citation classics are shown. We should remark that the journal *Fuzzy Sets and Systems* is the most important journal in the field of Fuzzy Decision Making, due to 20 of the highly cited papers have been published in that journal. Furthermore, along *Fuzzy Sets and Systems*, the journals i) *European Journal of Operation Research*, ii) *IEEE Transactions on Fuzzy Systems*, and iii) *International Journal of Intelligent Systems*, with 13, 9 and 8 citation classics respectively, have significantly contributed to the development

Table 2. Universities or institutions with more than tree classics.

Institution	#documents
University of Granada	17
Iona College	6
De Montfort University	5
Southeast University	5
University of Jaén	5
Chongqing University Arts & Science	3
Beijing Materials College	2
National Yunlin University Science & Technology	2
Polish Academy Science	2
Thomson-CSF, Central Research Laboratory	2
Tsing Hua University	2
University of Illes Balears	2
University of Trento	2
University of Turku	2

Table 3. Countries with more than three classics.

Country	#documents
Spain	20
Peoples R China	18
USA	10
England	8
Taiwan	7
Belgium	2
Finland	2
France	2
India	2
Italy	2
Poland	2
Turkey	2

of Fuzzy Decision Making research field. In fact, *Fuzzy Sets and Systems* and *IEEE Transactions on Fuzzy Systems* are the most important journal of the whole Fuzzy Sets research field.

Finally, in order to discover the thematic covered by the 70 citation classics of the Fuzzy Decision Making research field, a cloud tags (Figure 2) was built using the keywords provided by the authors and those provided by the bibliographic database (*ISI Keywords Plus*). The set of keywords were de-duplicated using SciMAT[21], in order to join those terms that represent the same concept. In Figure 2 the size of the terms are proportional to its frequency.

Table 4. Documents published by each journal.

Journal	#documents
FUZZY SETS AND SYSTEMS	20
EUROPEAN JOURNAL OF OPERATIONAL RESEARCH	13
IEEE TRANSACTIONS ON FUZZY SYSTEMS	9
INTERNATIONAL JOURNAL OF INTELLIGENT SYSTEMS	8
APPLIED SOFT COMPUTING	3
EXPERT SYSTEMS WITH APPLICATIONS	3
IEEE TRANSACTIONS ON SYSTEMS MAN AND CYBERNETICS PART A-SYSTEMS AND HUMANS	3
INTERNATIONAL JOURNAL OF APPROXIMATE REASONING	3
INTERNATIONAL JOURNAL OF GENERAL SYSTEMS	2
COMPUTERS & MATHEMATICS WITH APPLICATIONS	1
CONTROL AND CYBERNETICS	1
IEEE TRANSACTIONS ON SYSTEMS MAN AND CYBERNETICS PART B-CYBERNETICS	1
INFORMATION FUSION	1
INTERNATIONAL JOURNAL OF UNCERTAINTY FUZZINESS AND KNOWLEDGE-BASED SYSTEMS	1
KNOWLEDGE-BASED SYSTEMS	1

Analyzing Figure 2 we could identify terms related with techniques used in Fuzzy Decision Making research field, and terms related with its development.

- Regarding the techniques, we can appreciate four group of terms or keywords: i) those related with computing with words (*Linguistic-modeling*, *Linguistic-variables*, *Uncertain-linguistic-variables*, etc.), ii) terms related with preference relations (*Fuzzy-preference-relations*, *Multiplicative-preference-relations*, *Incomplete-preference-relations*, etc.), iii) keywords related with the family of aggregation operators (*OWA-operators*, *IOWA-operator*, etc.), and iv) terms related with Analytical Hierarchy Process. Moreover, we could appreciate terms related with advances fuzzy techniques, such as, Intuitionistic fuzzy sets or Vague sets.
- Regarding the terms related with Decision making, we could identify advance development in the field, such as, *Group-decision-making*, *Multicriteria-decision-making*, *Multiperson-decision-making* or *Decision-support-systems*. Furthermore, we could appreciate terms related with Consensus and Majority.

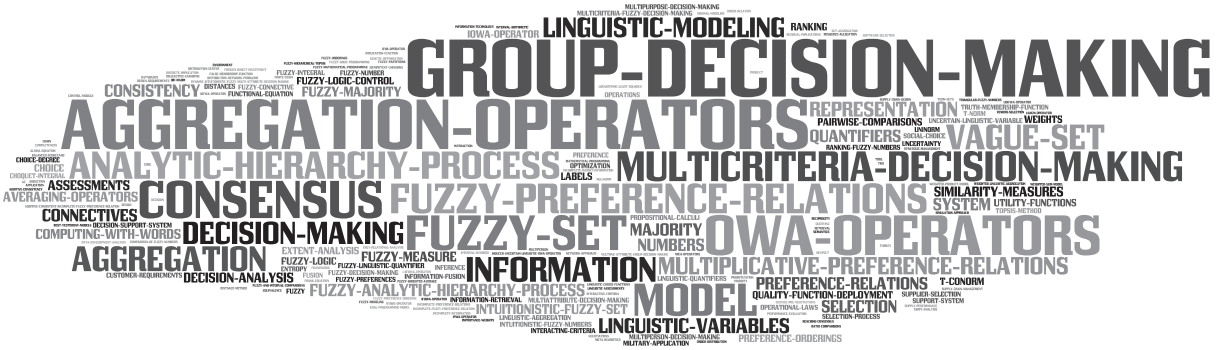

Fig. 2. Cloud tags

4. Concluding remarks

In this contribution a bibliometric analysis in order to identify the citation classics of the Fuzzy Decision Making research area is performed. Citation classics allow to identify those highly cited papers which are an important reference point in a research field.

The characterization of the citation classics is performed through the concept of H-Classics[4] which is based in the robust and rigorous bibliometric measure H-Index[14]. Moreover, the H-Classics is not biased by the dimension or citation patterns of the research area, and it is a criterion sensitive to the dimension and citation pattern of a research area.

An amount of 70 citation classics were identified in the Fuzzy Decision Making research field. Those documents, have been analyzed in order to show their authors, affiliations, journals and topics covered.

Acknowledgements

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6. Feijoo JF, Limeres J, Fernández-Varela M, Ramos I, Diz P. The 100 most cited articles in dentistry. *Clinical oral investigations* 2013;:1–8.
7. Ibrahim GM, Carter Snead O, Rutka JT, Lozano AM. The most cited works in epilepsy: Trends in the "citation classics". *Epilepsia* 2012; **53**(5):765–70.
8. Ponce FA, Lozano AM. Highly cited works in neurosurgery. part ii: the citation classics: A review. *Journal of neurosurgery* 2010;**112**(2):233–46.
9. Ponce FA, Lozano AM. The most cited works in parkinson's disease. *Movement Disorders* 2011;**26**(3):380–90.
10. Stack S. Citation classics in suicide and life threatening behavior: A research note. *Suicide and Life-Threatening Behavior* 2012;**42**(6):628–39.
11. Stack S. Citation classics in deviant behavior: A research note. *Deviant Behavior* 2013;**34**(2):85–96.
12. Tam WW, Wong EL, Wong FC, Hui DS. Citation classics: Top 50 cited articles in respiratory system. *Respirology* 2013;**18**(1):71–81.
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Appendix A. H-Core research documents list

Table A.5: H-Core: list with the 70 highly cited documents of Fuzzy Decision Making research field

Rank	Paper	#Citations
1	ZADEH LA. A Computational Approach To Fuzzy Quantifiers In Natural Languages. Computers & Mathematics With Applications 9:1 149-184 (1983).	735
2	CHANG DY. Applications Of The Extent Analysis Method On Fuzzy Ahp. European Journal Of Operational Research 95:3 649-655 (1996).	517
3	HERRERA F, MARTINEZ L. A 2-tuple Fuzzy Linguistic Representation Model For Computing With Words. Ieee Transactions On Fuzzy Systems 8:6 746-752 (2000).	484
4	HERRERA F, HERRERA-VIEDMA E. Linguistic Decision Analysis: Steps For Solving Decision Problems Under Linguistic Information. Fuzzy Sets And Systems 115:1 67-82 (2000).	458
5	VAIDYA OS, KUMAR S. Analytic Hierarchy Process: An Overview Of Applications. European Journal Of Operational Research 169:1 1-29 (2006).	320
6	CHICLANA F, HERRERA F, HERRERA-VIEDMA E. Integrating Three Representation Models In Fuzzy Multipurpose Decision Making Based On Fuzzy Preference Relations. Fuzzy Sets And Systems 97:1 33-48 (1998).	318
7	HERRERA F, HERRERA-VIEDMA E, VERDEGAY JL. A Model Of Consensus In Group Decision Making Under Linguistic Assessments. Fuzzy Sets And Systems 78:1 73-87 (1996).	314
8	XU ZS, DA QL. An Overview Of Operators For Aggregating Information. International Journal Of Intelligent Systems 18:9 953-969 (2003).	263
9	TANINO T. Fuzzy Preference Orderings In Group Decision-making. Fuzzy Sets And Systems 12:2 117-131 (1984).	262
10	HONG DH, CHOI CH. Multicriteria Fuzzy Decision-making Problems Based On Vague Set Theory. Fuzzy Sets And Systems 114:1 103-113 (2000).	259
11	GRABISCH M. The Application Of Fuzzy Integrals In Multicriteria Decision Making. European Journal Of Operational Research 89:3 445-456 (1996).	247
12	YAGER RR, RYBALOV A. Uninorm Aggregation Operators. Fuzzy Sets And Systems 80:1 111-120 (1996).	237

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Table A.5 – *Continued from previous page*

Rank	Paper	#Citations
13	CHEN SM, TAN JM. Handling Multicriteria Fuzzy Decision-making Problems Based On Vague Set-theory. Fuzzy Sets And Systems 67:2 163-172 (1994).	234
14	HERRERA F, HERRERA-VIEDMA E, MARTINEZ L. A Fusion Approach For Managing Multi-granularity Linguistic Term Sets In Decision Making. Fuzzy Sets And Systems 114:1 43-58 (2000).	231
15	HERRERA-VIEDMA E, HERRERA F, CHICLANA F, LUQUE M. Some Issues On Consistency Of Fuzzy Preference Relations. European Journal Of Operational Research 154:1 98-109 (2004).	222
16	BORDOGNA G, FEDRIZZI M, PASI G. A Linguistic Modeling Of Consensus In Group Decision Making Based On Owa Operators. Ieee Transactions On Systems Man And Cybernetics Part A-systems And Humans 27:1 126-132 (1997).	219
17	XU ZS, YAGER RR. Some Geometric Aggregation Operators Based On Intuitionistic Fuzzy Sets. International Journal Of General Systems 35:4 417-433 (2006).	217
18	CHICLANA F, HERRERA F, HERRERA-VIEDMA E. Integrating Multiplicative Preference Relations In A Multipurpose Decision-making Model Based On Fuzzy Preference Relations. Fuzzy Sets And Systems 122:2 277-291 (2001).	212
19	XU ZS. Intuitionistic Fuzzy Aggregation Operators. Ieee Transactions On Fuzzy Systems 15:6 1179-1187 (2007).	204
20	GRABISCH M. Fuzzy Integral In Multicriteria Decision-making. Fuzzy Sets And Systems 69:3 279-298 (1995).	195
21	XU ZS. An Overview Of Methods For Determining Owa Weights. International Journal Of Intelligent Systems 20:8 843-865 (2005).	194
22	HERRERA F, HERRERA-VIEDMA E. Aggregation Operators For Linguistic Weighted Information. Ieee Transactions On Systems Man And Cybernetics Part A-systems And Humans 27:5 646-656 (1997).	185
23	KAHRAMAN C, ERTAY T, BUYUKOZKAN, G. A Fuzzy Optimization Model For Qfd Planning Process Using Analytic Network Approach. European Journal Of Operational Research 171:2 390-411 (2006).	181
24	KACPRZYK J, FEDRIZZI M, NURMI H. Group Decision-making And Consensus Under Fuzzy Preferences And Fuzzy Majority. Fuzzy Sets And Systems 49:1 21-31 (1992).	181
25	HERRERA F, HERRERA-VIEDMA E, CHICLANA F. Multiperson Decision-making Based On Multiplicative Preference Relations. European Journal Of Operational Research 129:2 372-385 (2001).	178
26	HERRERA-VIEDMA E, HERRERA F, CHICLANA F. A Consensus Model For Multiperson Decision Making With Different Preference Structures. Ieee Transactions On Systems Man And Cybernetics Part A-systems And Humans 32:3 394-402 (2002).	177
27	HERRERA-VIEDMA E, MARTINEZ L, MATA F, CHICLANA F. A Consensus Support System Model For Group Decision-making Problems With Multigranular Linguistic Preference Relations. Ieee Transactions On Fuzzy Systems 13:5 644-658 (2005).	162
28	CHENG CH, LIN Y. Evaluating The Best Main Battle Tank Using Fuzzy Decision Theory With Linguistic Criteria Evaluation. European Journal Of Operational Research 142:1 174-186 (2002).	150
29	CHEN CT. A Fuzzy Approach To Select The Location Of The Distribution Center. Fuzzy Sets And Systems 118:1 65-73 (2001).	149
30	XU ZS, DA QL. The Uncertain Owa Operator. International Journal Of Intelligent Systems 17:6 569-575 (2002).	138
31	NURMI H. Approaches To Collective Decision-making With Fuzzy Preference Relations. Fuzzy Sets And Systems 6:3 249-259 (1981).	137
32	ZHU KJ, JING Y, CHANG, DY. A Discussion On Extent Analysis Method And Applications Of Fuzzy Ahp. European Journal Of Operational Research 116:2 450-456 (1999).	133
33	WEI GW. Some Induced Geometric Aggregation Operators With Intuitionistic Fuzzy Information And Their Application To Group Decision Making. Applied Soft Computing 10:2 423-431 (2010).	128
34	XU ZS, YAGER RR. Dynamic Intuitionistic Fuzzy Multi-attribute Decision Making. International Journal Of Approximate Reasoning 48:1 246-262 (2008).	127
35	LEUNG LC, CAO D. On Consistency And Ranking Of Alternatives In Fuzzy Ahp. European Journal Of Operational Research 124:1 102-113 (2000).	127

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Table A.5 – *Continued from previous page*

Rank	Paper	#Citations
36	TRIANTAPHYLLOU E, LIN CT. Development And Evaluation Of Five Fuzzy Multiattribute Decision-making Methods. International Journal Of Approximate Reasoning 14:4 281-310 (1996).	127
37	HERRERA-VIEDMA E, ALONSO S, CHICLANA F, HERRERA F. A Consensus Model For Group Decision Making With Incomplete Fuzzy Preference Relations. Ieee Transactions On Fuzzy Systems 15:5 863-877 (2007).	124
38	MIKHAILOV L. Deriving Priorities From Fuzzy Pairwise Comparison Judgements. Fuzzy Sets And Systems 134:3 365-385 (2003).	124
39	HERRERA-VIEDMA E, CHICLANA F, HERRERA F, ALONSO S. Group Decision-making Model With Incomplete Fuzzy Preference Relations Based On Additive Consistency. Ieee Transactions On Systems Man And Cybernetics Part B-cybernetics 37:1 176-189 (2007).	119
40	YAGER RR. Induced Aggregation Operators. Fuzzy Sets And Systems 137:1 59-69 (2003).	113
41	HERRERA F, HERRERA-VIEDMA E, MARTINEZ L. A Fuzzy Linguistic Methodology To Deal With Unbalanced Linguistic Term Sets. Ieee Transactions On Fuzzy Systems 16:2 354-370 (2008).	110
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45	BORAN FE, GENC S, KURT M, AKAY D. A Multi-criteria Intuitionistic Fuzzy Group Decision Making For Supplier Selection With Topsis Method. Expert Systems With Applications 36:8 11363-11368 (2009).	101
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47	SENGUPTA A, PAL TK. On Comparing Interval Numbers. European Journal Of Operational Research 127:1 28-43 (2000).	94
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