An Analytical Insight to Investigate the Research Patterns in the Realm of Type-2 Fuzzy Logic

Submitted: 10th April 2018, accepted: 15th May 2018

Sonakshi Vij, Amita Jain, Devendra Tayal, Oscar Castillo

DOI: 10.14313/JAMRIS_2-2018/8

Abstract:
Fuzzy logic has always been one of the key research areas in the field of computer science as it helps in dealing with the real world vagueness and uncertainty. In recent years, a variant of it, Type-2 Fuzzy Logic has gained enormous popularity for research purposes. In this paper, an analytical insight is provided into the research patterns of Type-2 Fuzzy logic. Web of Science has been used as the data source which consists of Science Citation Index-Expanded (SCI-E), SSCI, A&HCI and ESCI indexed research papers. 600 research papers were extracted from it in the field of Type-2 fuzzy logic from the year 2000 to 2016, which are analyzed both manually and in an automated manner. The performed study is Scientometric in nature and helps in answering research questions like control terms and top authors in this field, the growth pattern in research publications, top funding agencies and countries etc. The major goal of this study is to analyze the research work in type-2 fuzzy logic so as to track the growth of this discipline through the years and envision future trends in this area.

Keywords: *scientometric analysis, Type 2 fuzzy logic, Type 2 fuzzy systems, Type 2 fuzzy control, Type 2 fuzzy set*

1. Introduction

Fuzzy logic (Type-1 Fuzzy Logic) caters to the multi-valued logic. It represents a novel concept in the sense that the "*truth value*" of any variable under consideration may lie from 0 to 1 [1]. Type-2 fuzzy logic is the generalization of type-1 fuzzy logic which has the capability to handle a higher level of uncertainty. This is established from the fact that since the invention of type-1 fuzzy logic, there was a speculation in researchers that it doesn't have any uncertainty value associated with the corresponding membership function. The father of fuzzy logic, Zadeh, provided a solution to solve this issue by introducing the concept of type-2 fuzzy logic. He introduced the type-2 fuzzy sets which have a unique concept associated with it that is called the "Footprint of Uncertainty" [1]. This means that in order to classify any set as type-2 fuzzy set, an uncertainty value has to be associated with its membership function which would in turn help in dealing with the real world vagueness.

Type-2 fuzzy logic can help solving or improving solutions in many fields, as can be seen by the diversity of the papers covered in this review paper, and as such in theory it could be considered as a general form of modeling and coping with uncertainty in any area of application. However, there are limitations and challenges in this area, for example: how to optimally design the structure of the type-2 fuzzy systems, how to find the optimal parameter values for a particular application, when to apply modularity or granularity to improve results, just to mention a few. In addition, the particular form of type-2 fuzzy models could be application dependent, and if this is the case, finding these forms for particular classes of problems is a crucial task. In this sense, this paper is the first step in analyzing what has been achieved to the moment by the type-2 fuzzy research community, and then what can also be done in the future.

This paper presents an in-depth analysis to chart and map the progress of research work in the field of Type-2 fuzzy logic from the year 2000-2016 based on the research papers retrieved from web of science. The major goal of this study is to analyze the research work in type-2 fuzzy logic so as to track the growth of this discipline through the years. The study performed in this paper helps in answering the following imperative research questions:

1) What has been the growth rate in the field of type-2 fuzzy logic in terms of research publications?
2) Which journals account for the maximum publication in the field of type-2 fuzzy logic?
3) Which countries and institutes offer higher participation in the field of type-2 fuzzy logic?
4) Which authors have contributed significantly in the research publications pertaining to the field of type-2 fuzzy logic?
5) What has the ratio been of paid vs. open access publications in the field of type-2 fuzzy logic?
6) Which funding agencies have contributed the maximum in providing grants for the concerned research project based papers in the field of type-2 fuzzy logic?
7) What are the various types of research papers available in the field of type-2 fuzzy logic? Whether they are articles or proceeding papers or do they lie in any other category?
8) Which are the most cited research papers in the field of type-2 fuzzy logic and in which research domain do they lie?

Table 1. Details of the dataset

Data Source	Search Query	Time Period	Number of research papers extracted	Indexing
WOS (web of science)	TI=(Type 2 fuzzy logic OR type 2 fuzzy systems OR type 2 fuzzy control OR type 2 fuzzy pattern recognition OR type 2 fuzzy clustering OR type 2 fuzzy classification OR type 2 fuzzy set)	2000-2016	600	SCI-EXPANDED, SSCI, A&HCI, ESCI

9) Which control terms are associated with type-2 fuzzy logic?
10) What is the scenario regarding the inter country collaboration for research in type-2 fuzzy logic?

This paper assists in answering the above mentioned research questions, which would in turn help in understanding the discipline in a more elaborate manner. This type of work in the field of type-2 fuzzy logic is one of its kinds as it statistically highlights the various aspects related to it. Section 2 of the paper describes the data source and the methodology adopted for study in this paper, while Section 3 presents the results along with a detailed analysis. The work is concluded in Section 4.

2. Data and Methodology

The analysis is performed on a set of research papers obtained by using WOS (Web of Science) as the data source. WOS (Web of Science) is a database that consists of Science Citation Index-Expanded (SCI-E), SSCI, A&HCI and ESCI indexed research papers of various types (articles, reviews, proceeding papers etc.) in several languages. The details of the dataset used are given as in Table 1.

3. Detailed Analysis

This section presents the data collected through WOS [2-601] which is analyzed both manually and in an automated manner for studying the patterns of research in type-2 fuzzy logic.

a) Year-wise publication and growth pattern analysis:

The 600 research papers were analyzed to present the data about the number of research publications in each year from 2000 to 2016. It can be noted from Table 2 that recent years (2015 and 2016) have seen a boost in terms of type-2 fuzzy logic research publications. In order to track the growth in the number of research papers, we have calculated two scientometric measures namely Relative Growth Rate (RGR) and Doubling Time (DT). Figure 1 shows the number of research publications each year.

$$RGR = (\ln N_2 - \ln N_1)/T_2 - T_1 \text{.....} \quad (1)$$

$$DT = \ln 2/RGR \text{.....} \quad (2)$$

RGR is a measure that represents the relative growth in the number of research publications with respect to time. On the other hand DT highlights the time that is needed for the number of research papers in a particular year to become double of its current amount. From Figure 2 it can be seen that RGR and DT are inversely proportional to each other.

Table 2. NOP (Number of Papers) each year from 2000 to 2016 with DT and RGR

Year	NOP	CUM	RGR	DT
2000	4	4	0.000	0.000
2001	2	6	0.405	1.711
2002	3	9	0.405	1.711
2004	7	16	0.575	1.205
2005	4	20	0.223	3.107
2006	7	27	0.300	2.310
2007	19	46	0.532	1.302
2008	27	73	0.461	1.503
2009	33	106	0.372	1.862
2010	27	133	0.226	3.066
2011	59	192	0.367	1.888
2012	52	244	0.239	2.899
2013	65	309	0.236	2.936
2014	87	396	0.248	2.794
2015	104	500	0.233	2.974
2016	100	600	0.182	3.807

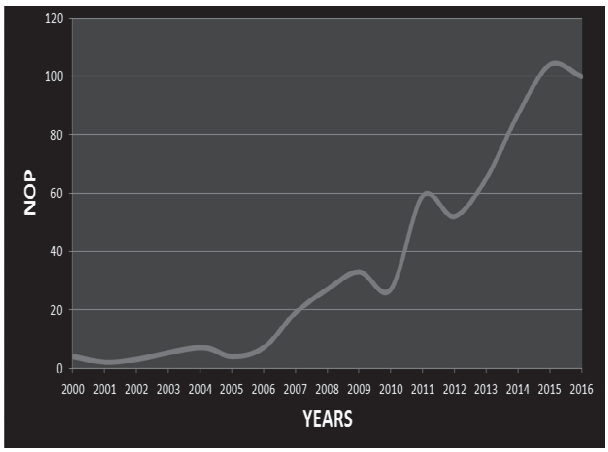

Fig. 1. Number of research papers published in type-2 fuzzy logic from 2000 to 2016

b) Country-wise contribution:

The top 30 countries contributing to the research publications in type-2 fuzzy logic are presented in Table 3 and illustrated pictorially as in Figure 3. For performing this type of analysis, the search query was further filtered to extract countries where the research publication record was greater than 1. It can

be observed that China accounts for the maximum number of research papers while USA gets the second rank. Iran and Taiwan also contribute significantly to the research publications in this field.

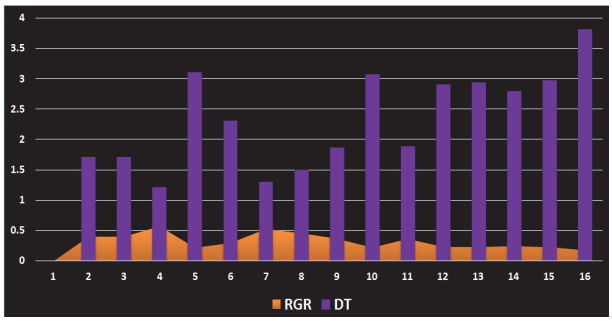

Fig. 2. RGR and DT for research papers published in type-2 fuzzy logic from 2000 to 2016

Table 3. Top 30 countries contributing to the research publication in type-2 fuzzy logic

S.No.	Country	Record Count
1	Peoples R China	117
2	USA	85
3	Iran	78
4	Taiwan	78
5	England	64
6	Turkey	49
7	Mexico	40
8	Canada	31
9	India	30
10	Australia	19
11	Saudi Arab	19
12	Italy	18
13	Singapore	17
14	Malaysia	14
15	South Korea	14
16	Poland	13
17	Algeria	11
18	Spain	9
19	Egypt	8
20	France	6
21	Vietnam	5
22	Belgium	4
23	Japan	4
24	Brazil	3
25	Lithuania	3
26	Slovakia	3
27	Czech Republic	2
28	Norway	2
29	Pakistan	2
30	Venezuela	2

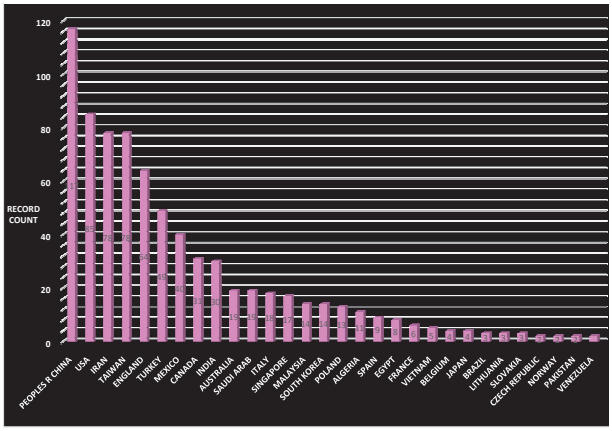

Fig. 3. Top 30 countries in terms of research publication count in type-2 fuzzy logic from 2000 to 2016

c) Top journals:

Table 4 and Figure 4 show the data for record count of research papers published in various journals. As far as the publication of research works for type-2 fuzzy logic is being concerned in WOS from the period of 2000 to 2016, the IEEE Transactions on fuzzy systems holds the top position. The second and third spots go to Information Sciences and Applied Soft Computing respectively. It is also worth observing that about 41.67% of the top 10 journals are from Elsevier publishers while 16.67% are from IEEE publishers.

Table 4. Record count of research papers published in various journals

S.No.	Journal	Record Count	Publication house
1	IEEE Transactions on Fuzzy Systems	87	IEEE
2	Information Sciences	60	ELSEVIER
3	Applied Soft Computing	42	ELSEVIER
4	Expert Systems with Applications	24	ELSEVIER
5	Soft Computing	22	SPRINGER
6	Neuro computing	18	ELSEVIER
7	Engineering Applications of Artificial Intelligence	16	ELSEVIER
8	Journal of Intelligent Fuzzy Systems	14	IOS PRESS
9	IEEE Computational Intelligence Magazine, International Journal of Fuzzy Systems	11	IEEE, SPRINGER
10	International Journal of Innovative Computing Information And Control, International Journal of Uncertainty Fuzziness and Knowledge Based Systems	9	KYUSHU TOKAI UNIVERSITY, WORLD SCIENTIFIC

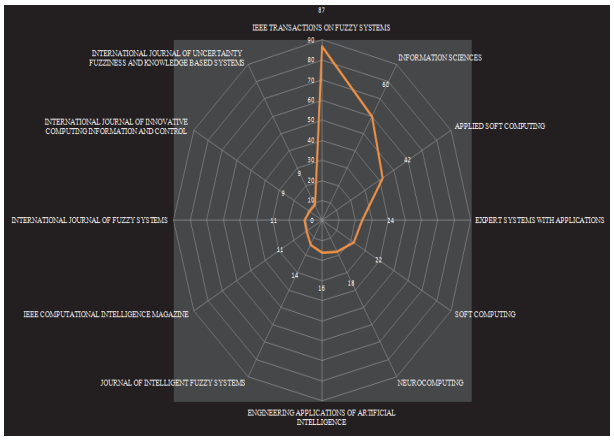

Fig. 4. Top 10 journals contributing to research publications in type-2 fuzzy logic from 2000 to 2016

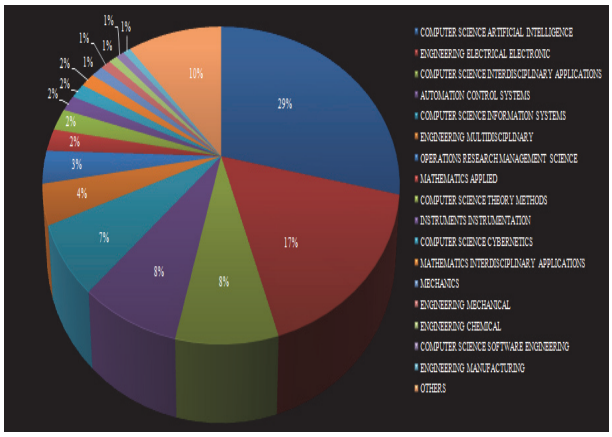

Fig. 5. Top WOS categories of research for type-2 fuzzy logic from 2000 to 2016

d) Category wise growth:

Several categories are defined in the WOS Core, which help in determining the domain of the research papers. As far as the study is being concerned for type-2 fuzzy logic, it can be easily observed from Figure 5 and Table 5 that the topmost category i.e. the one having number of research papers is computer science artificial intelligence. It is well justified too since fuzzy logic itself is a part of artificial intelligence which is a branch of computer science.

Table 5. WOS category wise research paper count

S.No.	WOS Category	Record Count
1	Computer Science Artificial Intelligence	326
2	Engineering Electrical Electronic	190
3	Computer Science Interdisciplinary Applications	88
4	Automation Control Systems	88
5	Computer Science Information Systems	78
6	Engineering Multidisciplinary	46
7	Operations Research Management Science	38
8	Mathematics Applied	26
9	Computer Science Theory Methods	26
10	Instruments Instrumentation	19
11	Computer Science Cybernetics	18
12	Mathematics Interdisciplinary Applications	17
13	Mechanics	14
14	Engineering Mechanical	12
15	Engineering Chemical	10
16	Computer Science Software Engineering	10
17	Engineering Manufacturing	9
18	Others	115

e) Research Domain:

All the 600 research papers that are under consideration for this study were analyzed to find in which research domain they lie. Table 6 presents the data for the same which is also visualized in Figure 6.

Table 6. Research area wise record count

S.No.	Research Area	Record Count
1	Computer Science	439
2	Engineering	260
3	Automation Control Systems	88
4	Mathematics	42
5	Operations Research Management Science	38
6	Instruments Instrumentation	19
7	Mechanics	14
8	Environmental Sciences Ecology, Science Technology Other Topics	8
9	Energy Fuels	7
10	Physics, Robotics	5
11	Business Economics, Metallurgy Metallurgical Engineering	4
12	Education Educational Research, Materials Science, Telecommunications	3
13	Medical Informatics	2

f) Type of access:

The papers under concern fall under two categories regarding the type of access: Open access and Paid access. Figure 7 helps in comprehending that 578 publications i.e. 96.3% of these research papers are having paid access while the rest 22 which constitute about 3.6% of the lot have open access.

g) Top authors according to record count:

The top authors were identified according to the record count. It can be noted that J.M. Mendel is the top author with 47 research papers from the year 2000 to 2016. O. Castillo holds the second position with 34 research papers. This data is recorded in Table 7.

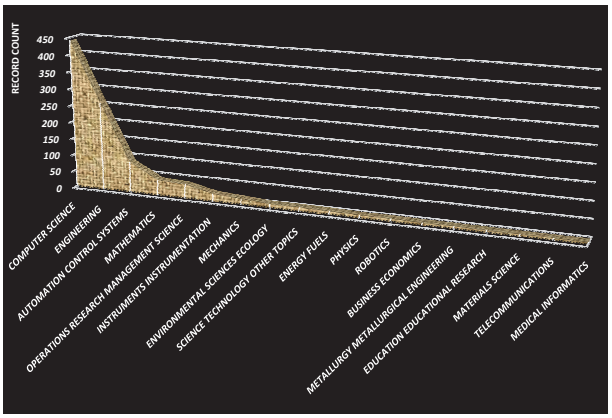

Fig. 6. Research area wise record count for research papers under consideration

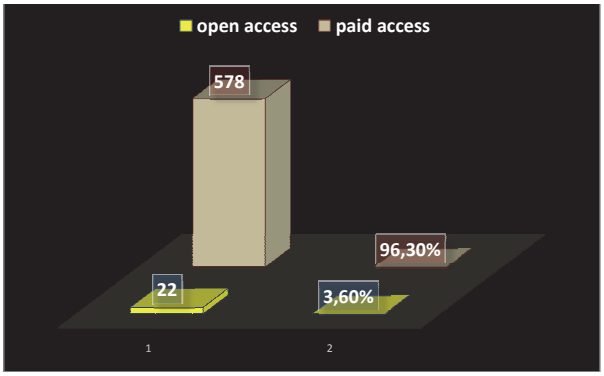

Fig. 7. Types of access of research publications in type-2 fuzzy logic from 2000 to 2016

Table 7. Top authors according to record count

S.No.	Author	Record count
1	MENDEL JM	47
2	CASTILLO O	34
3	MELIN P	25
4	HAGRAS H	20
5	ZARANDI MHF	17
6	KAYNAK O	13
7	LAM HK	13
8	LI HY	13
9	CHEN SM	11
10	JOHN RI	11
11	LIN TC	11
12	TURKSEN IB	11
13	KAYACAN E	10
14	ZHAO T	10

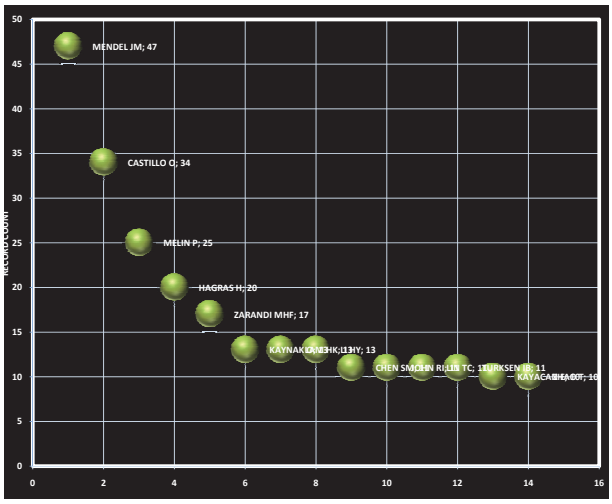

Fig. 8. Visualization of research paper record count for top authors

The year wise data for record count of the top 3 authors is recorded as in Table 8. Figure 9 visualizes this data, from which it can be concluded that J.M. Mendel published the maximum papers in 2007 while O. Castillo and P. Melin published their maximum papers in 2014.

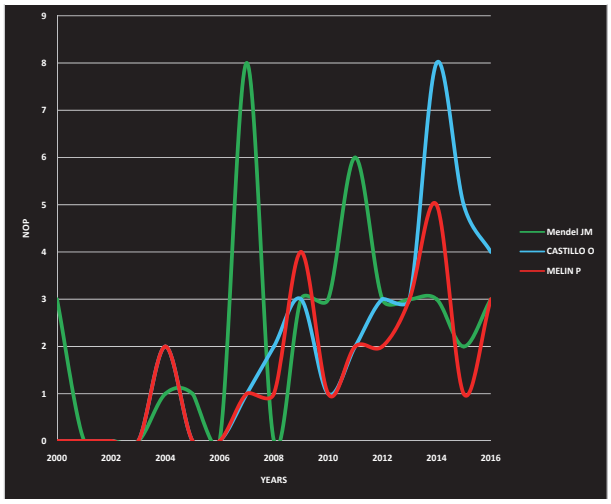

Fig. 9. Top 3 author's research publications from 2000 to 2016

h) Most cited research papers:

In this study, top 5 research publications have been identified according to the number of citations, as shown in Table 9. The research paper titled "Type-2 fuzzy sets made simple" is the most cited one (953 times). The average citation for this paper is 59.56. When analyzed, it was found that among all the papers that cited it, 355 belonged to the "Computer Science" research domain. Another research

Table 8. Year wise record count of top 3 authors

Year/Author	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Mendel	3	0	0	0	1	1	0	8	0	3	3	6	3	3	3	2	3
CASTILLO	0	0	0	0	2	0	0	1	2	3	1	2	3	3	8	5	4
MELIN	0	0	0	0	2	0	0	1	1	4	1	2	2	3	5	1	3

domain catering to the citations of this research paper is "Engineering". This shows the popularity of this paper in various domains, as presented in Table 10. Tables 11–14 show the research areas corresponding to papers ranked 2–5. The data from these is used to map the research papers to various research domains as shown in Figure 10.

Table 9. Citation and average citation count for top 5 research papers

S.No.	Research Paper	Total Citation	Average Citation
1	Type-2 fuzzy sets made simple	953	59.56
2	Interval type-2 fuzzy logic systems: Theory and design	782	43.44
3	Interval type-2 fuzzy logic systems made simple	647	53.92
4	Centroid of a type-2 fuzzy set	496	29.18
5	A hierarchical type-2 fuzzy logic control architecture for autonomous mobile robots	456	32.57

Table 10. Top 5 research areas corresponding to paper titled "Type-2 fuzzy sets made simple"

S.No.	Research area	Record count
1	Computer Science	355
2	Engineering	187
3	Automation Control Systems	54
4	Mathematics	42
5	Operations Research Management Science	23

Table 11. Top 5 research areas corresponding to paper titled "Interval type-2 fuzzy logic systems: Theory and design"

S. No.	Research area	Record count
1	Computer Science	296
2	Engineering	185
3	Automation Control Systems	65
4	Mathematics	26
5	Instruments Instrumentation	18

Table 12. Top 5 research areas corresponding to paper titled "Interval type-2 fuzzy logic systems made simple"

S.No.	Research area	Record count
1	Computer Science	277
2	Engineering	154
3	Automation Control Systems	49
4	Mathematics	35
5	Operations Research Management Science	33

Table 13. Top 5 research areas corresponding to paper titled "Centroid of a type-2 fuzzy set"

S.No.	Research area	Record count
1	Computer Science	221
2	Engineering	122
3	Automation Control Systems	34
4	Mathematics	25
5	Operations Research Management Science	17

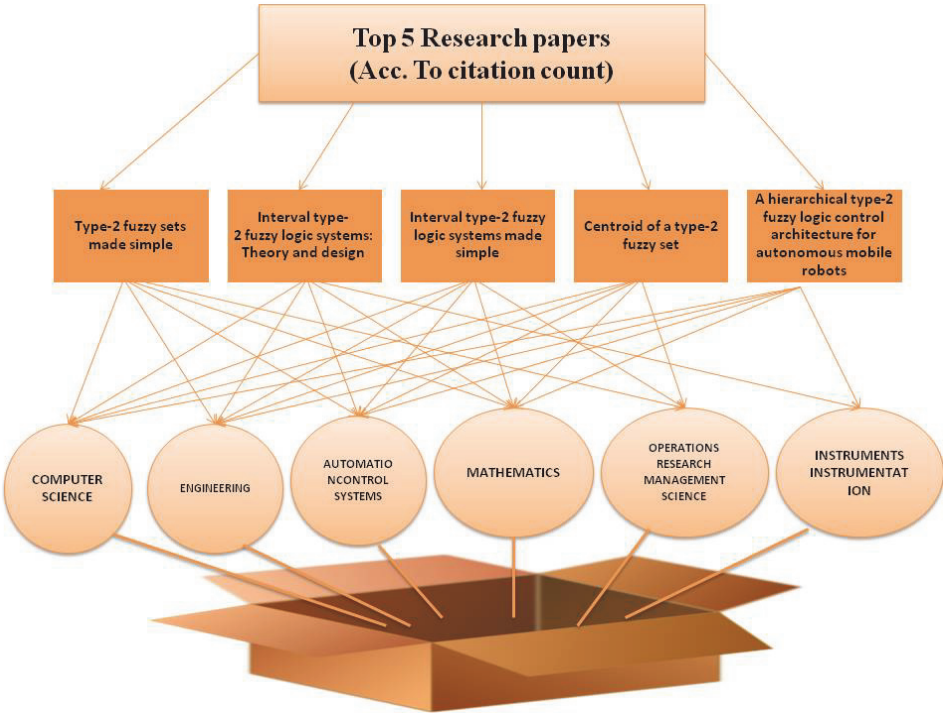

Fig. 10. Top 5 research publications from 2000 to 2016 mapped to their research areas

Table 14. Top 5 research areas corresponding to paper titled "A hierarchical type-2 fuzzy logic control architecture for autonomous mobile robots"

S.No.	Research area	Record count
1	Computer Science	174
2	Engineering	110
3	Automation Control Systems	47
4	Mathematics	12
5	Instruments Instrumentation	11

Table 15. Top 10 funding agencies

S.No.	Funding agencies	Record count
1	National Natural Science Foundation of China	65
2	National Science Council Taiwan	17
3	Fundamental Research Funds for the Central Universities	14
4	National Science Council Republic Of China	11
5	Program For New Century Excellent Talents In University	10
6	Australian Research Council, Bogazici University, Conacyt	8
7	Program for Liaoning Excellent Talents In University	7
8	National Nature Science Foundation of China, National Science Council Of Taiwan	6
9	Centre for Intelligent Systems Research Cisr At Deakin University, Tubitak	5
10	973 Program of China, Fok Ying Tung Education Foundation of China, Key Laboratory of Integrated Automation for The Process Industry Northeast University, Natural Science Foundation of Hebei Province of China, Program for Liaoning Innovative Research Team in University, Taiwan National Science Council, Zhujiang New Star	4

i) Top 10 Funding agencies:

Various research papers were found to be funded by some agencies that provided a research grant to carry out that research. These are listed in the table below. The top 4 countries corresponding to these agencies were analyzed and the mapped (in yellow color) on the world map as shown in Figure 11. It can be comprehended that China grants the maximum number of research grants in this aspect.

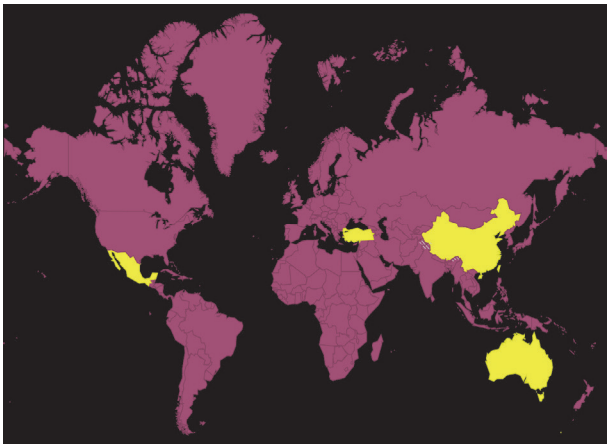

Fig. 11. World mapping of top 4 countries with maximum number of grants from funding agencies

j) Major Applications:

Type-2 fuzzy logic has always been associated with research applications catering to domains like classification, clustering, image processing etc. In our study, we evaluated the major research applications of type-2 fuzzy logic which are tabulated in Table 16. It can be inferred that control is the top most research application area, followed by clustering and classification.

Table 16. Major research applications of Type-2 fuzzy logic

S.No.	Application	Record count
1	Control	138
2	Clustering	27
3	Classification	18
4	Filtering	17
5	Image Processing, Image Segmentation	9

k) Control terms and density plot:

In order to gain better understanding of the research topics in the field of Type-2 fuzzy logic, some control terms need to be identified. These terms are the most frequently occurring author keywords that are extracted using both the title and the abstract of the research articles. In this paper, the 600 research articles from 2000 to 2016 have been analyzed and the density plot for the same has been created, as shown in Figure 12.

Figure 12 shows the density plot for all the control terms, simulated on VOSviewer. Control terms are the most frequently occurring terms. There are various clusters in this figure like the one centered on the control term "controller". The fact that the terms like fuzzy logic controller, feedback error, filter etc are centered around it helps in establishing a fact that research papers concerned with controller also deal with filters, feedback errors, tracking error, stability condition etc.

l) Inter-Country collaboration:

The research publication record of these 600 research papers was manually analyzed to find out the country of each author, which assisted in knowing

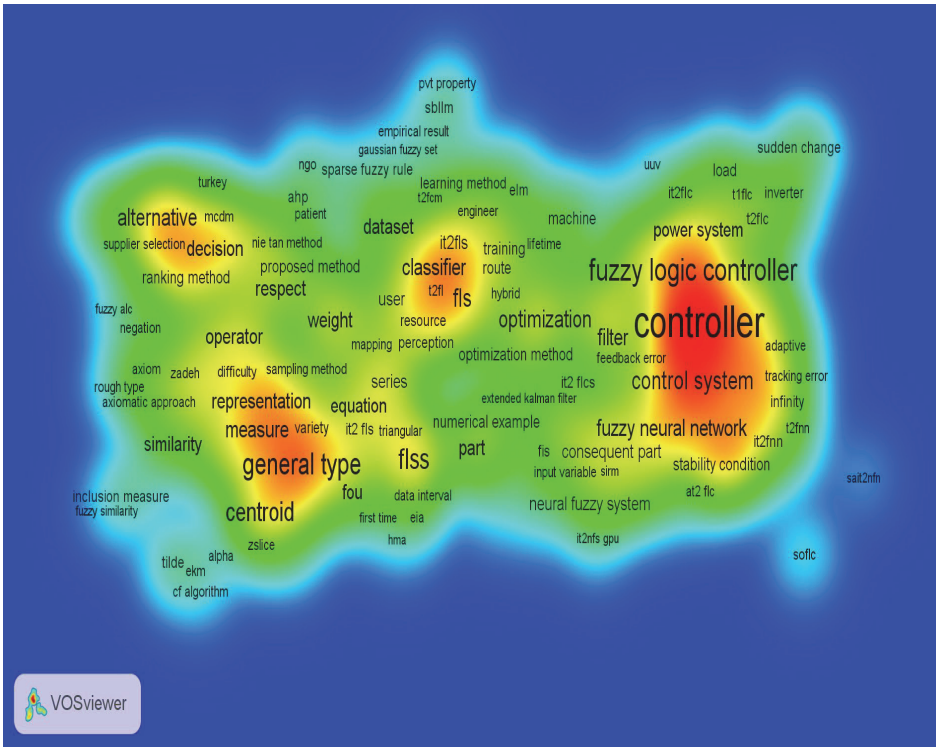

Fig. 12. Density plot for identifying the control terms in the field of Type-2 fuzzy logic

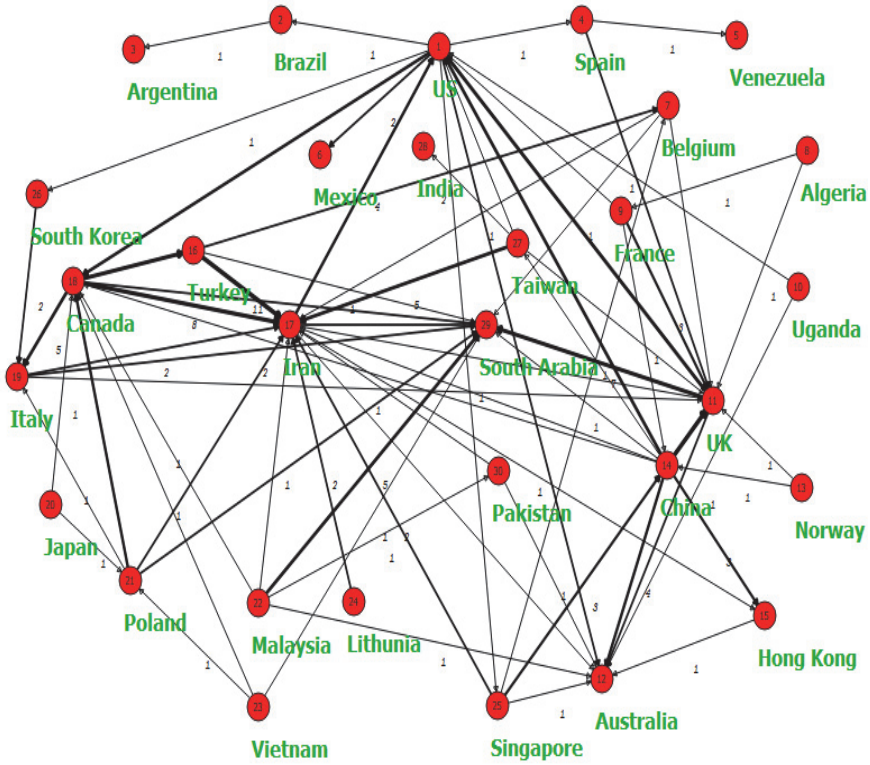

Fig. 13. Inter-Country collaboration pattern

about the inter-country collaboration which is visualized as in Figure 13. The nodes of this graph represent the countries that participate in inter-country collaboration and the edges represent the number of publications for the same. The inter-country collaboration was found to be the maximum between UK and China, Turkey and Iran. It can be observed that Turkey and Canada have also participated actively in such collaborations. As an individual country, USA, UK, China, Turkey, Canada and Iran have been dynamically involved in such inter country collaborations for research publications.

Regarding this inter-country collaboration that is illustrated in Figure 13, it is our believe that it will grow a lot in future years, as the type-2 fuzzy community in growing in many more countries and also it is consolidating in countries that already have research on type 2. There are other publications too in 2017 (published and ongoing papers) where other collaborations are flourishing, but they could not be repre-

sented here due to the limitation of the time interval of 2000-2016 and the year 2017 is not complete to the moment.

4. Conclusion

This paper charted and mapped the progress of research work in the field of Type-2 fuzzy logic from the year 2000-2016 on the basis of 600 research papers retrieved from web of science. The primary aim of this study was to analyze the research work in type-2 fuzzy logic so that the growth of this discipline through the years is tracked. The study performed in this paper helps in answering various significant research questions like the growth rate of type-2 fuzzy logic in terms of research publications, top journals, authors, research grant agencies etc. The inter-country collaboration was also visualized to map the authorship patterns among various countries. All this would help the researchers in understanding the discipline in a more elaborate manner. This kind of work in the field of type-2 fuzzy logic is the only one of its kind as it statistically highlights the various aspects related to it. As future work we envision updating this information about type-2 research in a few more years to verify the evolution and growth of the type-2 fuzzy area.

AUTHORS

Sonakshi Vij – Department of CSE, Indira Gandhi Delhi Technical University for Women, India.
Amita Jain – Department of CSE, Ambedkar Institute of Advanced Communication Technologies and Research, India.
Devendra Tayal – Department of CSE, Indira Gandhi Delhi Technical University for Women, India.
Oscar Castillo* – Department of Computer Science, Tijuana Institute of Technology, Mexico.
E-mail: ocastillo@hafsamx.org.

* Corresponding authors

REFERENCES

1) https://en.wikipedia.org/wiki/Fuzzy_logic
2) Wu, T., Liu, X. W., "An interval type-2 fuzzy clustering solution for large-scale multiple-criteria group decision-making problems", *Knowledge-Based Systems*, 114, 2016, 118–127. DOI: 10.1016/j.knosys.2016.10.004.
3) Mohammadzadeh, A., Ghaemi, S., Kaynak, O., Khanmohammadi, S., "Observer-based method for synchronization of uncertain fractional order chaotic systems by the use of a general type-2 fuzzy system", *Applied Soft Computing*, 49, 2016, 544–560. DOI: 10.1016/j.asoc.2016.08.016.
4) Yao, B., Hagras, H., Alghazzawi, D., Alhaddad, M. J., "A Big Bang–Big Crunch Type-2 Fuzzy Logic System for Machine-Vision-Based Event Detection and Summarization in Real-World Ambient-Assisted Living", *IEEE Transactions on Fuzzy Systems*, vol. 24, no. 6, 2016, 1307–1319. DOI: 10.1109/tfuzz.2016.2514366.
5) Das, A. K., Sundaram, S., Sundararajan, N., "A Self-Regulated Interval Type-2 Neuro-Fuzzy Inference System for Handling Nonstationarities in EEG Signals for BCI", *IEEE Transactions on Fuzzy Systems*, vol. 24, no. 6, 2016, 1565–1577. DOI: 10.1109/TFUZZ.2016.2540072.
6) Li, H., Wang, J., Lam, H. K., Zhou, Q., Du, H., "Adaptive sliding mode control for interval type-2 fuzzy systems", *IEEE Transactions on Systems, Man, and Cybernetics: Systems*, vol. 46, no. 12, 2016, 1654–1663. DOI: 10.1109/TSMC.2016.2531676.
7) Dey, A., Pal, A., Pal, T., "Interval Type 2 Fuzzy Set in Fuzzy Shortest Path Problem", *Mathematics*, vol. 4, no. 4, 2016, 62. DOI: 10.3390/math4040062.
8) Starkey, A., Hagras, H., Shakya, S., Owusu, G., Mohamed, A., Alghazzawi, D., "A cloud computing based many objective type-2 fuzzy logic system for mobile field workforce area optimization", *Memetic Computing*, vol. 8, no. 4, 2016, 269–286. DOI: 10.1007/s12293-016-0206-1.
9) Ngan, S. C., "A u-map representation of general type-2 fuzzy sets via concepts from activation detection: Application to constructing type-2 fuzzy set measures", *Expert Systems with Applications*, vol. 64, 2016, 169–193. DOI: 10.1016/j.eswa.2016.07.031.
10) Ghorabaee, M. K., Zavadskas, E. K., Amiri, M., Esmaeili, A., "Multi-criteria evaluation of green suppliers using an extended WASPAS method with interval type-2 fuzzy sets", *Journal of Cleaner Production*, *137*, 2016, 213–229.
11) Sharifian, A., Sasansara, S. F., Balgori, A. A., "A new control method based on type-2 fuzzy neural PI controller to improve dynamic performance of a half-bridge DC–DC converter", *Neurocomputing*, vol. 214, 2016, 718–728. DOI: 10.1016/j.neucom.2016.07.001.
12) Celik, E., Gumus, A. T., "An outranking approach based on interval type-2 fuzzy sets to evaluate preparedness and response ability of non-governmental humanitarian relief organizations", *Computers Industrial Engineering*, vol. 101, 2016, 21–34. DOI: 10.1016/j.cie.2016.08.020.
13) Hassan, S., Khosravi, A., Jaafar, J., Khanesar, M. A., "A systematic design of interval type-2 fuzzy logic system using extreme learning machine for electricity load demand forecasting", *International Journal of Electrical Power Energy Systems*, 82, 2016, 1–10. DOI: 10.1016/j.ijepes.2016.03.001.
14) Sumati, V., Chellapilla, P., Paul, S., Singh, L., "Parallel interval type-2 subsethood neural fuzzy inference system", *Expert Systems with Applications*, vol. 60, 2016, 156–168. DOI: 10.1016/j.eswa.2016.04.033.
15) Celik, E., Akyuz, E., "Application of interval type-2 fuzzy sets DEMATEL methods in maritime transportation: the case of ship collision". Transactions RINA, vol. 158, part A4, *International Journal Maritime Engineering*, Oct.-Dec. 2016. DOI: 10.3940/rina.ijme.2016.a4.392 .

16) Elloumi, M., Krid, M., Masmoudi, D. S., "FPGA implementation of a new interval type-2 Beta neuro-fuzzy system with on-chip learning for image denoising application", *Computers Electrical Engineering*, vol. 55, 2016, 164–179. DOI: 10.1016/j.compeleceng.2016.06.011.
17) Gong, Y., Dai, L., Hu, N., "MULTI-ATTRIBUTE DECISION MAKING METHOD BASED ON BONFERRONI MEAN OPERATOR and possibility degree OF INTERVAL TYPE-2 TRAPEZOIDAL FUZZY SETS", *Iranian Journal of Fuzzy Systems*, vol. 13, no. 5, 2016, 97–115.
18) Livi, L., Tahayori, H., Rizzi, A., Sadeghian, A., Pedrycz, W., "Classification of type-2 fuzzy sets represented as sequences of vertical slices", *IEEE Transactions on Fuzzy Systems*, vol. 24, no. 5, 2016, 1022–1034. DOI: 10.1109/TFUZZ.2015.2500274.
19) Golsefid, S. M. M., Zarandi, M. H. F., "Dual-centers type-2 fuzzy clustering framework and its verification and validation indices", *Applied Soft Computing*, 47, 2016, 600–613. DOI: 10.1016/j.asoc.2015.05.018.
20) Gonzalez, C. I., Melin, P., Castro, J. R., Castillo, O., Mendoza, O., "Optimization of interval type-2 fuzzy systems for image edge detection", *Applied Soft Computing*, 47, 2016, 631–643. DOI: j.asoc.2014.12.010.
21) Zoveidavianpoor, M., Gharibi, A., "Applications of type-2 fuzzy logic system: handling the uncertainty associated with candidate-well selection for hydraulic fracturing", *Neural Computing and Applications*, vol. 27, no. 7, 2016, 1831–1851. DOI: 10.1007/s00521-015-1977-x.
22) Cheng, S. H., Chen, S. M., Huang, Z. C., "Autocratic decision making using group recommendations based on ranking interval type-2 fuzzy sets", *Information Sciences*, 361, 2016, 135–161. DOI: 10.1016/j.ins.2016.04.035.
23) Almaraashi, M., John, R., Hopgood, A., Ahmadi, S., "Learning of interval and general type-2 fuzzy logic systems using simulated annealing: Theory and practice", *Information Sciences*, vol. 360, 2016, 21–42. DOI: 10.1016/j.ins.2016.03.047.
24) Panda, A. K., Ramesh, T., Kumar, S. S., "Rotor-flux-based MRAS speed estimator for DTFC-SVM of a speed sensorless induction motor drive using Type-1 and Type-2 fuzzy logic controllers over a wide speed range", *International Transactions on Electrical Energy Systems*, vol. 26, no. 9, 2016, 1863–1881. DOI: 10.1002/etep.2181.
25) Celik, E., Gumus, A. T., Erdogan, M., "A new extension of the ELECTRE method based upon interval type-2 fuzzy sets for green logistic service providers evaluation", *Journal of Testing and Evaluation*, vol. 44, no. 5, 2015, 1813–1827. DOI: 10.1520/JTE20140046.
26) Tavoosi, J., Suratgar, A. A., Menhaj, M. B., "Nonlinear system identification based on a self-organizing type-2 fuzzy RBFN", *Engineering Applications of Artificial Intelligence*, vol. 54, 2016, 26–38. DOI: j.engappai.2016.04.006.
27) Sarkar, J. P., Saha, I., Maulik, U., "Rough Possibilistic Type-2 Fuzzy C-Means clustering for MR brain image segmentation", *Applied Soft Computing*, vol. 46, 2016, 527–536. DOI: j.asoc.2016.01.040.
28) Vella, V., Ng, W. L., "Improving risk-adjusted performance in high frequency trading using interval type-2 fuzzy logic", *Expert Systems with Applications*, vol. 5, 2016, 70–86. DOI: 10.1016/j.eswa.2016.01.056.
29) Dorantes, P. N. M., Mendez, G. M., "Type-2 fuzzy logic systems for temperature evaluation in ladle furnace", *IEEE Latin America Transactions*, vol. 14, no. 8, 2016, 3914–3920. DOI: 10.1109/TLA.2016.7786380.
30) Hao, M., Mendel, J. M., "Encoding words into normal interval type-2 fuzzy sets: HM approach", *IEEE Transactions on Fuzzy Systems*, vol. 24, no. 4, 2016, 865–879. DOI: 10.1109/TFUZZ.2015.2486814.
31) Ruiz, G., Hagras, H., Pomares, H., Rojas, I., Bustince, H., "Join and Meet Operations for Type-2 Fuzzy Sets With Nonconvex Secondary Memberships", *IEEE Transactions on Fuzzy Systems*, vol. 24, no. 4, 2016, 1000–1008. DOI: 10.1109/TFUZZ.2015.2489242.
32) Dominik, I., "Type-2 fuzzy logic controller for position control of shape memory alloy wire actuator", *Journal of Intelligent Material Systems and Structures*, vol. 27, no. 14, 2016, 1917–1926. DOI: 10.1177/1045389X15610907.
33) Zeghlache, S., Saigaa, D., Kara, K., "Fault tolerant control based on neural network interval type-2 fuzzy sliding mode controller for octorotor UAV", *Frontiers of Computer Science*, vol. 10, no. 4, 2016, 657–672. DOI: 10.1007/s11704-015-4448-8.
34) Ngo, P. D., Shin, Y. C., "Modeling of unstructured uncertainties and robust controlling of nonlinear dynamic systems based on type-2 fuzzy basis function networks", *Engineering Applications of Artificial Intelligence*, *53*, 2016, 74–85. DOI: 10.1016/j.engappai.2016.03.010.
35) Castillo, O., Amador-Angulo, L., Castro, J. R., Garcia-Valdez, M., "A comparative study of type-1 fuzzy logic systems, interval type-2 fuzzy logic systems and generalized type-2 fuzzy logic systems in control problems", *Information Sciences*, 354, 2016, 257–274. DOI: 10.1016/j.ins.2016.03.026.
36) Ekong, U., Lam, H. K., Xiao, B, et. al., "Classification of epilepsy seizure phase using interval type-2 fuzzy support vector machines", *Neurocomputing*, 199, 2016, 66–76. DOI: 10.1016/j.neucom.2016.03.033.
37) Khormali, A., Addeh, J., "A novel approach for recognition of control chart patterns: Type-2 fuzzy clustering optimized support vector machine", *ISA transactions*, 63, 2016, 256–264. DOI: 10.1016/j.isatra.2016.03.004.
38) Wu, G. D., Zhu, Z. W., "Dual-Discriminability-Analysis Type-2 Fuzzy-Neural-Network Based Speech Classification for Human-Machine Interaction", *Journal of Information Science Engineering,* vol. 32, no. 4, 2016, 831–847.
39) Hassan, S., Khanesar, M. A., Kayacan, E., Jaafar, J., Khosravi, A., "Optimal design of adaptive

type-2 neuro-fuzzy systems: A review", *Applied Soft Computing*, 44, 2016, 134–143. DOI: 10.1016/j.asoc.2016.03.023.
40) Pan, Y., Yang, G. H., "Switched filter design for interval type-2 fuzzy systems with sensor nonlinearities", *Neurocomputing*, 194, 2016, 168–175. DOI: 10.1016/j.neucom.2016.01.082.
41) Khakshour, A. J., Khanesar, M. A., "Model reference fractional order control using type-2 fuzzy neural networks structure: Implementation on a 2-DOF helicopter", *Neurocomputing*, vol. 193, 2016, 268–279.
42) Jana, D. K., Pramanik, S., Maiti, M., "A parametric programming method on Gaussian type-2 fuzzy set and its application to a multilevel supply chain", *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, vol. 24, no. 3, 2016, 451–477. DOI: 10.1142/S0218488516500239.
43) Hui, H., Dan, H., Xian-Chuan, Y., "Land cover classification based on adaptive interval type-2 fuzzy clustering", *Chinese Journal of Geophysic–Chinese Edition*, vol. 59, no. 6, 2016, 1983–1993.
44) Das, A. K., Anh, N., Suresh, S., Srikanth, N., "An interval type-2 fuzzy inference system and its meta-cognitive learning algorithm", *Evolving Systems*, vol. 7, no. 2, 2016, 95–105. DOI: 10.1007/s12530-016-9148-6.
45) Lei, B. B., Duan, X. C., Bao, H., Xu, Q., "Derivation and analysis on the analytical structure of interval type-2 fuzzy controller with two nonlinear fuzzy sets for each input variable", *Frontiers of Information Technology Electronic Engineering*, vol. 17, no. 6, 2016, 587–602. DOI: 10.1631/FITEE.1601019.
46) Kumbasar, T., "Robust stability analysis and systematic design of single-input interval type-2 fuzzy logic controllers", *IEEE Transactions on Fuzzy Systems*, vol. 24, no. 3, 2016, 675–694. DOI: 10.1109/TFUZZ.2015.2471805.
47) Sabahi, K., Ghaemi, S., Badamchizadeh, M., "Designing an adaptive type-2 fuzzy logic system load frequency control for a nonlinear time-delay power system", *Applied Soft Computing*, vol. 43, 2016, 97–106. DOI: 10.1016/j.asoc.2016.02.012.
48) Mohammadzadeh, A., Ghaemi, S., "A modified sliding mode approach for synchronization of fractional-order chaotic/hyperchaotic systems by using new self-structuring hierarchical type-2 fuzzy neural network", *Neurocomputing*, 191, 2016, 200–213. DOI: 10.1016/j.neucom.2015.12.098.
49) Wu, C., Li, H., Lam, H. K., Karimi, H. R., "Fault detection for nonlinear networked systems based on quantization and dropout compensation: An interval type-2 fuzzy-model method", *Neurocomputing*, vol. 191, 2016, 409–420. DOI: 10.1016/j.neucom.2016.01.061.
50) Lu, X., Liu, M., "Optimal design and tuning of PID-type interval type-2 fuzzy logic controllers for delta parallel robots", *International Journal of Advanced Robotic Systems*, vol. 3, no. 3, 2016, 96. DOI: 10.5772/63941.
51) Yang, Y., Que, Y., Huang, S., Lin, P., "Multimodal sensor medical image fusion based on type-2 fuzzy logic in NSCT domain", *IEEE Sensors Journal*, vol. 16, no. 10, 2016, 3735–3745. DOI: 10.1109/JSEN.2016.2533864.
52) Sang, X., Liu, X., "An interval type-2 fuzzy sets-based TODIM method and its application to green supplier selection", *Journal of the Operational Research Society*, vol. 67, no. 5, 2016, 722–734. DOI: 10.1057/jors.2015.86.
53) Khooban, M. H., Niknam, T., Sha-Sadeghi, M., "Speed control of electrical vehicles: a time-varying proportional–integral controller-based type-2 fuzzy logic", *IET Science, Measurement Technology*, vol. 10, no. 3, 2016, 185–192. DOI: 10.1049/iet-smt.2015.0033.
54) Wei, Y., Watada, J., Pedrycz, W., "Design of a qualitative classification model through fuzzy support vector machine with type-2 fuzzy expected regression classifier preset", *IEEJ Transactions on Electrical and Electronic Engineering*, vol. 11, no. 3, 2016, 348–356. DOI: 10.1002/tee.22224.
55) Mendel, J. M., Rajati, M. R., Sussner, P., "On clarifying some definitions and notations used for type-2 fuzzy sets as well as some recommended changes", *Information Sciences*, *340*, 2016, 337–345. DOI: 10.1016/j.ins.2016.01.015.
56) Chaoui, H., Hamane, B., Doumbia, M. L., "Adaptive control of venturini modulation based matrix converters using interval type-2 fuzzy sets", *Journal of Control, Automation and Electrical Systems*, vol. 27, no. 2, 2016, 132–143.
57) Huang, H. C., Yang, X., "A Comparative Investigation of Type-2 Fuzzy Sets, Nonstationary Fuzzy Sets and Cloud Models", *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, vol. 24, no. 02, 2016, 213–227. DOI: 10.1142/S0218488516500112.
58) Nguyen, T., Nahavandi, S., "Modified AHP for gene selection and cancer classification using type-2 fuzzy logic", *IEEE Transactions on Fuzzy Systems*, vol. 24, no. 2, 2016, 273–287. DOI: 10.1109/TFUZZ.2015.2453153.
59) Bilgin, A., Hagras, H., van Helvert, J., Alghazzawi, D., "A Linear General Type-2 Fuzzy-Logic-Based Computing With Words Approach for Realizing an Ambient Intelligent Platform for Cooking Recipe Recommendation", *IEEE Transactions on Fuzzy Systems*, vol. 24, no.2, 2016, 306–329. DOI: 10.1109/TFUZZ.2015.2453400.
60) Raju, S. K., Pillai, G. N., "Design and real time implementation of type-2 fuzzy vector control for DFIG based wind generators", *Renewable Energy*, vol. 88, 2016, 40–50. DOI: 10.1016/j.renene.2015.11.006.
61) Acampora, G., Alghazzawi, D., Hagras, H., Vitiello, A., "An interval type-2 fuzzy logic based framework for reputation management in Peer-to-Peer e-commerce", *Information Sciences*, vol. 333, 2016, 88–107. DOI: 10.1016/j.ins.2015.11.015.
62) Benzerafa, F., Tlemcani, A., Sebaa, K., "Type-1 and Type-2 Fuzzy Logic Controller Based Mul-

tilevel DSTATCOM Using SVM", *Studies in Informatics and Control*, vol. 25, no. 1, 2016, 87–98. DOI: 10.24846/v25i1y201610.
63) Baghbani, F., Akbarzadeh-T, M. R., Akbarzadeh, A., Ghaemi, M., "Robust adaptive mixed H 2/H∞ interval type-2 fuzzy control of nonlinear uncertain systems with minimal control effort", *Engineering Applications of Artificial Intelligence*, vol. 49, 2016, 88–102. DOI: 10.1016/j.engappai.2015.12.003.
64) Olivas, F., Valdez, F., Castillo, O., Melin, P., "Dynamic parameter adaptation in particle swarm optimization using interval type-2 fuzzy logic", *Soft Computing*, vol. 20, no. 3, 2016, 1057–1070. DOI: 10.1007/s00500-014-1567-3.
65) Sang, X., Liu, X., "An analytical solution to the TOPSIS model with interval type-2 fuzzy sets", *Soft Computing*, vol. 20, no. 3, 2016, 1213–1230. DOI: 10.1007/s00500-014-1584-2.
66) Baydokhty, M. E., Zare, A., Balochian, S., "Performance of optimal hierarchical type 2 fuzzy controller for load–frequency system with production rate limitation and governor dead band", *Alexandria Engineering Journal*, vol. 55, no. 1, 2016, 379–397.
67) Yassin, H. M., Hanafy, H. H., Hallouda, M. M. (2016). Enhancement low-voltage ride through capability of permanent magnet synchronous generator-based wind turbines using interval type-2 fuzzy control. *IET Renewable Power Generation*, *10*(3), 339–348.
68) Li, H., Wu, C., Wu, L., Lam, H. K., Gao, Y. (2016). Filtering of interval type-2 fuzzy systems with intermittent measurements. *IEEE transactions on cybernetics*, *46*(3), 668–678.
69) Alipouri, Y., Poshtan, J. (2016). Design of robust minimum variance controller using type-2 fuzzy set. *Transactions of the Institute of Measurement and Control*, *38*(3), 315–326.
70) Kiliç, M., Kaya, İ. (2016). The prioritisation of provinces for public grants allocation by a decision-making methodology based on type-2 fuzzy sets. *Urban Studies*, *53*(4), 755–774.
71) Gao, Y., Li, H., Wu, L., Karimi, H. R., Lam, H. K. (2016). Optimal control of discrete-time interval type-2 fuzzy-model-based systems with D-stability constraint and control saturation. *Signal Processing*, *120*, 409–421.
72) Zhao, T., Wei, Z., Dian, S., Xiao, J. (2016). Observer-based H∞ controller design for interval type-2 T–S fuzzy systems. *Neurocomputing*, *177*, 9-25.
73) Tao, H., Zhidong, L., Jihong, P., Xianquan, Y., Jinxin, Y. (2016). Load Interval Prediction of the Power System based on Type-2 Fuzzy Theory. *International Journal of Grid and Distributed Computing*, *9*(2), 73–84.
74) Gonzalez, C. I., Melin, P., Castro, J. R., Mendoza, O., Castillo, O. (2016). An improved sobel edge detection method based on generalized type-2 fuzzy logic. *Soft Computing*, *20*(2), 773–784.
75) Sola, H. B., Fernandez, J., Hagras, H., Herrera, F., Pagola, M., Barrenechea, E. (2015). Interval type-2 fuzzy sets are generalization of interval-valued fuzzy sets: toward a wider view on their relationship. *IEEE Transactions on Fuzzy Systems*, *23*(5), 1876–1882.
76) El-Nagar, A. M., El-Bardini, M. (2016). Hardware-in-the-loop simulation of interval type-2 fuzzy PD controller for uncertain nonlinear system using low cost microcontroller. *Applied Mathematical Modelling*, *40*(3), 2346–2355.
77) Starkey, A., Hagras, H., Shakya, S., Owusu, G. (2016). A multi-objective genetic type-2 fuzzy logic based system for mobile field workforce area optimization. *Information Sciences*, *329*, 390–411.
78) Ghorabaee, M. K. (2016). Developing an MCDM method for robot selection with interval type-2 fuzzy sets. *Robotics and Computer-Integrated Manufacturing*, *37*, 221–232.
79) Chen, Y., Wang, D., Tong, S. (2016). Forecasting studies by designing Mamdani interval type-2 fuzzy logic systems: With the combination of BP algorithms and KM algorithms. *Neurocomputing*, *174*, 1133–1146.
80) Golsefid, S. M. M., Zarandi, M. F., Turksen, I. B. (2016). Multi-central general type-2 fuzzy clustering approach for pattern recognitions. *Information Sciences*, *328*, 172–188.
81) Lu, J., Li, D. Y., Zhai, Y. H., Li, H., Bai, H. X. (2016). A model for type-2 fuzzy rough sets. *Information Sciences*, *328*, 359-377.
82) Huang, S., Chen, M. (2016). Constructing optimized interval type-2 TSK neuro-fuzzy systems with noise reduction property by quantum inspired BFA. *Neurocomputing*, *173*, 1839-1850.
83) Amiri, M., Antucheviciene, J. (2016). EVALUATION BY AN AREA-BASED METHOD OF RANKING INTERVAL TYPE-2 FUZZY SETS (EAMRIT-2F) FOR MULTI-CRITERIA GROUP DECISION-MAKING.*TRANSFORMATIONS IN BUSINESS ECONOMICS*, *15*(3), 39.
84) Gong, Y., Yang, S., Dai, L. (2016). The NOWA weighted sampling type-reduction method for interval type-2 fuzzy sets and its application. *Journal of Intelligent Fuzzy Systems*, *31*(6), 2927–2933.
85) Meziane, K. B., Boumhidi, I. (2016). An interval type-2 fuzzy logic PSS with the optimal H∞ tracking control for multi-machine power system.*International Journal of Intelligent Engineering Informatics*, *4*(3-4), 286–304.
86) Xiao, Y. C., Hu, B. Q., Zhao, X. R. (2016). Three-way decisions based on type-2 fuzzy sets and interval-valued type-2 fuzzy sets. *Journal of Intelligent Fuzzy Systems*, *31*(3), 1385–1395.
87) Zakeri, E., Farahat, S., Moezi, S. A., Zare, A. (2016). Path planning for unmanned underwater vehicle in 3d space with obstacles using spline-imperialist competitive algorithm and optimal interval type-2 fuzzy logic controller. *Latin American Journal of Solids and Structures*, *13*(6), 1054–1085.
88) Suresh, D., Singh, S. P. (2016). Type-2 Fuzzy Logic Controlled Three-level Shunt Active Power Filter for Power Quality Improvement. *Electric Power Components and Systems*, *44*(8), 873–882.

89) Loukal, K., Benalia, L. (2016). Type-2 Fuzzy Logic Controller of a Doubly Fed Induction Machine. *Advances in Fuzzy Systems*, *2016*, 7.
90) Zhou, L., Sun, K., Li, H. (2016). Multifactorial decision making based on type-2 fuzzy sets and factor space approach. *Journal of Intelligent Fuzzy Systems*, *30*(4), 2257–2266.
91) Sambariya, D. K., Prasad, R. (2016). Design and small signal stability enhancement of power system using interval type-2 fuzzy PSS. *Journal of Intelligent Fuzzy Systems*, *30*(1), 597–612.
92) Kwak, K. C. (2016). A Design of Incremental Granular Model Using Context-Based Interval Type-2 Fuzzy C-Means Clustering Algorithm. *IEICE TRANSACTIONS on Information and Systems*, *99*(1), 309–312.
93) Zhao, T., Wei, Z. (2016). On Characterization of Rough Type-2 Fuzzy Sets. *Mathematical Problems in Engineering*, *2016*.
94) Gao, Y., Li, H., Chadli, M., Lam, H. K. (2016). Static output-feedback control for interval type-2 discrete-time fuzzy systems. *Complexity*, *21*(3), 74–88.
95) Du, Y., Lu, X., Chen, L., Zeng, W. (2016). An interval type-2 TS fuzzy classification system based on PSO and SVM for gender recognition.*Multimedia Tools and Applications*, *75*(2), 987–1007.
96) Raju, S. K., Pillai, G. N. (2016). Design and implementation of type-2 fuzzy logic controller for DFIG-based wind energy systems in distribution networks. *IEEE Transactions on Sustainable Energy*, *7*(1), 345–353.
97) Heidarzade, A., Mahdavi, I., Mahdavi-Amiri, N. (2016). Supplier selection using a clustering method based on a new distance for interval type-2 fuzzy sets: A case study. *Applied Soft Computing*, *38*, 213–231.
98) Doctor, F., Syue, C. H., Liu, Y. X., Shieh, J. S., Iqbal, R. (2016). Type-2 fuzzy sets applied to multivariable self-organizing fuzzy logic controllers for regulating anesthesia. *Applied Soft Computing*, *38*, 872–889.
99) Wang, Y. (2016). Type-2 fuzzy event parallel computing system: overcoming computer int index limitation in big data. *Applied Soft Computing*, *38*, 1076–1087.
100) Bhattacharya, D., Konar, A., Das, P. (2016). Secondary factor induced stock index time-series prediction using self-adaptive interval type-2 fuzzy sets. *Neurocomputing*, *171*, 551–568.
101) Shahnazi, R. (2016). Observer-based adaptive interval type-2 fuzzy control of uncertain MIMO nonlinear systems with unknown asymmetric saturation actuators. *Neurocomputing*, *171*, 1053–1065.
102) Cervantes, L., Castillo, O. (2015). Type-2 fuzzy logic aggregation of multiple fuzzy controllers for airplane flight control. *Information Sciences*, *324*, 247–256.
103) Hassanifard, G., Gharaveisi, A. A., Vali, M. A. (2015). Interval Type-2 Takagi-Sugeno fuzzy modeling of the chaotic systems based on variations in initial conditions. *Iranian Journal of Science and Technology (Sciences)*, *39*(1), 59–67.
104) Harding, J., Walker, C., Walker, E. (2015). Equations in Type-2 Fuzzy Sets. *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, *23*(Suppl. 1), 31–42.
105) Li, H., Sun, X., Wu, L., Lam, H. K. (2015). State and output feedback control of interval type-2 fuzzy systems with mismatched membership functions. *IEEE Transactions on Fuzzy Systems*, *23*(6), 1943–1957.
106) Lu, Q., Shi, P., Lam, H. K., Zhao, Y. (2015). Interval type-2 fuzzy model predictive control of nonlinear networked control systems. *IEEE Transactions on Fuzzy systems*, *23*(6), 2317–2328.
107) Toloue, S. F., Akbarzadeh, M. R., Akbarzadeh, A., Jalaeian-F, M. (2015). Position tracking of a 3-PSP parallel robot using dynamic growing interval type-2 fuzzy neural control. *Applied Soft Computing*, *37*, 1–14.
108) Ulu, C. (2015). Exact analytical inversion of interval type-2 TSK fuzzy logic systems with closed form inference methods. *Applied Soft Computing*, *37*, 60–70.
109) Mohammadzadeh, A., Hashemzadeh, F. (2015). A new robust observer-based adaptive type-2 fuzzy control for a class of nonlinear systems. *Applied Soft Computing*, *37*, 204–216.
110) Zaheer, S. A., Choi, S. H., Jung, C. Y., Kim, J. H. (2015). A modular implementation scheme for nonsingleton type-2 fuzzy logic systems with input uncertainties. *IEEE/ASME Transactions on Mechatronics*, *20*(6), 3182–3193.
111) Zhao, T., Xiao, J. (2015). State feedback control of interval type-2 Takagi–Sugeno fuzzy systems via interval type-2 regional switching fuzzy controllers. *International Journal of systems science*, *46*(15), 2756–2769.
112) Li, H., Wu, C., Shi, P., Gao, Y. (2015). Control of nonlinear networked systems with packet dropouts: interval type-2 fuzzy model-based approach. *IEEE Transactions on Cybernetics*, *45*(11), 2378–2389.
113) Zeghlache, S., Kara, K., Saigaa, D. (2015). Fault tolerant control based on interval type-2 fuzzy sliding mode controller for coaxial trirotor aircraft. *ISA transactions*, *59*, 215–231.
114) Bilgin, A., Hagras, H., Ghelli, A., Alghazzawi, D., Aldabbagh, G. (2015). An Ambient Intelligent and Energy Efficient Food Preparation System Using Linear General Type-2 Fuzzy Logic Based Computing with Words Framework [Application Notes]. *IEEE Computational Intelligence Magazine*, *10*(4), 66–78.
115) Li, H., Yin, S., Pan, Y., Lam, H. K. (2015). Model reduction for interval type-2 Takagi–Sugeno fuzzy systems. *Automatica*, *61*, 308–314.
116) Wang, J. C., Chen, T. Y. (2015). A simulated annealing-based permutation method and experimental analysis for multiple criteria decision analysis with interval type-2 fuzzy sets. *Applied Soft Computing*, *36*, 57–69.
117) Masumpoor, S., Khanesar, M. A. (2015). Adaptive sliding-mode type-2 neuro-fuzzy control of an

induction motor. *Expert Systems with Applications*, *42*(19), 6635–6647.
118) Zhao, J. (2015). Forecasting Of Type-2 Fuzzy Electric Power System Based On Phase Space Reconstruction Model. *International Journal of Grid and Distributed Computing*, *8*(5), 263–272.
119) Nguyen, T., Khosravi, A., Creighton, D., Nahavandi, S. (2015). Multi-Output Interval Type-2 Fuzzy Logic System for Protein Secondary Structure Prediction. *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, *23*(05), 735–760.
120) Gholami, S., Alasty, A., Salarieh, H., Hosseinian--Sarajehlou, M. (2015). On the control of tumor growth via type-1 and interval type-2 fuzzy logic. *Journal of Mechanics in Medicine and Biology*, *15*(05), 1550083.
121) Juang, C. F., Wang, P. H. (2015). An interval type-2 neural fuzzy classifier learned through soft margin minimization and its human posture classification application. *IEEE Transactions on Fuzzy Systems*, *23*(5), 1474–1487.
122) Lee, C. S., Wang, M. H., Lan, S. T. (2015). Adaptive personalized diet linguistic recommendation mechanism based on type-2 fuzzy sets and genetic fuzzy markup language. *IEEE Transactions on Fuzzy Systems*,*23*(5), 1777–1802.
123) Wang, T., Tong, S., Yi, J., Li, H. (2015). Adaptive inverse control of cable-driven parallel system based on type-2 fuzzy logic systems. *IEEE Transactions on Fuzzy Systems*, *23*(5), 1803–1816.
124) Sola, H. B., Fernandez, J., Hagras, H., Herrera, F., Pagola, M., Barrenechea, E. (2015). Interval type-2 fuzzy sets are generalization of interval--valued fuzzy sets: toward a wider view on their relationship. *IEEE Transactions on Fuzzy Systems*, *23*(5), 1876–1882.
125) Ngo, L. T., Mai, D. S., Pedrycz, W. (2015). Semi--supervising Interval Type-2 Fuzzy C-Means clustering with spatial information for multispectral satellite image classification and change detection. *Computers Geosciences*, *83*, 1–16.
126) Zarinbal, M., Zarandi, M. F., Turksen, I. B., Izadi, M. (2015). A type-2 fuzzy image processing expert system for diagnosing brain tumors. *Journal of medical systems*, *39*(10), 110.
127) Zhao, T., Xiao, J., Sheng, H., Wang, T. (2015). H∞ control of continuous-time interval type-2 T–S fuzzy systems via dynamic output feedback controllers. *Neurocomputing*, *165*, 133–143.
128) Singh, P. (2015). Similarity measure for type-2 fuzzy sets with an application to students' evaluation. *Computer Applications in Engineering Education*,*23*(5), 694–702.
129) Malinowski, M. T. (2015). Set-valued and fuzzy stochastic differential equations in M-type 2 Banach spaces. *Tohoku Mathematical Journal*, *67*(3), 349–381.
130) Mohammadzadeh, A., Ghaemi, S. (2015). Synchronization of chaotic systems and identification of nonlinear systems by using recurrent hierarchical type-2 fuzzy neural networks. *ISA transactions*, *58*, 318–329.
131) Ghorabaee, M. K., Amiri, M., Sadaghiani, J. S., Zavadskas, E. K. (2015). Multi-criteria project selection using an extended VIKOR method with interval type-2 fuzzy sets. *International Journal of Information Technology Decision Making*, *14*(05), 993–1016.
132) Torshizi, A. D., Zarandi, M. H. F. (2015). Alpha--plane based automatic general type-2 fuzzy clustering based on simulated annealing meta--heuristic algorithm for analyzing gene expression data. *Computers in biology and medicine*, *64*, 347–359.
133) Hu, J., Xiao, K., Chen, X., Liu, Y. (2015). Interval type-2 hesitant fuzzy set and its application in multi-criteria decision making. *Computers Industrial Engineering*, *87*, 91–103.
134) Celik, E., Gul, M., Aydin, N., Gumus, A. T., Guneri, A. F. (2015). A comprehensive review of multi criteria decision making approaches based on interval type-2 fuzzy sets. *Knowledge-Based Systems*, *85*, 329–341.
135) Xie, W. X., Zhang, Q. Y., Sun, Z. M., Zhang, F. (2015). A clustering routing protocol for WSN based on type-2 fuzzy logic and ant colony optimization. *Wireless Personal Communications*, *84*(2), 1165–1196.
136) Sanchez, M. A., Castillo, O., Castro, J. R. (2015). Generalized type-2 fuzzy systems for controlling a mobile robot and a performance comparison with interval type-2 and type-1 fuzzy systems. *Expert Systems with Applications*, *42*(14), 5904–5914.
137) Chen, Z., Xiong, S., Li, Y., Chin, K. S. (2015). Entropy measures of type-2 intuitionistic fuzzy sets and type-2 triangular intuitionistic trapezodial fuzzy sets. *Journal of Systems Engineering and Electronics*, *26*(4), 774.
138) Wang, J. C., Tsao, C. Y., Chen, T. Y. (2015). A likelihood-based QUALIFLEX method with interval type-2 fuzzy sets for multiple criteria decision analysis. *Soft computing*, *19*(8), 2225–2243.
139) Kalaivani, R., Lakshmi, P., Rajeswari, K. (2015). An improved type-2 fuzzy logic approach based sliding mode controller for vehicle active suspension system. *Journal Of Vibration Engineering Technologies*, *3*(4), 431–446.
140) Nie, M., Tan, W. W. (2015). Ensuring the centroid of an interval type-2 fuzzy set. *IEEE Transactions on Fuzzy Systems*, *23*(4), 950–963.
141) Tahayori, H., Livi, L., Sadeghian, A., Rizzi, A. (2015). Interval type-2 fuzzy set reconstruction based on fuzzy information-theoretic kernels. *IEEE Transactions on Fuzzy Systems*, *23*(4), 1014–1029.
142) Tahayori, H., Livi, L., Sadeghian, A., Rizzi, A. (2015). Interval type-2 fuzzy set reconstruction based on fuzzy information-theoretic kernels. *IEEE Transactions on Fuzzy Systems*, *23*(4), 1014–1029.
143) Hernández, P., Cubillo, S., Torres-Blanc, C. (2015). On t-norms for type-2 fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *23*(4), 1155–1163.

144) Juang, C. F., Chen, W. Y., Liang, C. W. (2015). Speedup of learning in interval type-2 neural fuzzy systems through graphic processing units. *IEEE Transactions on Fuzzy Systems*, *23*(4), 1286–1298.
145) Bhattacharyya, S., Pal, M., Konar, A., Tibarewala, D. N. (2015). An interval type-2 fuzzy approach for real-time EEG-based control of wrist and finger movement. *Biomedical Signal Processing and Control*, *21*, 90–98.
146) Ganjefar, S., Solgi, Y. (2015). A Lyapunov stable type-2 fuzzy wavelet network controller design for a bilateral teleoperation system. *Information Sciences*, *311*, 1–17.
147) Wang, T., Tong, S. (2015). Direct inverse control of cable-driven parallel system based on type-2 fuzzy systems. *Information Sciences*, *310*, 1–15.
148) Ramesh, T., Panda, A. K., Kumar, S. S. (2015). Type-2 fuzzy logic control based MRAS speed estimator for speed sensorless direct torque and flux control of an induction motor drive. *ISA transactions*, *57*, 262–275.
149) Jiao, X., Fidan, B., Jiang, J., Kamel, M. (2015). Adaptive mode switching of hypersonic morphing aircraft based on type-2 TSK fuzzy sliding mode control. *Science China Information Sciences*, *58*(7), 1–15.
150) Lin, C. T., Pal, N. R., Wu, S. L., Liu, Y. T., Lin, Y. Y. (2015). An interval type-2 neural fuzzy system for online system identification and feature elimination. *IEEE transactions on neural networks and learning systems*,*26*(7), 1442–1455.
151) Schrieber, M. D., Biglarbegian, M. (2015). Hardware implementation and performance comparison of interval type-2 fuzzy logic controllers for real-time applications. *Applied Soft Computing*, *32*, 175–188.
152) Mendel, J. M., Rajati, M. R. (2015). Critique of "Footprint of uncertainty for type-2 fuzzy sets". *Information Sciences*, *308*, 1–2.
153) Sharan, S., Tiwari, S. P., Yadav, V. K. (2015). Interval Type-2 Fuzzy Rough Sets and Interval Type-2 Fuzzy Closure Spaces. *Iranian Journal of Fuzzy Systems*, *12*(3), 113–125.
154) Li, H., Pan, Y., Zhou, Q. (2015). Filter design for interval type-2 fuzzy systems with D stability constraints under a unified frame. *IEEE Transactions on Fuzzy Systems*, *23*(3), 719–725.
155) Lu, T. C. (2015). Genetic-algorithm-based type reduction algorithm for interval type-2 fuzzy logic controllers. *Engineering Applications of Artificial Intelligence*, *42*, 36–44.
156) Nguyen, T., Khosravi, A., Creighton, D., Nahavandi, S. (2015). EEG signal classification for BCI applications by wavelets and interval type-2 fuzzy logic systems. *Expert Systems with Applications*, *42*(9), 4370–4380.
157) Bhattacharyya, S., Basu, D., Konar, A., Tibarewala, D. N. (2015). Interval type-2 fuzzy logic based multiclass ANFIS algorithm for real-time EEG based movement control of a robot arm. *Robotics and Autonomous Systems*, *68*, 104–115.
158) Wang, C. Y. (2015). Type-2 fuzzy rough sets based on extended t-norms. *Information Sciences*, *305*, 165–183.
159) Zhou, Q., Liu, D., Gao, Y., Lam, H. K., Sakthivel, R. (2015). Interval type-2 fuzzy control for nonlinear discrete-time systems with time-varying delays. *Neurocomputing*, *157*, 22–32.
160) Olatunji, S. O., Selamat, A., Azeez, A. R. A. (2015). Modeling permeability and PVT properties of oil and gas reservoir using hybrid model based on type-2 fuzzy logic systems. *Neurocomputing*, *157*, 125–142.
161) Bozdag, E., Asan, U., Soyer, A., Serdarasan, S. (2015). Risk prioritization in Failure Mode and Effects Analysis using interval type-2 fuzzy sets. *Expert Systems with Applications*, *42*(8), 4000–4015.
162) Ramesh, T., Panda, A. K., Kumar, S. S. (2015). MRAS speed estimator based on type-1 and type-2 fuzzy logic controller for the speed sensorless DTFC-SVPWM of an induction motor drive. *Journal of Power Electronics*,*15*(3), 730–740.
163) De, I., Sil, J. (2015). No-reference image quality assessment using interval type 2 fuzzy sets. *Applied Soft Computing*, *30*, 441-453.
164) Nguyen, T., Khosravi, A., Creighton, D., Nahavandi, S. (2015). Medical data classification using interval type-2 fuzzy logic system and wavelets. *Applied Soft Computing*, *30*, 812–822.
165) Aliasghary, M., Eksin, I., Guzelkaya, M., Kumbasar, T. (2015). General derivation and analysis for input–output relations in interval type-2 fuzzy logic systems. *Soft Computing*, *19*(5), 1283–1293.
166) Li, H., Sun, X., Shi, P., Lam, H. K. (2015). Control design of interval type-2 fuzzy systems with actuator fault: Sampled-data control approach.*Information Sciences*, *302*, 1–13.
167) Beirami, H., Zerafat, M. M. (2015). Self-tuning of an interval type-2 fuzzy PID controller for a heat exchanger system. *Iranian Journal of Science and Technology Transactions of Mechanical Engineering*, *39*, 113–129.
168) Zhao, T., Xiao, J. (2015). A new interval type-2 fuzzy controller for stabilization of interval type-2 T–S fuzzy systems. *Journal of the Franklin Institute*, *352*(4), 1627–1648.
169) Wagner, C., Miller, S., Garibaldi, J. M., Anderson, D. T., Havens, T. C. (2015). From interval-valued data to general type-2 fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *23*(2), 248–269.
170) Ali, F., Kim, E. K., Kim, Y. G. (2015). Type-2 fuzzy ontology-based opinion mining and information extraction: A proposal to automate the hotel reservation system. *Applied Intelligence*, *42*(3), 481–500.
171) Khanesar, M. A., Kayacan, E., Reyhanoglu, M., Kaynak, O. (2015). Feedback error learning control of magnetic satellites using type-2 fuzzy neural networks with elliptic membership functions. *IEEE transactions on cybernetics*, *45*(4), 858–868.

172) Zarandi, M. H. F., Najafi, S. (2015). A type-2 fuzzy-statistical clustering approach for estimating the multiple change points in a process mean with monotonic change. *The International Journal of Advanced Manufacturing Technology*, *77*(9-12), 1751–1765.
173) Martínez-Soto, R., Castillo, O., Aguilar, L. T., Rodriguez, A. (2015). A hybrid optimization method with PSO and GA to automatically design Type-1 and Type-2 fuzzy logic controllers. *International Journal of Machine Learning and Cybernetics*, *6*(2), 175–196.
174) Alhaddad, M. J., Mohammed, A., Kamel, M., Hagras, H. (2015). A genetic interval type-2 fuzzy logic-based approach for generating interpretable linguistic models for the brain P300 phenomena recorded via brain–computer interfaces. *Soft Computing*, *19*(4), 1019–1035.
175) Xie, X. P., Zhang, Z. W., Hu, S. L. (2015). Control synthesis of roesser type discrete-time 2-dt–s fuzzy systems via a multi-instant fuzzy state--feedback control scheme. *Neurocomputing*, *151*, 1384–1391.
176) de los Angeles Hernandez, M., Melin, P., Méndez, G. M., Castillo, O., López-Juarez, I. (2015). A hybrid learning method composed by the orthogonal least-squares and the back-propagation learning algorithms for interval A2-C1 type-1 non-singleton type-2 TSK fuzzy logic systems. *Soft Computing*, *19*(3), 661–678.
177) Sun, X., Cai, C., Yang, J., Shen, X. (2015). Route evaluation for unmanned aerial vehicle based on type-2 fuzzy sets. *Engineering Applications of Artificial Intelligence*, *39*, 132–145.
178) Kayacan, E., Kayacan, E., Khanesar, M. A. (2015). Identification of nonlinear dynamic systems using type-2 fuzzy neural networks—A novel learning algorithm and a comparative study. *IEEE Transactions on Industrial Electronics*, *62*(3), 1716–1724.
179) Safarinejadian, B., Ghane, P., Monirvaghefi, H. (2015). Fault detection in non-linear systems based on type-2 fuzzy logic. *International Journal of Systems Science*, *46*(3), 394–404.
180) Kayacan, E., Kayacan, E., Ramon, H., Kaynak, O., Saeys, W. (2015). Towards agrobots: Trajectory control of an autonomous tractor using type-2 fuzzy logic controllers. *IEEE/ASME Transactions on Mechatronics*, *20*(1), 287–298.
181) Hagras, H., Alghazzawi, D., Aldabbagh, G. (2015). Employing type-2 fuzzy logic systems in the efforts to realize ambient intelligent environments [application notes]. *IEEE Computational Intelligence Magazine*, *10*(1), 44–51.
182) Erdogan, M. (2015). An integrated multi-criteria decision-making methodology based on type-2 fuzzy sets for selection among energy alternatives in Turkey. *Iranian Journal of Fuzzy Systems*, *12*(1), 1–25.
183) Kiliç, M., Kaya, İ. (2015). Investment project evaluation by a decision making methodology based on type-2 fuzzy sets. *Applied Soft Computing*,*27*, 399–410.
184) Sanchez, M. A., Castillo, O., Castro, J. R. (2015). Information granule formation via the concept of uncertainty-based information with Interval Type-2 Fuzzy Sets representation and Takagi–Sugeno–Kang consequents optimized with Cuckoo search. *Applied Soft Computing*, *27*, 602–609.
185) Torshizi, A. D., Zarandi, M. H. F., Zakeri, H. (2015). On type-reduction of type-2 fuzzy sets: A review. *Applied Soft Computing*, *27*, 614–627.
186) Yuhendri, M., Ashari, M., Purnomo, M. H. (2015). Adaptive Type-2 Fuzzy Sliding Mode Control for Grid-Connected Wind Turbine Generator Using Very Sparse Matrix Converter. *International Journal Of Renewable Energy Research*, *5*(3), 668–676.
187) Bahraminejad, B., Iranpour, M. R. (2015). Comparison of Interval Type-2 Fuzzy Logic Controller with PI Controller in Pitch Control of Wind Turbines. *International Journal of Renewable Energy Research (IJRER)*, *5*(3), 836–846.
188) Torshizi, A. D., Zarandi, M. F., Türksen, I. B. (2015). Computing centroid of general type-2 fuzzy set using constrained switching algorithm. *Scientia Iranica. Transaction E, Industrial Engineering*, *22*(6), 2664.
189) Özkan, B., Kaya, İ., Cebeci, U., Başlıgil, H. (2015). A hybrid multicriteria decision making methodology based on type-2 fuzzy sets for selection among energy storage alternatives. *International Journal of Computational Intelligence Systems*, *8*(5), 914–927.
190) Wen, C., Hui, Z., Tao, L., Yuling, L. (2015). Intelligent traffic signal controller based on type-2 fuzzy logic and NSGAII. *Journal of Intelligent Fuzzy Systems*, *29*(6), 2611–2618.
191) Ying, H. (2009, June). Interval type-2 Takagi--Sugeno fuzzy systems with linear rule consequent are universal approximators. In *Fuzzy Information Processing Society, 2009. NAFIPS 2009. Annual Meeting of the North American* (pp. 1–5). IEEE.
192) Qin, Y., Zhang, Z., Liu, X., Li, M., Kou, L. (2015). Dynamic risk assessment of metro station with interval type-2 fuzzy set and TOPSIS method. *Journal of Intelligent Fuzzy Systems*, *29*(1), 93–106.
193) Zhao, M., Qin, S. S., Li, Q. W., Lu, F. Q., Shen, Z. (2015). The likelihood ranking methods for interval type-2 fuzzy sets considering risk preferences.*Mathematical Problems in Engineering*, *2015*.
194) Kuo, C. T., Lee, C. H. (2015). Network-based type-2 fuzzy system with water flow like algorithm for system identification and signal processing.*Smart Science*, *3*(1), 21–34.
195) Jafarinezhad, S., Shahbazian, M., Baghaee, M. R. (2015). Porosity Estimation of a Reservoir Using Geophysical Well Logs and an Interval Type-2 Fuzzy Logic System. *Petroleum Science and Technology*, *33*(11), 1222–1228.
196) Hamza, M. F., Yap, H. J., Choudhury, I. A. (2015). Genetic algorithm and particle swarm optimization based cascade interval type 2 fuzzy PD

controller for rotary inverted pendulum system. *Mathematical Problems in Engineering*, *2015*.
197) Lutfy, O. F., Selamat, H., Mohd Noor, S. B. (2015). Intelligent modeling and control of a conveyor belt grain dryer using a simplified type 2 neuro-fuzzy controller. *Drying technology*, *33*(10), 1210–1222.
198) Jafarinezhad, S., Shahbazian, M. (2015). Modeling the Porosity of the Carbonate Reservoir Using a Genetic Type-2 Fuzzy Logic System. *Energy Sources, Part A: Recovery, Utilization, and Environmental Effects*, *37*(12), 1354–1362.
199) Biglarbegian, M., Mendel, J. M. (2015). On the justification to use a novel simplified interval type-2 fuzzy logic system. *Journal of Intelligent Fuzzy Systems*, *28*(3), 1071–1079.
200) Oztaysi, B. (2015). A Group Decision Making Approach Using Interval Type-2 Fuzzy AHP for Enterprise Information Systems Project Selection. *Journal of Multiple-Valued Logic Soft Computing*, *24*(5).
201) Zirkohi, M. M., Lin, T. C. (2015). Interval type-2 fuzzy-neural network indirect adaptive sliding mode control for an active suspension system. *Nonlinear Dynamics*, *79*(1), 513–526.
202) Sun, Z., Wang, N., Bi, Y. (2015). Type-1/type-2 fuzzy logic systems optimization with RNA genetic algorithm for double inverted pendulum. *Applied Mathematical Modelling*, *39*(1), 70–85.
203) Moharrer, M., Tahayori, H., Livi, L., Sadeghian, A., Rizzi, A. (2015). Interval type-2 fuzzy sets to model linguistic label perception in online services satisfaction. *Soft Computing*, *19*(1), 237–250.
204) Safarinejadian, B., Bagheri, B., Ghane, P. (2015). Fault detection in nonlinear systems based on type-2 fuzzy sets and bat optimization algorithm. *Journal of Intelligent Fuzzy Systems*, *28*(1), 179–187.
205) Sharifian, A., Sharifian, S. (2015). A new power system transient stability assessment method based on type-2 fuzzy neural network estimation.*International Journal of Electrical Power Energy Systems*, *64*, 71–87.
206) Yu, W. S., Chen, H. S. (2014). Interval type-2 fuzzy adaptive tracking control design for PMDC motor with the sector dead-zones. *Information Sciences*, *288*, 108–134.
207) Pan, Y., Li, H., Zhou, Q. (2014). Fault detection for interval type-2 fuzzy systems with sensor nonlinearities. *Neurocomputing*, *145*, 488–494.
208) Nguyen, S. D., Choi, S. B., Nguyen, Q. H. (2014). An optimal design of interval type-2 fuzzy logic system with various experiments including magnetorheological fluid damper. *Proceedings of the Institution of Mechanical Engineers, Part C: Journal of Mechanical Engineering Science*,*228*(17), 3090–3106.
209) Melin, P., Gonzalez, C. I., Castro, J. R., Mendoza, O., Castillo, O. (2014). Edge-detection method for image processing based on generalized type-2 fuzzy logic. *IEEE Transactions on Fuzzy Systems*, *22*(6), 1515–1525.
210) Murthy, C., Varma, K. A., Roy, D. S., Mohanta, D. K. (2014). Reliability evaluation of phasor measurement unit using type-2 fuzzy set theory. *IEEE Systems Journal*, *8*(4), 1302–1309.
211) Chen, S. M., Hong, J. A. (2014). Fuzzy multiple attributes group decision-making based on ranking interval type-2 fuzzy sets and the TOPSIS method. *IEEE Transactions on Systems, Man, and Cybernetics: Systems*,*44*(12), 1665–1673.
212) Martínez-Soto, R., Castillo, O., Aguilar, L. T. (2014). Type-1 and Type-2 fuzzy logic controller design using a Hybrid PSO–GA optimization method.*Information Sciences*, *285*, 35–49.
213) Bi, Y., Srinivasan, D., Lu, X., Sun, Z., Zeng, W. (2014). Type-2 fuzzy multi-intersection traffic signal control with differential evolution optimization.*Expert Systems with Applications*, *41*(16), 7338–7349.
214) Michal, B., Eugen, V., Peter, F. (2014). Reducing the Impact of Uncertainties in Networked Control Systems Using Type-2 Fuzzy Logic.*Journal of Electrical Engineering*, *65*(6), 364–370.
215) Ghaemi, M., Hosseini-Sani, S. K., Khooban, M. H. (2014). Direct adaptive general type-2 fuzzy control for a class of uncertain non-linear systems. *IET Science, Measurement Technology*, *8*(6), 518–527.
216) Zhao, T., Xiao, J., Han, L., Qiu, C., Huang, J. (2014). Static Output Feedback Control for Interval Type-2 T-S Fuzzy Systems Based on Fuzzy Lyapunov Functions. *Asian Journal of Control*, *16*(6), 1702–1712.
217) Khosravi, A., Nahavandi, S. (2014). An interval type-2 fuzzy logic system-based method for prediction interval construction. *Applied Soft Computing*, *24*, 222–231.
218) Méndez, G. M., Castillo, O., Colás, R., Moreno, H. (2014). Finishing mill strip gage setup and control by interval type-1 non-singleton type-2 fuzzy logic systems. *Applied Soft Computing*, *24*, 900–911.
219) Maldonado, Y., Castillo, O., Melin, P. (2014). A multi-objective optimization of type-2 fuzzy control speed in FPGAs. *Applied Soft Computing*, *24*, 1164–1174.
220) Ghorabaee, M. K., Amiri, M., Sadaghiani, J. S., Goodarzi, G. H. (2014). Multiple criteria group decision-making for supplier selection based on COPRAS method with interval type-2 fuzzy sets. *The International Journal of Advanced Manufacturing Technology*, *75*(5-8), 1115–1130.
221) Sun, Z., Wang, N., Srinivasan, D., Bi, Y. (2014). Optimal tunning of type-2 fuzzy logic power system stabilizer based on differential evolution algorithm.*International Journal of Electrical Power Energy Systems*, *62*, 19–28.
222) Ghaemi, M., Akbarzadeh-Totonchi, M. R. (2014). Indirect adaptive interval type-2 fuzzy PI sliding mode control for a class of uncertain nonlinear systems. *Iranian Journal of Fuzzy Systems*, *11*(5), 1–21.
223) Mendel, J. M. (2014). General type-2 fuzzy logic systems made simple: a tutorial. *IEEE Transactions on Fuzzy Systems*, *22*(5), 1162–1182.

224) Li, C., Yi, J., Zhang, G. (2014). On the monotonicity of interval type-2 fuzzy logic systems. *IEEE Transactions on Fuzzy Systems*, *22*(5), 1197–1212.
225) Mohammadzadeh, A., Kaynak, O., Teshnehlab, M. (2014). Two-mode indirect adaptive control approach for the synchronization of uncertain chaotic systems by the use of a hierarchical interval type-2 fuzzy neural network. *IEEE Transactions on Fuzzy Systems*, *22*(5), 1301–1312.
226) Mendel, J. M., Rajati, M. R. (2014). On computing normalized interval type-2 fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *22*(5), 1335–1340.
227) Singh, P. (2014). Some new distance measures for type-2 fuzzy sets and distance measure based ranking for group decision making problems. *Frontiers of Computer Science*, *8*(5), 741–752.
228) Hernández, P., Cubillo, S., Torres-Blanc, C. (2014). Negations on type-2 fuzzy sets. *Fuzzy Sets and Systems*, *252*, 111–124.
229) Starczewski, J. T. (2014). Centroid of triangular and Gaussian type-2 fuzzy sets. *Information Sciences*, *280*, 289–306.
230) Di Martino, F., Sessa, S. (2014). Type-2 interval fuzzy rule-based systems in spatial analysis. *Information Sciences*, *279*, 199–212.
231) Castillo, O., Melin, P. (2014). A review on interval type-2 fuzzy logic applications in intelligent control. *Information Sciences*, *279*, 615–631.
232) Fayek, H. M., Elamvazuthi, I., Perumal, N., Venkatesh, B. (2014). A controller based on Optimal Type-2 Fuzzy Logic: Systematic design, optimization and real-time implementation. *ISA transactions*, *53*(5), 1583–1591.
233) Aras, A. C., Kaynak, O. (2014). Interval Type-2 Fuzzy Neural System Based Control with Recursive Fuzzy C-Means Clustering. *International Journal of Fuzzy Systems*, *16*(3).
234) Chen, T. Y. (2014). An interactive signed distance approach for multiple criteria group decision-making based on simple additive weighting method with incomplete preference information defined by interval type-2 fuzzy sets. *International Journal of Information Technology Decision Making*, *13*(05), 979–1012.
235) Son, L. H. (2014). Enhancing clustering quality of geo-demographic analysis using context fuzzy clustering type-2 and particle swarm optimization. *Applied Soft Computing*, *22*, 566–584.
236) Hao, M., Mendel, J. M. (2014). Similarity measures for general type-2 fuzzy sets based on the α-plane representation. *Information Sciences*, *277*, 197–215.
237) Torshizi, A. D., Zarandi, M. H. F. (2014). Hierarchical collapsing method for direct defuzzification of general type-2 fuzzy sets. *Information Sciences*,*277*, 842–861.
238) Chen, C. L., Chen, S. C., Kuo, Y. H. (2014). The reduction of interval type-2 LR fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *22*(4), 840–858.
239) Sabahi, K., Ghaemi, S., Pezeshki, S. (2014). Application of type-2 fuzzy logic system for load frequency control using feedback error learning approaches. *Applied Soft Computing*, *21*, 1–11.
240) Melin, P., Castillo, O. (2014). A review on type-2 fuzzy logic applications in clustering, classification and pattern recognition. *Applied soft computing*, *21*, 568–577.
241) Melin, P., Castillo, O. (2014). A review on type-2 fuzzy logic applications in clustering, classification and pattern recognition. *Applied soft computing*, *21*, 568–577.
242) Mo, H., Wang, F. Y., Zhou, M., Li, R., Xiao, Z. (2014). Footprint of uncertainty for type-2 fuzzy sets. *Information Sciences*, *272*, 96–110.
243) Zhou, H. B., Duan, J. A., Zhou, Z. Y. (2014). A simplified adaptive interval Type-2 fuzzy control in practical industrial application. *Journal of Central South University*, *21*(7), 2693–2700.
244) Sheng, L., Ma, X. (2014). Stability Analysis and Controller Design of Discrete Interval Type-2 Fuzzy Systems. *Asian Journal of Control*, *16*(4), 1091–1104.
245) Torshizi, A. D., Zarandi, M. H. F. (2014). A new cluster validity measure based on general type-2 fuzzy sets: application in gene expression data clustering. *Knowledge-Based Systems*, *64*, 81–93.
246) Naim, S., Hagras, H. (2014). A type 2-hesitation fuzzy logic based multi-criteria group decision making system for intelligent shared environments.*Soft Computing*, *18*(7), 1305–1319.
247) Maldonado, Y., Castillo, O., Melin, P. (2014). Embedded average of an interval type-2 fuzzy systems for applications in FPGAs. *Intelligent Automation Soft Computing*, *20*(2), 183–199.
248) Castillo, O., Cervantes, L. (2014). Genetic design of optimal type-1 and type-2 fuzzy systems for longitudinal control of an airplane. *Intelligent Automation Soft Computing*, *20*(2), 213–227.
249) Gokulan, B. P., Srinivasan, D. (2014). Modified symbiotic evolutionary learning for type-2 fuzzy system. *IEEE Systems Journal*, *8*(2), 353–362.
250) Aisbett, J., Rickard, J. T. (2014). Centroids of type-1 and type-2 fuzzy sets when membership functions have spikes. *IEEE Transactions on Fuzzy Systems*, *22*(3), 685–692.
251) Huang, C. J., Wang, Y. W., Chen, H. M., Tsai, H. W., Jian, J. J., Cheng, A. L., Liao, J. J. (2014). Application of cellular automata and type-2 fuzzy logic to dynamic vehicle path planning. *Applied Soft Computing*, *19*, 333–342.
252) Abdullah, L., Najib, L. (2014). A new type-2 fuzzy set of linguistic variables for the fuzzy analytic hierarchy process. *Expert Systems with Applications*, *41*(7), 3297–3305.
253) Sheng, L., Ma, X. (2014). Stability analysis and controller design of interval type-2 fuzzy systems with time delay. *International Journal of systems science*, *45*(5), 977–993.
254) Miccio, M., Cosenza, B. (2014). Control of a distillation column by type-2 and type-1 fuzzy logic PID controllers. *Journal of Process Control*, *24*(5), 475–484.

255) El-Nagar, A. M., El-Bardini, M. (2014). Interval type-2 fuzzy neural network controller for a multivariable anesthesia system based on a hardware-in-the-loop simulation. *Artificial intelligence in medicine*, *61*(1), 1–10.
256) Khosravi, A., Nahavandi, S. (2014). Load forecasting using interval type-2 fuzzy logic systems: Optimal type reduction. *IEEE Transactions on Industrial Informatics*, *10*(2), 1055–1063.
257) El-Bardini, M., El-Nagar, A. M. (2014). Interval type-2 fuzzy PID controller for uncertain nonlinear inverted pendulum system. *ISA transactions*, *53*(3), 732–743.
258) Chen, T. Y. (2014). A PROMETHEE-based outranking method for multiple criteria decision analysis with interval type-2 fuzzy sets. *Soft Computing*, *18*(5), 923–940.
259) Juang, C. F., Jang, W. S. (2014). A type-2 neural fuzzy system learned through type-1 fuzzy rules and its FPGA-based hardware implementation. *Applied Soft Computing*, *18*, 302–313.
260) Venkataramana Naik, N., Singh, S. P. (2014). Improved torque and flux performance of type-2 fuzzy-based direct torque control induction motor using space vector pulse-width modulation. *Electric Power Components and Systems*, *42*(6), 658–669.
261) Fadali, M. S., Jafarzadeh, S. (2014). TSK observers for discrete type-1 and type-2 fuzzy systems. *IEEE Transactions on Fuzzy Systems*, *22*(2), 451–458.
262) Deng, Z., Choi, K. S., Cao, L., Wang, S. (2014). T2fela: type-2 fuzzy extreme learning algorithm for fast training of interval type-2 TSK fuzzy logic system. *IEEE transactions on neural networks and learning systems*, *25*(4), 664–676.
263) Zhao, T., Xiao, J., Li, Y., Deng, X. (2014). A new approach to similarity and inclusion measures between general type-2 fuzzy sets. *Soft Computing*, *18*(4), 809–823.
264) Livi, L., Tahayori, H., Sadeghian, A., Rizzi, A. (2014). Distinguishability of interval type-2 fuzzy sets data by analyzing upper and lower membership functions. *Applied Soft Computing*, *17*, 79–89.
265) Chen, T. Y. (2014). An ELECTRE-based outranking method for multiple criteria group decision making using interval type-2 fuzzy sets. *Information Sciences*, *263*, 1–21.
266) Jin, L., Huang, G. (2014). A ROBUST INEXACT TYPE-2 FUZZY SETS LINEAR OPTIMIZATION PROGRAMMING FOR IRRIGATION WATER SYSTEM MANAGEMENT UNDER UNCERTAINTY. *Environmental Engineering Management Journal (EEMJ)*, *13*(3).
267) Kahraman, C., Öztayşi, B., Sarı, İ. U., Turanoğlu, E. (2014). Fuzzy analytic hierarchy process with interval type-2 fuzzy sets. *Knowledge-Based Systems*, *59*, 48–57.
268) Lee, C. H., Chang, F. Y., Lin, C. M. (2014). DSP-Based Optical Character Recognition System Using Interval Type-2 Neural Fuzzy System. *International Journal of Fuzzy Systems*, *16*(1).
269) Jin, L., Huang, G. H., Cong, D., Fan, Y. R. (2014). A Robust Inexact Joint-optimal α cut Interval Type-2 Fuzzy Boundary Linear Programming (RIJ-IT2FBLP) for energy systems planning under uncertainty. *International Journal of Electrical Power Energy Systems*, *56*, 19–32.
270) Zarandi, M. F., Gamasaee, R., Turksen, I. B. (2014). A type-2 fuzzy expert system based on a hybrid inference method for steel industry. *The International Journal of Advanced Manufacturing Technology*, *71*(5-8), 857–885.
271) Liu, Z., Xu, S., Zhang, Y., Chen, X., Chen, C. P. (2014). Interval type-2 fuzzy kernel based support vector machine algorithm for scene classification of humanoid robot. *Soft Computing*, *18*(3), 589–606.
272) Olatunji, S. O., Selamat, A., Abdulraheem, A. (2014). A hybrid model through the fusion of type-2 fuzzy logic systems and extreme learning machines for modelling permeability prediction. *Information fusion*, *16*, 29–45.
273) Chang, Y. H., Chan, W. S. (2014). Adaptive dynamic surface control for uncertain nonlinear systems with interval type-2 fuzzy neural networks. *IEEE transactions on cybernetics*, *44*(2), 293–304.
274) Zhao, T., Xiao, J. (2014). General type-2 fuzzy rough sets based on\alpha-plane Representation theory. *Soft computing*, *18*(2), 227–237.
275) Hu, B. Q., Wang, C. Y. (2014). On type-2 fuzzy relations and interval-valued type-2 fuzzy sets. *Fuzzy Sets and Systems*, *236*, 1–32.
276) Lam, H. K., Li, H., Deters, C., Secco, E. L., Wurdemann, H. A., Althoefer, K. (2014). Control design for interval type-2 fuzzy systems under imperfect premise matching. *IEEE Transactions on Industrial Electronics*, *61*(2), 956–968.
277) Hu, B. Q., Kwong, C. K. (2014). On type-2 fuzzy sets and their t-norm operations. *Information Sciences*, *255*, 58–81.
278) Ren, Q., Balazinski, M., Baron, L., Jemielniak, K., Botez, R., Achiche, S. (2014). Type-2 fuzzy tool condition monitoring system based on acoustic emission in micromilling. *Information Sciences*, *255*, 121–134.
279) Liu, Y. X., Doctor, F., Fan, S. Z., Shieh, J. S. (2014). Performance analysis of extracted rule-base multivariable type-2 self-organizing fuzzy logic controller applied to anesthesia. *BioMed research international*, *2014*.
280) Nguyen, D. D., Ngo, L. T., Watada, J. (2014). A genetic type-2 fuzzy C-means clustering approach to M-FISH segmentation. *Journal of Intelligent Fuzzy Systems*, *27*(6), 3111–3122.
281) El-Nagar, A. M., El-Bardini, M. (2014). Simplified interval type-2 fuzzy logic system based on new type-reduction. *Journal of Intelligent Fuzzy Systems*, *27*(4), 1999–2010.
282) Qin, J., Liu, X. (2014). Frank aggregation operators for triangular interval type-2 fuzzy set and its application in multiple attribute group decision making. *Journal of Applied Mathematics*, *2014*.

283) Long, N. C., Meesad, P. (2014). An optimal design for type–2 fuzzy logic system using hybrid of chaos firefly algorithm and genetic algorithm and its application to sea level prediction. *Journal of Intelligent Fuzzy Systems*,*27*(3), 1335–1346.
284) Zhao, T., Xiao, J., Ding, J., Chen, P. (2014). A variable precision interval type-2 fuzzy rough set model for attribute reduction. *Journal of Intelligent Fuzzy Systems*, *26*(6), 2785–2797.
285) Li, C. T., Lee, C. H., Chang, F. Y., Lin, C. M. (2014). An interval type-2 fuzzy system with a species-based hybrid algorithm for nonlinear system control design. *Mathematical Problems in Engineering*, *2014*.
286) Zhao, T., Xiao, J., Ding, J., Deng, X., Wang, S. (2014). Relaxed stability conditions for interval type-2 fuzzy-model-based control systems. *Kybernetika*, *50*(1), 46–65.
287) Khooban, M. H., Abadi, D. N. M., Alfi, A., Siahi, M. (2014). Optimal type-2 fuzzy controller for HVAC systems. *automatika*, *55*(1), 69–78.
288) Zhao, T., Xiao, J., Ding, J., Deng, X., Wang, S. (2014). Relaxed stability conditions for interval type-2 fuzzy-model-based control systems. *Kybernetika*, *50*(1), 46–65.
289) Tayal, D. K., Saxena, P. C., Sharma, A., Khanna, G., Gupta, S. (2014). New method for solving reviewer assignment problem using type-2 fuzzy sets and fuzzy functions. *Applied intelligence*, *40*(1), 54–73.
290) Juang, C. F., Chen, C. Y. (2014). An interval type-2 neural fuzzy chip with on-chip incremental learning ability for time-varying data sequence prediction and system control. *IEEE transactions on neural networks and learning systems*, *25*(1), 216–228.
291) Olatunji, S. O., Selamat, A., Raheem, A. A. A. (2014). Improved sensitivity based linear learning method for permeability prediction of carbonate reservoir using interval type-2 fuzzy logic system. *Applied Soft Computing*, *14*, 144–155.
292) Chourasia, V. S., Tiwari, A. K., Gangopadhyay, R. (2014). Interval type-2 fuzzy logic based antenatal care system using phonocardiography. *Applied Soft Computing*, *14*, 489–497.
293) Gong, Y. (2013). Fuzzy multi-attribute group decision making method based on interval type-2 fuzzy sets and applications to global supplier selection. *International Journal of Fuzzy Systems*, *15*(4), 392–400.
294) Wang, L., Liu, Z., Zhang, Y., Chen, C. P., Chen, X. (2013). Type-2 Fuzzy Logic Controller Using SRUKF-Based State Estimations for Biped Walking Robots. *International Journal of Fuzzy Systems*, *15*(4).
295) Chang, Y. H., Chen, C. L., Chan, W. S., Lin, H. W. (2013). Type-2 Fuzzy Formation Control for Collision-Free Multi-Robot Systems. *International Journal of Fuzzy Systems*, *15*(4).
296) Anifowose, F., Labadin, J., Abdulraheem, A. (2013). A least-square-driven functional networks type-2 fuzzy logic hybrid model for efficient petroleum reservoir properties prediction. *Neural Computing and Applications*, *23*(1), 179–190.
297) Juang, C. F., Chen, C. Y. (2013). Data-driven interval type-2 neural fuzzy system with high learning accuracy and improved model interpretability. *IEEE Transactions on Cybernetics*, *43*(6), 1781–1795.
298) Mendel, J. M., Liu, X. (2013). Simplified interval type-2 fuzzy logic systems. *IEEE Transactions on Fuzzy Systems*, *21*(6), 1056–1069.
299) Esposito, M., De Pietro, G. (2013). Interval type-2 fuzzy logic for encoding clinical practice guidelines. *Knowledge-Based Systems*, *54*, 329–341.
300) Li, C., Zhang, G., Yi, J., Wang, M. (2013). Uncertainty degree and modeling of interval type-2 fuzzy sets: definition, method and application. *Computers Mathematics with Applications*, *66*(10), 1822–1835.
301) Bernardo, D., Hagras, H., Tsang, E. (2013). A genetic type-2 fuzzy logic based system for the generation of summarised linguistic predictive models for financial applications. *Soft Computing*, *17*(12), 2185–2201.
302) Bilgin, A., Hagras, H., Malibari, A., Alhaddad, M. J., Alghazzawi, D. (2013). Towards a linear general type-2 fuzzy logic based approach for computing with words. *Soft Computing*, *17*(12), 2203–2222.
303) Castillo, O., Melin, P., Castro, J. R. (2013). Computational intelligence software for interval type-2 fuzzy logic. *Computer Applications in Engineering Education*, *21*(4), 737–747.
304) Kang, T. K., Zhang, H., Park, G. T., Kim, D. W. (2013). Ego-motion-compensated object recognition using type-2 fuzzy set for a moving robot. *Neurocomputing*, *120*, 130–140.
305) Fazlyab, M., Pedram, M. Z., Salarieh, H., Alasty, A. (2013). Parameter estimation and interval type-2 fuzzy sliding mode control of a z-axis MEMS gyroscope. *ISA transactions*, *52*(6), 900–911.
306) Ulu, C., Guzelkaya, M., Eksin, I. (2013). A closed form type reduction method for piecewise linear interval type-2 fuzzy sets. *International Journal of Approximate Reasoning*, *54*(9), 1421–1433.
307) Yang, F., Yuan, R., Yi, J., Fan, G., Tan, X. (2013). Direct adaptive type-2 fuzzy neural network control for a generic hypersonic flight vehicle. *Soft computing*, *17*(11), 2053–2064.
308) Chen, S. M., Lee, L. W., Shen, V. R. (2013). Weighted fuzzy interpolative reasoning systems based on interval type-2 fuzzy sets. *Information Sciences*, *248*, 15–30.
309) Greenfield, S., Chiclana, F. (2013). Accuracy and complexity evaluation of defuzzification strategies for the discretised interval type-2 fuzzy set. *International Journal of Approximate Reasoning*, *54*(8), 1013–1033.
310) Melin, P., Castillo, O. (2013). A review on the applications of type-2 fuzzy logic in classification and pattern recognition. *Expert Systems with Applications*, *40*(13), 5413–5423.
311) Greenfield, S., Chiclana, F. (2013). Defuzzification of the discretised generalised type-2 fuzzy set: experimental evaluation. *Information Sciences*, *244*, 1–25.

312) Chen, X., Tan, W. W. (2013). Tracking control of surface vessels via fault-tolerant adaptive backstepping interval type-2 fuzzy control. *Ocean Engineering*, *70*, 97–109.
313) Wang, L., Liu, Z., Zhang, Y., Chen, C. P., Chen, X. (2013). Type-2 Fuzzy Logic Controller Using SRUKF-Based State Estimations for Biped Walking Robots. *International Journal of Fuzzy Systems*, *15*(4).
314) Tavoosi, J., Badamchizadeh, M. A. (2013). A class of type-2 fuzzy neural networks for nonlinear dynamical system identification. *Neural Computing and Applications*, *23*(3-4), 707–717.
315) Sayed, M. M., Saad, M. S., Emara, H. M., El-Zahab, E. A. (2013). Improving the performance of the Egyptian second testing nuclear research reactor using interval type-2 fuzzy logic controller tuned by modified biogeography-based optimization. *Nuclear Engineering and Design*, *262*, 294–305.
316) Chen, T. Y. (2013). An interactive method for multiple criteria group decision analysis based on interval type-2 fuzzy sets and its application to medical decision making. *Fuzzy Optimization and Decision Making*, *12*(3), 323–356.
317) Abiyev, R. H., Kaynak, O., Kayacan, E. (2013). A type-2 fuzzy wavelet neural network for system identification and control. *Journal of the Franklin Institute*, *350*(7), 1658–1685.
318) Chen, S. M., Wang, C. Y. (2013). Fuzzy decision making systems based on interval type-2 fuzzy sets. *Information Sciences*, *242*, 1–21.
319) Dereli, T., Altun, K. (2013). Technology evaluation through the use of interval type-2 fuzzy sets and systems. *Computers Industrial Engineering*, *65*(4), 624–633.
320) Ulu, C., Güzelkaya, M., Eksin, I. (2013). Granular type-2 membership functions: A new approach to formation of footprint of uncertainty in type-2 fuzzy sets. *Applied Soft Computing*, *13*(8), 3713–3728.
321) Martínez, J. S., Mulot, J., Harel, F., Hissel, D., Pera, M. C., John, R. I., Amiet, M. (2013). Experimental validation of a type-2 fuzzy logic controller for energy management in hybrid electrical vehicles. *Engineering Applications of Artificial Intelligence*, *26*(7), 1772–1779.
322) Takáč, Z. (2013). Inclusion and subsethood measure for interval-valued fuzzy sets and for continuous type-2 fuzzy sets. *Fuzzy Sets and Systems*, *224*, 106–120.
323) Zarandi, M. F., Gamasaee, R. (2013). A type-2 fuzzy system model for reducing bullwhip effects in supply chains and its application in steel manufacturing. *Scientia Iranica*, *20*(3), 879–899.
324) Mendel, J. M., Hagras, H., John, R. I. (2013). Guest Editorial for the special issue on type-2 fuzzy sets and systems. *IEEE Transactions on Fuzzy Systems*, *21*(3), 397–398.
325) Chen, S. M., Chang, Y. C., Pan, J. S. (2013). Fuzzy rules interpolation for sparse fuzzy rule-based systems based on interval type-2 Gaussian fuzzy sets and genetic algorithms. *IEEE transactions on fuzzy systems*, *21*(3), 412–425.
326) Mendel, J. M. (2013). On KM algorithms for solving type-2 fuzzy set problems. *IEEE Transactions on Fuzzy Systems*, *21*(3), 426–446.
327) Cara, A. B., Wagner, C., Hagras, H., Pomares, H., Rojas, I. (2013). Multiobjective optimization and comparison of nonsingleton type-1 and singleton interval type-2 fuzzy logic systems. *IEEE Transactions on Fuzzy systems*, *21*(3), 459–476.
328) Juang, C. F., Juang, K. J. (2013). Reduced interval type-2 neural fuzzy system using weighted bound-set boundary operation for computation speedup and chip implementation. *IEEE Transactions on Fuzzy Systems*, *21*(3), 477–491.
329) Lin, Y. Y., Chang, J. Y., Pal, N. R., Lin, C. T. (2013). A mutually recurrent interval type-2 neural fuzzy system (MRIT2NFS) with self-evolving structure and parameters. *IEEE Transactions on Fuzzy Systems*, *21*(3), 492–509.
330) Yuste, A. J., Trivino, A., Casilari, E. (2013). Type-2 fuzzy decision support system to optimise MANET integration into infrastructure-based wireless systems. *Expert Systems with Applications*, *40*(7), 2552–2567.
331) Zarandi, M. F., Torshizi, A. D., Turksen, I. B., Rezaee, B. (2013). A new indirect approach to the type-2 fuzzy systems modeling and design. *Information Sciences*, *232*, 346–365.
332) Chen, T. Y. (2013). A linear assignment method for multiple-criteria decision analysis with interval type-2 fuzzy sets. *Applied Soft Computing*, *13*(5), 2735–2748.
333) Chiclana, F., Zhou, S. M. (2013). Type-Reduction of General Type-2 Fuzzy Sets: The Type-1 OWA Approach. *International Journal of Intelligent Systems*, *28*(5), 505–522.
334) Chen, T. Y., Chang, C. H., Lu, J. F. R. (2013). The extended QUALIFLEX method for multiple criteria decision analysis based on interval type-2 fuzzy sets and applications to medical decision making. *European Journal of Operational Research*, *226*(3), 615–625.
335) Zhang, Z., Zhang, S. (2013). A novel approach to multi attribute group decision making based on trapezoidal interval type-2 fuzzy soft sets. *Applied Mathematical Modelling*, *37*(7), 4948–4971.
336) Pagola, M., Lopez-Molina, C., Fernandez, J., Barrenechea, E., Bustince, H. (2013). Interval type-2 fuzzy sets constructed from several membership functions: application to the fuzzy thresholding algorithm. *IEEE Transactions on Fuzzy Systems*, *21*(2), 230–244.
337) Chen, T. Y. (2013). A signed-distance-based approach to importance assessment and multi-criteria group decision analysis based on interval type-2 fuzzy set. *Knowledge and information systems*, 1–39.
338) Demidova, L. A. (2013). Genetic algorithm for optimal parameters search in the one-factor forecasting model based on continuous type-2 fuzzy sets. *Automation and Remote Control*, *74*(2), 313–320.
339) Wu, G. D., Huang, P. H. (2013). A vectorization--optimization-method-based type-2 fuzzy neu-

ral network for noisy data classification. *IEEE Transactions on Fuzzy Systems*, *21*(1), 1–15.
340) Wu, D. (2013). Approaches for reducing the computational cost of interval type-2 fuzzy logic systems: overview and comparisons. *IEEE Transactions on Fuzzy Systems*, *21*(1), 80–99.
341) Hsu, C. H., Juang, C. F. (2013). Evolutionary robot wall-following control using type-2 fuzzy controller with species-DE-activated continuous ACO. *IEEE Transactions on Fuzzy Systems*, *21*(1), 100–112.
342) Kumbasar, T., Eksin, I., Guzelkaya, M., Yesil, E. (2013). Exact inversion of decomposable interval type-2 fuzzy logic systems. *International Journal of Approximate Reasoning*, *54*(2), 253–272.
343) Molaeezadeh, S. F., Moradi, M. H. (2013). A 2uFunction representation for non-uniform type-2 fuzzy sets: Theory and design. *International Journal of Approximate Reasoning*, *54*(2), 273–289.
344) Abbadi, A., Nezli, L., Boukhetala, D. (2013). A nonlinear voltage controller based on interval type 2 fuzzy logic control system for multimachine power systems. *International Journal of Electrical Power Energy Systems*, *45*(1), 456–467.
345) Tung, S. W., Quek, C., Guan, C. (2013). eT2FIS: An evolving type-2 neural fuzzy inference system. *Information Sciences*, *220*, 124–148.
346) MéNdez, G. M., De Los Angeles HernáNdez, M. (2013). Hybrid learning mechanism for interval A2-C1 type-2 non-singleton type-2 Takagi–Sugeno–Kang fuzzy logic systems. *Information Sciences*, *220*, 149–169.
347) Zhang, Z. (2013). On characterization of generalized interval type-2 fuzzy rough sets. *Information Sciences*, *219*, 124–150.
348) Çelik, Y. H., Özek, M. B., Özek, C. (2013). Investigation of Plasma Arc Cutting Parameters With Type-2 Fuzzy Set and System. *Materials Testing*, *55*(10), 789–795.
349) Altin, N. (2013). Interval type-2 fuzzy logic controller based maximum power point tracking in photovoltaic systems. *Advances in Electrical and Computer Engineering*, *13*(3), 65–70.
350) Aminifar, S., Marzuki, A. (2013). Uncertainty in interval type-2 fuzzy systems. *Mathematical Problems in Engineering*, 2013.
351) Kiani, M., Mohammadi, S. M. A., Gharaveisi, A. A. (2013). A bacterial foraging optimization approach for tuning type-2 fuzzy logic controller. *Turkish Journal of Electrical Engineering Computer Sciences*, *21*(1), 263–273.
352) Mikkili, S., Panda, A. K. (2013). Types-1 and-2 fuzzy logic controllers-based shunt active filter Id–Iq control strategy with different fuzzy membership functions for power quality improvement using RTDS hardware. *IET Power Electronics*, *6*(4), 818–833.
353) Ngo, L. T. (2013). General type-2 fuzzy logic systems based on refinement constraint triangulated irregular network. *Journal of Intelligent Fuzzy Systems*, *25*(3), 771–784.
354) Khooban, M. H., Alfi, A., Abadi, D. N. M. (2013). Control of a class of non-linear uncertain chaotic systems via an optimal Type-2 fuzzy proportional integral derivative controller. *IET Science, Measurement Technology*, *7*(1), 50–58.
355) Takáč, Z. (2013). On some properties of $\alpha $-planes of type-2 fuzzy sets. *Kybernetika*, *49*(1), 149–163.
356) El-Sousy, F. F. (2013). Robust recurrent wavelet interval type-2 fuzzy-neural-network control for dsp-based pmsm servo drive systems. *Journal of Power Electronics*, *13*(1), 139–160.
357) Maldonado, Y., Castillo, O., Melin, P. (2013). Particle swarm optimization of interval type-2 fuzzy systems for FPGA applications. *Applied Soft Computing*, *13*(1), 496–508.
358) Taoyan, Z. H. A. O., Ping, L. I., Jiangtao, C. (2012). Study of interval type-2 fuzzy controller for the twin-tank water level system. *Chinese Journal of Chemical Engineering*, *20*(6), 1102–1106.
359) Lou, C. W., Dong, M. C. (2012). Modeling data uncertainty on electric load forecasting based on Type-2 fuzzy logic set theory. *Engineering Applications of Artificial Intelligence*, *25*(8), 1567–1576.
360) Ren, Q., Balazinski, M., Baron, L. (2012). High-order interval type-2 Takagi-Sugeno-Kang fuzzy logic system and its application in acoustic emission signal modeling in turning process. *The International Journal of Advanced Manufacturing Technology*, *63*(9), 1057–1063.
361) Sudha, K. R., Santhi, R. V. (2012). Load frequency control of an interconnected reheat thermal system using type-2 fuzzy system including SMES units. *International Journal of Electrical Power Energy Systems*, *43*(1), 1383–1392.
362) Tao, C. W., Taur, J. S., Chang, C. W., Chang, Y. H. (2012). Simplified type-2 fuzzy sliding controller for wing rock system. *Fuzzy sets and systems*, *207*, 111–129.
363) Panda, M. K., Pillai, G. N., Kumar, V. (2012). Power system stabilizer design using interval type-2 fuzzy logic control. *INTERNATIONAL REVIEW OF ELECTRICAL ENGINEERING-IREE*, *7*(6), 6252–6265.
364) Zhang, Z. (2012). On interval type-2 rough fuzzy sets. *Knowledge-Based Systems*, *35*, 1–13.
365) Liu, Z., Chen, C. P., Zhang, Y., Li, H. X. (2012). Type-2 hierarchical fuzzy system for high-dimensional data-based modeling with uncertainties. *Soft Computing*, *16*(11), 1945–1957.
366) Khanesar, M. A., Kayacan, E., Teshnehlab, M., Kaynak, O. (2012). Extended Kalman filter based learning algorithm for type-2 fuzzy logic systems and its experimental evaluation. *IEEE Transactions on Industrial Electronics*, *59*(11), 4443–4455.
367) Castillo, O., Melin, P. (2012). Optimization of type-2 fuzzy systems based on bio-inspired methods: A concise review. *Information Sciences*, *205*, 1–19.
368) Linda, O., Manic, M. (2012). Monotone centroid flow algorithm for type reduction of general type-2 fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *20*(5), 805–819.

369) Wu, D. (2012). On the fundamental differences between interval type-2 and type-1 fuzzy logic controllers. *IEEE Transactions on Fuzzy Systems*, *20*(5), 832–848.
370) Linda, O., Manic, M. (2012). General type-2 fuzzy c-means algorithm for uncertain fuzzy clustering. *IEEE Transactions on Fuzzy Systems*, *20*(5), 883–897.
371) Zhai, D., Mendel, J. M. (2012). Enhanced centroid-flow algorithm for computing the centroid of general type-2 fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *20*(5), 939–956.
372) Wagner, C., Hagras, H. (2010). Toward general type-2 fuzzy logic systems based on zSlices. *IEEE Transactions on Fuzzy Systems*, *18*(4), 637–660.
373) Zhai, D., Hao, M., Mendel, J. (2012). Universal image noise removal filter based on type-2 fuzzy logic system and QPSO. *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, *20*(supp02), 207–232.
374) Kwak, H. J., Kim, D. W., Park, G. T. (2012). A New Fuzzy Inference Technique for Singleton Type-2 Fuzzy Logic Systems. *International Journal of Advanced Robotic Systems*, *9*(3), 83.
375) Hu, H., Wang, Y., Cai, Y. (2012). Advantages of the Enhanced Opposite Direction Searching Algorithm for Computing the Centroid of An Interval Type-2 Fuzzy Set. *Asian Journal of Control*, *14*(5), 1422–1430.
376) Kayacan, E., Cigdem, O., Kaynak, O. (2012). Sliding mode control approach for online learning as applied to type-2 fuzzy neural networks and its experimental evaluation. *IEEE transactions on industrial electronics*, *59*(9), 3510–3520.
377) Chen, X., Hu, W. D. (2012). Approach based on interval type-2 fuzzy logic system for emitter identification. *Electronics letters*, *48*(18), 1156–1158.
378) Tan, K. (2012). Type-2 Fuzzy Logic-Plodding on Steadily and Staying Relevant [Editor's Remarks]. *IEEE Computational Intelligence Magazine*, *7*(3), 2–8.
379) Hagras, H., Wagner, C. (2012). Towards the wide spread use of type-2 fuzzy logic systems in real world applications. *IEEE Computational Intelligence Magazine*, *7*(3), 14–24.
380) Yuksel, M. E., Basturk, A. (2012). Application of type-2 fuzzy logic filtering to reduce noise in color images. *IEEE Computational intelligence magazine*, *7*(3), 25–35.
381) John, R., Coupland, S. (2012). Type-2 fuzzy logic: challenges and misconceptions [discussion forum]. *IEEE Computational Intelligence Magazine*, *7*(3), 48–52.
382) Khosravi, A., Nahavandi, S., Creighton, D., Srinivasan, D. (2012). Interval type-2 fuzzy logic systems for load forecasting: A comparative study. *IEEE Transactions on Power Systems*, *27*(3), 1274–1282.
383) Boumella, N., Djouani, K., Boulemden, M. (2012). A robust interval Type-2 TSK Fuzzy Logic System design based on Chebyshev fitting. *International Journal of Control, Automation and Systems*, *10*(4), 727–736.
384) Atacak, I., Bay, O. F. (2012). A type-2 fuzzy logic controller design for buck and boost DC–DC converters. *journal of intelligent manufacturing*, *23*(4), 1023–1034.
385) Cazarez-Castro, N. R., Aguilar, L. T., Castillo, O. (2012). Designing type-1 and type-2 fuzzy logic controllers via fuzzy Lyapunov synthesis for nonsmooth mechanical systems. *Engineering Applications of Artificial Intelligence*, *25*(5), 971–979.
386) Zarandi, M. F., Gamasaee, R. (2012). Type-2 fuzzy hybrid expert system for prediction of tardiness in scheduling of steel continuous casting process. *Soft Computing*, *16*(8), 1287–1302.
387) Kayacan, E., Kaynak, O. (2012). Sliding mode control theory-based algorithm for online learning in type-2 fuzzy neural networks: application to velocity control of an electro hydraulic servo system. *International Journal of Adaptive Control and Signal Processing*, *26*(7), 645–659.
388) Méndez, G. M., Colás, R., Leduc, L., Lopez-Juarez, I., Longoria, R. (2012). Finishing mill thread speed set-up and control by interval type 1 non-singleton type 2 fuzzy logic systems. *Ironmaking Steelmaking*, *39*(5), 342–354.
389) Nechadi, E., Harmas, M. N., Hamzaoui, A., Essounbouli, N. (2012). Type-2 fuzzy based adaptive synergetic power system control. *Electric Power Systems Research*, *88*, 9–15.
390) Mahmoodian, H. (2012). Predicting the continuous values of breast cancer relapse time by type-2 fuzzy logic system. *Australasian physical engineering sciences in medicine*, *35*(2), 193–204.
391) Wu, D., Mendel, J. M., Coupland, S. (2012). Enhanced interval approach for encoding words into interval type-2 fuzzy sets and its convergence analysis. *IEEE Transactions on Fuzzy Systems*, *20*(3), 499–513.
392) Wu, H. J., Su, Y. L., Lee, S. J. (2012). A fast method for computing the centroid of a type-2 fuzzy set. *IEEE Transactions on Systems, Man, and Cybernetics, Part B (Cybernetics)*, *42*(3), 764–777.
393) Hwang, C. M., Yang, M. S., Hung, W. L. (2012). On similarity, inclusion measure and entropy between type-2 fuzzy sets. *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, *20*(03), 433–449.
394) Li, Y. M., Sun, Y. Y. (2012). Type-2 T–S fuzzy impulsive control of nonlinear systems. *Applied Mathematical Modelling*, *36*(6), 2710–2723.
395) Martínez, J. S., John, R. I., Hissel, D., Péra, M. C. (2012). A survey-based type-2 fuzzy logic system for energy management in hybrid electrical vehicles. *Information Sciences*, *190*, 192–207.
396) Greenfield, S., Chiclana, F., John, R., Coupland, S. (2012). The sampling method of defuzzification for type-2 fuzzy sets: experimental evaluation. *Information Sciences*, *189*, 77–92.
397) Huang, C. J., Hu, K. W., Cheng, H., Chang, T. K., Luo, Y. C., Lien, Y. J. (2012). Application of type-2 fuzzy logic to rule-based intrusion alert correlation detection. *Int J Innov Computing Inform and Control*, *8*(4), 2865–74.

398) Hosseini, R., Qanadli, S. D., Barman, S., Mazinani, M., Ellis, T., Dehmeshki, J. (2012). An automatic approach for learning and tuning Gaussian interval type-2 fuzzy membership functions applied to lung CAD classification system. *IEEE Transactions on Fuzzy Systems*, *20*(2), 224–234.
399) Manceur, M., Essounbouli, N., Hamzaoui, A. (2012). Second-order sliding fuzzy interval type-2 control for an uncertain system with real application. *IEEE Transactions on Fuzzy Systems*, *20*(2), 262–275.
400) Mousavi, S. H., Ranjbar-Sahraei, B., Noroozi, N. (2012). Output feedback controller for hysteretic time-delayed MIMO nonlinear systems. *Nonlinear Dynamics*, *68*(1), 63–76.
401) Chen, S. M., Yang, M. W., Lee, L. W., Yang, S. W. (2012). Fuzzy multiple attributes group decision-making based on ranking interval type-2 fuzzy sets. *Expert Systems with Applications*, *39*(5), 5295–5308.
402) Zarandi, M. F., Gamasaee, R., Turksen, I. B. (2012). A type-2 fuzzy c-regression clustering algorithm for Takagi–Sugeno system identification and its application in the steel industry. *Information Sciences*, *187*, 179–203.
403) Zhang, L., Jia, Z., Liu, W., Li, A. (2012). A two--stage servo feed controller of micro-EDM based on interval type-2 fuzzy logic. *The International Journal of Advanced Manufacturing Technology*, *59*(5), 633–645.
404) Hidalgo, D., Melin, P., Castillo, O. (2012). An optimization method for designing type-2 fuzzy inference systems based on the footprint of uncertainty using genetic algorithms. *Expert Systems with Applications*, *39*(4), 4590–4598.
405) Chakravarty, S., Dash, P. K. (2012). A PSO based integrated functional link net and interval type-2 fuzzy logic system for predicting stock market indices. *Applied Soft Computing*, *12*(2), 931–941.
406) Zhang, Z., Zhang, S. (2012). Type-2 fuzzy soft sets and their applications in decision making. *Journal of Applied Mathematics*, *2012*.
407) Yi-Min, L., Yang, Y., Li, L. (2012). Adaptive backstepping fuzzy control based on type-2 fuzzy system. *Journal of Applied Mathematics*, *2012*.
408) Panda, M. K., Pillai, G. N., Kumar, V. (2011). Design of an interval type-2 fuzzy logic controller for automatic voltage regulator system. *Electric Power Components and Systems*, *40*(2), 219–235.
409) Zarandi, M. F., Faraji, M. R., Karbasian, M. (2012). Interval type-2 fuzzy expert system for prediction of carbon monoxide concentration in mega--cities. *Applied Soft Computing*, *12*(1), 291–301.
410) Wang, M., Li, N., Li, S., Shi, H. (2011). Embedded interval type-2 TS fuzzy time/space separation modeling approach for nonlinear distributed parameter system. *Industrial Engineering Chemistry Research*, *50*(24), 13954–13961.
411) Cao, J., Ji, X., Li, P., Liu, H. (2011). Design of Adaptive Interval Type-2 Fuzzy Control System and Its Stability Analysis. *International Journal of Fuzzy Systems*, *13*(4).
412) Yeh, C. Y., Jeng, W. H. R., Lee, S. J. (2011). Data--based system modeling using a type-2 fuzzy neural network with a hybrid learning algorithm. *IEEE transactions on neural networks*, *22*(12), 2296–2309.
413) Khaki, B., Ranjbar-Sahraei, B., Noroozi, N., Seifi, A. (2011). Interval type-2 fuzzy finite-time control approach for chaotic oscillation damping of power systems. *International Journal of Innovative Computing, Information and Control*, *7*(12), 6827–6835.
414) Jafarzadeh, S., Fadali, M. S., Sonbol, A. H. (2011). Stability analysis and control of discrete type-1 and type-2 TSK fuzzy systems: Part I. Stability analysis. *IEEE Transactions on Fuzzy Systems*, *19*(6), 989–1000
415) Jafarzadeh, S., Fadali, M. S., Sonbol, A. H. (2011). Stability analysis and control of discrete type-1 and type-2 TSK fuzzy systems: Part II. Control design. *IEEE Transactions on Fuzzy Systems*, *19*(6), 1001–1013.
416) Kayacan, E., Oniz, Y., Aras, A. C., Kaynak, O., Abiyev, R. (2011). A servo system control with time-varying and nonlinear load conditions using type-2 TSK fuzzy neural system. *Applied Soft Computing*, *11*(8), 5735–5744.
417) Roopaei, M., Jahromi, M. Z., Ranjbar-Sahraei, B., Lin, T. C. (2011). Synchronization of two different chaotic systems using novel adaptive interval type-2 fuzzy sliding mode control. *Nonlinear Dynamics*, *66*(4), 667–680.
418) Linda, O., Manic, M. (2011). Uncertainty-robust design of interval type-2 fuzzy logic controller for delta parallel robot. *IEEE transactions on industrial informatics*, *7*(4), 661–670.
419) Makhloufi, S., Abdessemed, R. (2011). Type-2 fuzzy logic optimum PV/inverter sizing ratio for grid-connected PV systems: application to selected Algerian locations. *Journal of Electrical Engineering and Technology*, *6*(6), 731–741.
420) Chen, C. S., Lin, W. C. (2011). Self-adaptive interval type-2 neural fuzzy network control for PMLSM drives. *Expert Systems with Applications*, *38*(12), 14679–14689.
421) Barkat, S., Tlemçani, A., Nouri, H. (2011). Noninteracting adaptive control of PMSM using interval type-2 fuzzy logic systems. *IEEE Transactions on Fuzzy Systems*, *19*(5), 925–936.
422) Chen, C. S. (2011). Supervisory adaptive tracking control of robot manipulators using interval type-2 TSK fuzzy logic system. *IET control theory applications*, *5*(15), 1796–1807.
423) Pan, Y., Er, M. J., Huang, D., Wang, Q. (2011). Fire--rule-based direct adaptive type-2 fuzzy H∞ tracking control. *Engineering Applications of Artificial Intelligence*, *24*(7), 1174–1185.
424) Khanesar, M. A., Kayacan, E., Teshnehlab, M., Kaynak, O. (2011). Analysis of the noise reduction property of type-2 fuzzy logic systems using a novel type-2 membership function. *IEEE Transactions on Systems, Man, and Cybernetics, Part B (Cybernetics)*, *41*(5), 1395–1406.
425) Chen, S. M., Chang, Y. C. (2011). Fuzzy rule interpolation based on the ratio of fuzziness of inter-

val type-2 fuzzy sets. *Expert Systems with Applications*, *38*(10), 12202–12213.
426) Sahab, N., Hagras, H. (2011). Adaptive non-singleton type-2 fuzzy logic systems: A way forward for handling numerical uncertainties in real world applications. *International Journal of Computers Communications Control*, *6*(3), 503–529.
427) Melin, P., Mendoza, O., Castillo, O. (2011). Face recognition with an improved interval type-2 fuzzy logic sugeno integral and modular neural networks. *IEEE Transactions on systems, man, and cybernetics-Part A: systems and humans*, *41*(5), 1001–1012.
428) Lin, T. C., Chen, M. C., Roopaei, M. (2011). Synchronization of uncertain chaotic systems based on adaptive type-2 fuzzy sliding mode control. *Engineering Applications of Artificial Intelligence*, *24*(1), 39–49.
429) Galluzzo, M., Cosenza, B. (2011). Control of a non-isothermal continuous stirred tank reactor by a feedback–feedforward structure using type-2 fuzzy logic controllers. *Information Sciences*, *181*(17), 3535–3550.
430) Olatunji, S. O., Selamat, A., Raheem, A. A. A. (2011). Predicting correlations properties of crude oil systems using type-2 fuzzy logic systems. *Expert Systems with Applications*, *38*(9), 10911–10922.
431) Chen, S. M., Chang, Y. C. (2011). Fuzzy rule interpolation based on principle membership functions and uncertainty grade functions of interval type-2 fuzzy sets. *Expert Systems with Applications*, *38*(9), 11573–11580.
432) Visconti, A., Tahayori, H. (2011). Artificial immune system based on interval type-2 fuzzy set paradigm. *Applied Soft Computing*, *11*(6), 4055–4063.
433) Liu, X., Mendel, J. M. (2011). Connect Karnik–Mendel algorithms to root-finding for computing the centroid of an interval type-2 fuzzy set. *IEEE Transactions on Fuzzy Systems*, *19*(4), 652–665.
434) Chen, S. M., Lee, L. W. (2011). Fuzzy interpolative reasoning for sparse fuzzy rule-based systems based on interval type-2 fuzzy sets. *Expert Systems with Applications*, *38*(8), 9947–9957.
435) Linda, O., Manic, M. (2011). Interval type-2 fuzzy voter design for fault tolerant systems. *Information Sciences*, *181*(14), 2933–2950.
436) Chen, C. S. (2011). Supervisory interval type-2 TSK neural fuzzy network control for linear microstepping motor drives with uncertainty observer. *IEEE Transactions on Power Electronics*, *26*(7), 2049–2064.
437) Flores, W. C., Mombello, E. E., Jardini, J. A., Rattá, G., Corvo, A. M. (2011). Expert system for the assessment of power transformer insulation condition based on type-2 fuzzy logic systems. *Expert Systems with Applications*, *38*(7), 8119–8127.
438) Yuste, A. J., Triviño, A., Casilari, E. (2011). Type-2 fuzzy logic control to optimise Internet-connected MANETs. *Electronics letters*, *47*(12), 727–728.
439) Li, R., Wen, K., Gu, X., Li, Y., Sun, X., Li, B. (2011). Type-2 fuzzy description logic. *Frontiers of Computer Science in China*, *5*(2), 205–215.
440) Zhai, D., Mendel, J. M. (2011). Computing the centroid of a general type-2 fuzzy set by means of the centroid-flow algorithm. *IEEE Transactions on Fuzzy Systems*, *19*(3), 401–422.
441) Zhou, H. B., Ying, H., Duan, J. A. (2011). Adaptive control using interval Type-2 fuzzy logic for uncertain nonlinear systems. *Journal of Central South University of Technology*, *18*(3), 760.
442) Castillo, O., Melin, P., Alanis, A., Montiel, O., Sepúlveda, R. (2011). Optimization of interval type-2 fuzzy logic controllers using evolutionary algorithms. *Soft Computing*, *15*(6), 1145–1160.
443) Rey, M. A. M., Blanco, J. O. B., Paez, G. K. S. (2011). An embedded type-2 fuzzy processor for the inverted pendulum control problem. *IEEE Latin America Transactions*, *9*(3), 240–246.
444) Park, K. J., Oh, S. K., Kim, Y. K. (2011). Design of Interval Type-2 Fuzzy Set-based Fuzzy Neural Networks and Its Optimization Using Generation-based Evolution. *information-an international interdisciplinary journal*, *14*(5), 1775–1790.
445) Aliev, R. A., Pedrycz, W., Guirimov, B. G., Aliev, R. R., Ilhan, U., Babagil, M., Mammadli, S. (2011). Type-2 fuzzy neural networks with fuzzy clustering and differential evolution optimization. *Information Sciences*, *181*(9), 1591–1608.
446) Hwang, C. M., Yang, M. S., Hung, W. L., Lee, E. S. (2011). Similarity, inclusion and entropy measures between type-2 fuzzy sets based on the Sugeno integral. *Mathematical and Computer Modelling*, *53*(9), 1788–1797.
447) Mohammadi, S. M. A., Gharaveisi, A. A., Mashinchi, M., Vaezi-Nejad, S. M. (2011). An evolutionary tuning technique for type-2 fuzzy logic controller. *Transactions of the Institute of Measurement and Control*, *33*(2), 223–245.
448) Yeh, C. Y., Jeng, W. H. R., Lee, S. J. (2011). An enhanced type–reduction algorithm for type–2 fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *19*(2), 227–240.
449) Biglarbegian, M., Melek, W., Mendel, J. (2011). On the robustness of type-1 and interval type-2 fuzzy logic systems in modeling. *Information Sciences*, *181*(7), 1325–1347.
450) Li, C., Yi, J., Wang, T. (2011). Encoding prior knowledge into data driven design of interval type-2 fuzzy logic systems. *International Journal of Innovative Computing, Information and Control*, *7*(3), 1133–1144.
451) Sudha, K. R., Santhi, R. V. (2011). Robust decentralized load frequency control of interconnected power system with Generation Rate Constraint using Type-2 fuzzy approach. *International Journal of Electrical Power Energy Systems*, *33*(3), 699–707.
452) Pan, Y., Huang, D. (2011). Comment on "Based on interval type-2 adaptive fuzzy H∞ tracking controller for SISO time-delay nonlinear systems". *Communications in Nonlinear Science and Numerical Simulation*, *16*(3), 1693–1696.

453) Wu, D., Mendel, J. M. (2011). Linguistic summarization using IF–THEN rules and interval type-2 fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *19*(1), 136–151.
454) Wu, D., Mendel, J. M. (2011). On the continuity of type-1 and interval type-2 fuzzy logic systems. *IEEE Transactions on Fuzzy Systems*, *19*(1), 179–192.
455) Balaji, P. G., Srinivasan, D. (2011). Type-2 fuzzy logic based urban traffic management. *Engineering Applications of Artificial Intelligence*, *24*(1), 12–22.
456) Al-Khazraji, A., Essounbouli, N., Hamzaoui, A., Nollet, F., Zaytoon, J. (2011). Type-2 fuzzy sliding mode control without reaching phase for nonlinear system. *Engineering applications of artificial intelligence*, *24*(1), 23–38.
457) Lin, T. C., Chen, M. C., Roopaei, M. (2011). Synchronization of uncertain chaotic systems based on adaptive type-2 fuzzy sliding mode control. *Engineering Applications of Artificial Intelligence*, *24*(1), 39–49.
458) Hwang, J. H., Kwak, H. J., Park, G. T. (2011). Adaptive interval type-2 fuzzy sliding mode control for unknown chaotic system. *Nonlinear dynamics*, *63*(3), 491–502.
459) Dereli, T., Baykasoglu, A., Altun, K., Durmusoglu, A., Türksen, I. B. (2011). Industrial applications of type-2 fuzzy sets and systems: A concise review. *Computers in Industry*, *62*(2), 125–137.
460) Olatunji, S. O., Selamat, A., Abdulraheem, A. (2011). Modeling the permeability of carbonate reservoir using type-2 fuzzy logic systems. *Computers in industry*, *62*(2), 147–163.
461) Zhai, D., Mendel, J. M. (2011). Uncertainty measures for general type-2 fuzzy sets. *Information Sciences*, *181*(3), 503–518.
462) Aisbett, J., Rickard, J. T., Morgenthaler, D. (2011). Multivariate modeling and type-2 fuzzy sets. *Fuzzy Sets and Systems*, *163*(1), 78–95.
463) Lee, C. H., Chang, F. Y. (2011). Interval type-2 recurrent fuzzy neural system for nonlinear systems control using stable simultaneous perturbation stochastic approximation algorithm. *Mathematical Problems in Engineering*, *2011*.
464) Lee, C. H., Lin, Y. C. (2011). Robust adaptive control for nonlinear uncertain systems using type-2 fuzzy neural network system. *Mathematical Problems in Engineering*, *2011*.
465) Karnik, N. N., Mendel, J. M. (2001). Centroid of a type-2 fuzzy set. *Information Sciences*, *132*(1), 195–220.
466) Abiyev, R. H., Kaynak, O., Alshanableh, T., Mamedov, F. (2011). A type-2 neuro-fuzzy system based on clustering and gradient techniques applied to system identification and channel equalization. *Applied Soft Computing*, *11*(1), 1396–1406.
467) Özbay, Y., Ceylan, R., Karlik, B. (2011). Integration of type-2 fuzzy clustering and wavelet transform in a neural network based ECG classifier. *Expert Systems with Applications*, *38*(1), 1004–1010.
468) Knychas, S., Szabat, K. (2011). Adaptive speed control of drive system with 2-type neuro-fuzzy controller. *Przeglad Elektrotechniczny*, *87*(4), 160–163.
469) Knychas, S., Szabat, K. (2011). Adaptive speed control of drive system with 2-type neuro-fuzzy controller. *Przeglad Elektrotechniczny*, *87*(4), 160–163.
470) Lin, T. C. (2010). Based on interval type-2 fuzzy--neural network direct adaptive sliding mode control for SISO nonlinear systems. *Communications in Nonlinear Science and Numerical Simulation*, *15*(12), 4084–4099.
471) Melin, P., Mendoza, O., Castillo, O. (2010). An improved method for edge detection based on interval type-2 fuzzy logic. *Expert Systems with Applications*, *37*(12), 8527–8535.
472) Abiyev, R. H., Kaynak, O. (2010). Type 2 fuzzy neural structure for identification and control of time-varying plants. *IEEE Transactions on Industrial Electronics*, *57*(12), 4147–4159.
473) Wu, T., Qin, K. (2010). Comparative study of image thresholding using type-2 fuzzy sets and cloud model. *International Journal of Computational Intelligence Systems*, *3*(sup01), 61–73.
474) Lin, T. C. (2010). Stable indirect adaptive type-2 fuzzy sliding mode control using Lyapunov approach. *International Journal of Innovative Computing*, *6*(12).
475) Mendel, J. M. (2010). Type-2 fuzzy sets, a tribal parody [discussion forum]. *IEEE Computational Intelligence Magazine*, *5*(4), 24–27.
476) Chen, S. M., Lee, L. W. (2010). Fuzzy multiple criteria hierarchical group decision-making based on interval type-2 fuzzy sets. *IEEE Transactions on Systems, Man, and Cybernetics-Part A: Systems and Humans*, *40*(5), 1120–1128.
477) Li, C., Yi, J. (2010). SIRMs based interval type-2 fuzzy inference systems: properties and application.
478) Wagner, C., Hagras, H. (2010). Toward general type-2 fuzzy logic systems based on zSlices. *IEEE Transactions on Fuzzy Systems*, *18*(4), 637–660.
479) Aisbett, J., Rickard, J. T., Morgenthaler, D. G. (2010). Type-2 fuzzy sets as functions on spaces. *IEEE Transactions on Fuzzy Systems*, *18*(4), 841–844.
480) Galluzzo, M., Cosenza, B. (2010). Adaptive type-2 fuzzy logic control of a bioreactor. *Chemical Engineering Science*, *65*(14), 4208–4221.
481) Niewiadomski, A. (2010). On finity, countability, cardinalities, and cylindric extensions of type-2 fuzzy sets in linguistic summarization of databases. *IEEE Transactions on Fuzzy Systems*, *18*(3), 532–545.
482) Biglarbegian, M., Melek, W. W., Mendel, J. M. (2010). On the stability of interval type-2 TSK fuzzy logic control systems. *IEEE Transactions on Systems, Man, and Cybernetics, Part B (Cybernetics)*, *40*(3), 798–818.
483) Wang, M., Li, N., Li, S. (2010). Local modeling approach for spatially distributed system based on interval type-2 ts fuzzy sets. *Industrial Engineering Chemistry Research*, *49*(9), 4352–4359.
484) Lin, T. C. (2010). Analog circuit fault diagnosis under parameter variations based on type-2

fuzzy logic systems. *International Journal of Innovative Computing, Information and Control*, *6*(5), 2137–2158.
485) Zhang, Q., Chung, F. L., Wang, S. (2010). Transformation between type-2 TSK fuzzy systems and an uncertain Gaussian mixture model. *Soft Computing*, *14*(7), 701–711.
486) Tahayori, H., Tettamanzi, A. G., Degli Antoni, G., Visconti, A., Moharrer, M. (2010). Concave type-2 fuzzy sets: properties and operations. *Soft Computing*, *14*(7), 749–756.
487) Lin, T. C. (2010). Observer-based robust adaptive interval type-2 fuzzy tracking control of multivariable nonlinear systems. *Engineering Applications of Artificial Intelligence*, *23*(3), 386–399.
488) Harding, J., Walker, C., Walker, E. (2010). The variety generated by the truth value algebra of type-2 fuzzy sets. *Fuzzy Sets and Systems*, *161*(5), 735–749.
489) Lin, T. C., Kuo, M. J., Hsu, C. H. (2010). Robust adaptive tracking control of multivariable nonlinear systems based on interval type-2 fuzzy approach. *International Journal of Innovative Computing, Information and Control*, *6*(3), 941–961.
490) Fisher, P. F. (2010). Remote sensing of land cover classes as type 2 fuzzy sets. *Remote Sensing of Environment*, *114*(2), 309-321.
491) Mendel, J. M. (2010). Comments on" $\alpha $-Plane Representation for Type-2 Fuzzy Sets: Theory and Applications. *IEEE Transactions on Fuzzy Systems*, *18*(1), 229–230.
492) Mendez, G. M., Leduc-Lezama, L., Colas, R., Murillo-Perez, G., Ramirez-Cuellar, J., Lopez, J. J. (2010). Modelling and control of coiling entry temperature using interval type-2 fuzzy logic systems. *Ironmaking Steelmaking*, *37*(2), 126–134.
493) Jammeh, E., Mkwawa, I., Sun, L., Ifeachor, E. (2010). Type-2 fuzzy logic control of PQoS driven adaptive VoIP scheme. *Electronics letters*, *46*(2), 137–138.
494) Chen, S. M., Lee, L. W. (2010). Fuzzy multiple attributes group decision-making based on the ranking values and the arithmetic operations of interval type-2 fuzzy sets. *Expert Systems with applications*, *37*(1), 824–833.
495) Boulkhrachef, S., Barkat, S., Berkouk, E. M. (2010). A New Type-2 Fuzzy Logic Based Controller for Unbalance Problem of the DC-Link Voltages of Five-Level NPC Inverter. *International Review of Electrical Engineering*, *5*(1).
496) Own, C. M. (2009). Switching between type-2 fuzzy sets and intuitionistic fuzzy sets: an application in medical diagnosis. *Applied Intelligence*, *31*(3), 283–291.
497) Mendoza, O., Melin, P., Licea, G. (2009). Interval type-2 fuzzy logic for edges detection in digital images. *International Journal of Intelligent Systems*, *24*(11), 1115–1133.
498) Juang, C. F., Huang, R. B., Lin, Y. Y. (2009). A recurrent self-evolving interval type-2 fuzzy neural network for dynamic system processing. *IEEE Transactions on Fuzzy Systems*, *17*(5), 1092–1105.
499) Jammeh, E. A., Fleury, M., Wagner, C., Hagras, H., Ghanbari, M. (2009). Interval type-2 fuzzy logic congestion control for video streaming across IP networks. *IEEE Transactions on Fuzzy Systems*, *17*(5), 1123–1142.
500) Mendel, J. M., Liu, F., Zhai, D. (2009). $\alpha $-Plane Representation for Type-2 Fuzzy Sets: Theory and Applications. *IEEE Transactions on Fuzzy Systems*, *17*(5), 1189–1207.
501) Galluzzo, M., Cosenza, B. (2009). Control of the biodegradation of mixed wastes in a continuous bioreactor by a type-2 fuzzy logic controller. *Computers Chemical Engineering*, *33*(9), 1475–1483.
502) Mendel, J. M. (2009). On answering the question "Where do I start in order to solve a new problem involving interval type-2 fuzzy sets?". *Information Sciences*, *179*(19), 3418–3431.
503) Mendoza, O., Melín, P., Castillo, O. (2009). Interval type-2 fuzzy logic and modular neural networks for face recognition applications. *Applied Soft Computing*, *9*(4), 1377–1387.
504) Yüksel, M. E., Borlu, M. (2009). Accurate segmentation of dermoscopic images by image thresholding based on type-2 fuzzy logic. *IEEE Transactions on Fuzzy Systems*, *17*(4), 976–982.
505) Hameed, I. A. (2009). Simplified architecture of a type-2 fuzzy controller using four embedded type-1 fuzzy controllers and its application to a greenhouse climate control system. *Proceedings of the Institution of Mechanical Engineers, Part I: Journal of Systems and Control Engineering*, *223*(5), 619–631.
506) Greenfield, S., Chiclana, F., Coupland, S., John, R. (2009). The collapsing method of defuzzification for discretised interval type-2 fuzzy sets. *Information Sciences*, *179*(13), 2055–2069.
507) Mendoza, O., Melin, P., Licea, G. (2009). A hybrid approach for image recognition combining type-2 fuzzy logic, modular neural networks and the Sugeno integral. *Information Sciences*, *179*(13), 2078–2101.
508) Choi, B. I., Rhee, F. C. H. (2009). Interval type-2 fuzzy membership function generation methods for pattern recognition. *Information Sciences*, *179*(13), 2102–2122.
509) Hidalgo, D., Castillo, O., Melin, P. (2009). Type-1 and type-2 fuzzy inference systems as integration methods in modular neural networks for multimodal biometry and its optimization with genetic algorithms. *Information Sciences*, *179*(13), 2123–2145.
510) Méndez, G. M., De los Angeles Hernandez, M. (2009). Hybrid learning for interval type-2 fuzzy logic systems based on orthogonal least-squares and back-propagation methods. *Information Sciences*, *179*(13), 2146–2157.
511) Martínez, R., Castillo, O., Aguilar, L. T. (2009). Optimization of interval type-2 fuzzy logic controllers for a perturbed autonomous wheeled mobile robot using genetic algorithms. *Information Sciences*, *179*(13), 2158–2174.

512) Jeon, G., Anisetti, M., Bellandi, V., Damiani, E., Jeong, J. (2009). Designing of a type-2 fuzzy logic filter for improving edge-preserving restoration of interlaced-to-progressive conversion. *Information Sciences*, *179*(13), 2194–2207.
513) Jeon, G., Anisetti, M., Bellandi, V., Damiani, E., Jeong, J. (2009). Designing of a type-2 fuzzy logic filter for improving edge-preserving restoration of interlaced-to-progressive conversion. *Information Sciences*, *179*(13), 2194–2207.
514) Zhou, S. M., Garibaldi, J. M., John, R. I., Chiclana, F. (2009). On constructing parsimonious type-2 fuzzy logic systems via influential rule selection. *IEEE Transactions on Fuzzy Systems*, *17*(3), 654–667.
515) Starczewski, J. T. (2009). Efficient triangular type-2 fuzzy logic systems. *International journal of approximate reasoning*, *50*(5), 799–811.
516) Lin, T. C., Liu, H. L., Kuo, M. J. (2009). Direct adaptive interval type-2 fuzzy control of multivariable nonlinear systems. *Engineering Applications of Artificial Intelligence*, *22*(3), 420–430.
517) Ceylan, R., Özbay, Y., Karlik, B. (2009). A novel approach for classification of ECG arrhythmias: Type-2 fuzzy clustering neural network. *Expert Systems with Applications*, *36*(3), 6721–6726.
518) Wu, H., Wu, Y., Luo, J. (2009). An interval type-2 fuzzy rough set model for attribute reduction. *IEEE Transactions on Fuzzy Systems*, *17*(2), 301–315.
519) Wu, D., Mendel, J. M. (2009). A comparative study of ranking methods, similarity measures and uncertainty measures for interval type-2 fuzzy sets. *Information Sciences*, *179*(8), 1169–1192.
520) Yang, M. S., Lin, D. C. (2009). On similarity and inclusion measures between type-2 fuzzy sets with an application to clustering. *Computers Mathematics with Applications*, *57*(6), 896–907.
521) Ahmed, M. A., Muzaffar, Z. (2009). Handling imprecision and uncertainty in software development effort prediction: A type-2 fuzzy logic based framework. *Information and Software Technology*, *51*(3), 640–654.
522) Lin, F. J. (2015). Type-2 Fuzzy Logic Control [Book Review]. *IEEE Systems, Man, and Cybernetics Magazine*, *1*(1), 47–48.
523) Rickard, J. T., Aisbett, J., Gibbon, G. (2009). Fuzzy Subsethood for Fuzzy Sets of Type-2 and Generalized Type-${n} $. *IEEE Transactions on Fuzzy Systems*, *17*(1), 50–60.
524) Li, T. H., Hsiao, M. Y., Lee, J. Z., Tsai, S. H. (2009). Controlling a time-varying unified chaotic system via interval type 2 fuzzy sliding-mode technique. *International Journal of Nonlinear Sciences and Numerical Simulation*, *10*(2), 171–180.
525) Zarandi, M. F., Rezaee, B., Turksen, I. B., Neshat, E. (2009). A type-2 fuzzy rule-based expert system model for stock price analysis. *Expert Systems with Applications*, *36*(1), 139–154.
526) Lin, F. J., Chou, P. H. (2009). Adaptive control of two-axis motion control system using interval type-2 fuzzy neural network. *IEEE Transactions on Industrial Electronics*, *56*(1), 178–193.
527) Walker, C. L., Walker, E. A. (2009). Some general comments on fuzzy sets of type-2. *International Journal of Intelligent Systems*, *24*(1), 62–75.
528) Lin, F. J., Chen, S. Y., Chou, P. H., Shieh, P. H. (2009). Interval type-2 fuzzy neural network control for X–Y–Theta motion control stage using linear ultrasonic motors. *Neurocomputing*, *72*(4), 1138–1151.
529) Galluzzo, M., Cosenza, B., Matharu, A. (2008). Control of a nonlinear continuous bioreactor with bifurcation by a type-2 fuzzy logic controller. *Computers Chemical Engineering*, *32*(12), 2986–2993.
530) Liu, F., Mendel, J. M. (2008). Encoding words into interval type-2 fuzzy sets using an interval approach. *IEEE transactions on fuzzy systems*, *16*(6), 1503–1521.
531) Juang, C. F., Tsao, Y. W. (2008). A type-2 self-organizing neural fuzzy system and its FPGA implementation. *IEEE Transactions on Systems, Man, and Cybernetics, Part B (Cybernetics)*, *38*(6), 1537–1548.
532) Hsiao, M. Y., Chen, C. Y., Li, T. H. S. (2008). Interval Type-2 Adaptive Fuzzy Sliding-Mode Dynamic Control Design for Wheeled Mobile Robots. *International Journal of Fuzzy Systems*, *10*(4).
533) Tahayori, H., Degli Antoni, G. (2008). Operations on concavoconvex type-2 fuzzy sets. *International Journal of Fuzzy Systems*, *10*(4), 276–286.
534) Wang, T., Chen, Y., Tong, S. (2008). Fuzzy reasoning models and algorithms on type-2 fuzzy sets. *Int. J. Innovative Comput. Inf. Control*, *4*(10), 2451–2460.
535) Fotea, V. L. (2008). The direct and the inverse limit of hyperstructures associated with fuzzy sets of type 2. *Iranian Journal of Fuzzy Systems*, *5*(3), 89–94.
536) Coupland, S., John, R. (2008). New geometric inference techniques for type-2 fuzzy sets. *International Journal of Approximate Reasoning*, *49*(1), 198–211.
537) Lucas, L. A., Centeno, T. M., Delgado, M. R. (2008). Land Cover Classification Based on General Type-2 Fuzzy Classifiers. *International Journal of Fuzzy Systems*, *10*(3).
538) Ozek, M. B., Akpolat, Z. H. (2008). A software tool: Type-2 fuzzy logic toolbox. *Computer Applications in Engineering Education*, *16*(2), 137–146.
539) Ba, A., YÜksel, M. E. (2008). Impulse noise removal from digital images by a detail-preserving filter based on type-2 fuzzy logic. *IEEE Transactions on Fuzzy Systems*, *16*(4), 920–928.
540) Coupland, S., John, R. (2008). A fast geometric method for defuzzification of type-2 fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *16*(4), 929–941.
541) Cao, J., Liu, H., Li, P., Brown, D. (2008). An interval type-2 fuzzy logic controller for quarter-vehicle active suspensions. *Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering*, *222*(8), 1361–1373.
542) Chen, X., Li, Y., Harrison, R., Zhang, Y. Q. (2008). Type-2 fuzzy logic-based classifier fusion for

support vector machines. *Applied Soft Computing*, *8*(3), 1222–1231.
543) Castillo, O., Aguilar, L., Cázarez, N., Cárdenas, S. (2008). Systematic design of a stable type-2 fuzzy logic controller. *Applied Soft Computing*, *8*(3), 1274–1279.
544) Lam, H. K., Seneviratne, L. D. (2008). Stability analysis of interval type-2 fuzzy-model-based control systems. *IEEE Transactions on Systems, Man, and Cybernetics, Part B (Cybernetics)*, *38*(3), 617–628.
545) Xia, X., Liang, Q. (2008). Cross-Layer Design for Mobile Ad Hoc Networks Using Interval Type-2 Fuzzy Logic Systems. *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, *16*(03), 391–407.
546) Barkati, S., Berkouk, E. M., Boucherit, M. S. (2008). Application of type-2 fuzzy logic controller to an induction motor drive with seven-level diode-clamped inverter and controlled infeed. *Electrical Engineering*, *90*(5), 347–359.
547) Liu, F. (2008). An efficient centroid type-reduction strategy for general type-2 fuzzy logic system. *Information Sciences*, *178*(9), 2224–2236.
548) Shu, H., Liang, Q., Gao, J. (2008). Wireless sensor network lifetime analysis using interval type-2 fuzzy logic systems. *IEEE Transactions on Fuzzy Systems*, *16*(2), 416–427.
549) Castillo, O., Melin, P. (2008). Intelligent systems with interval type-2 fuzzy logic. *International Journal of Innovative Computing, Information and Control*, *4*(4), 771–783.
550) Li, Y., Sun, X. (2008). Modelling dynamic niche and community model by type-2 fuzzy set. *ecological modelling*, *211*(3), 375–382.
551) Li, Y., Sun, X., Hua, J., Gong, C. (2008). Modelling redundant structure in ecosystem by type-2 fuzzy logic system. *ecological modelling*, *211*(1), 113–120.
552) Chaoui, H., Gueaieb, W. (2008). Type-2 fuzzy logic control of a flexible-joint manipulator. *Journal of Intelligent Robotic Systems*, *51*(2), 159–186.
553) Wu, D., Mendel, J. M. (2008). A vector similarity measure for linguistic approximation: Interval type-2 and type-1 fuzzy sets. *Information Sciences*, *178*(2), 381–402.
554) Nagy, K., Takács, M. (2008). Type-2 fuzzy sets and SSAD as a Possible Application. *Acta Polytechnica Hungarica*, *5*(1), 111–120.
555) Lin, F. J., Shieh, P. H., Hung, Y. C. (2008). An intelligent control for linear ultrasonic motor using interval type-2 fuzzy neural network. *IET electric power applications*, *2*(1), 32–41.
556) Wu, D., Mendel, J. M. (2007). Aggregation using the linguistic weighted average and interval type-2 fuzzy sets. *IEEE Transactions on Fuzzy Systems*, *15*(6), 1145–1161.
557) Wu, D., Mendel, J. M. (2007). Uncertainty measures for interval type-2 fuzzy sets. *Information sciences*, *177*(23), 5378–5393.
558) Liu, Z., Zhang, Y., Wang, Y. (2007). A type-2 fuzzy switching control system for biped robots. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, *37*(6), 1202–1213.
559) Mendel, J. M., Wu, H. (2007). Type-2 fuzzistics for nonsymmetric interval type-2 fuzzy sets: Forward problems. *IEEE Transactions on Fuzzy Systems*, *15*(5), 916–930.
560) Sevastjanov, P., Figat, P. (2007). Aggregation of aggregating modes in MCDM: Synthesis of Type 2 and Level 2 fuzzy sets. *Omega*, *35*(5), 505–523.
561) Wu, H., Wu, Y., Liu, H., Zhang, H. (2007). Roughness of Type-2 Fuzzy Set Based on Similarity Relation. *International Journal of Uncertainty, Fuzziness and Knowledge-Based Systems*, *15*(04), 503–517.
562) Yager, R. R. (2007). Containment and specificity for type-2 fuzzy sets. *International Journal of Fuzzy Systems*, *9*(2), 55.
563) Sepúlveda, R., Castillo, O., Melin, P., Rodríguez-Díaz, A., Montiel, O. (2007). Experimental study of intelligent controllers under uncertainty using type-1 and type-2 fuzzy logic. *Information Sciences*, *177*(10), 2023–2048.
564) Mendel, J. M., Wu, H. (2007). Type-2 fuzzistics for symmetric interval type-2 fuzzy sets: Part 2, inverse problems. *IEEE Transactions on Fuzzy Systems*, *15*(2), 301–308.
565) Mendel, J. M., Liu, F. (2007). Super-exponential convergence of the Karnik–Mendel algorithms for computing the centroid of an interval type-2 fuzzy set. *IEEE Transactions on Fuzzy Systems*, *15*(2), 309–320.
566) Mendez, G. M. (2007). Modelling and prediction of the MXNUSD exchange rate using interval singleton type-2 fuzzy logic systems [application notes]. *IEEE Computational Intelligence Magazine*, *2*(1), 5–8.
567) Fisher, P. (2007). What is Where? Type-2 Fuzzy Sets for Geographical Information [Research Frontier]. *IEEE Computational Intelligence Magazine*, *2*(1), 9–14.
568) Mendel, J. M. (2007). Type-2 fuzzy sets and systems: An overview [corrected reprint]. *IEEE computational intelligence magazine*, *2*(2), 20–29.
569) John, R., Coupland, S. (2007). Type-2 fuzzy logic: A historical view. *IEEE computational intelligence magazine*, *2*(1), 57–62.
570) Coupland, S., John, R. (2007). Geometric type-1 and type-2 fuzzy logic systems. *IEEE Transactions on Fuzzy Systems*, *15*(1), 3–15.
571) Uncu, O., Turksen, I. B. (2007). Discrete interval type 2 fuzzy system models using uncertainty in learning parameters. *IEEE Transactions on Fuzzy Systems*, *15*(1), 90–106.
572) Hwang, C., Rhee, F. C. H. (2007). Uncertain fuzzy clustering: Interval type-2 fuzzy approach to $ c $-means. *IEEE Transactions on Fuzzy Systems*, *15*(1), 107–120.
573) Mendel, J. M., Wu, H. (2007). New results about the centroid of an interval type-2 fuzzy set, including the centroid of a fuzzy granule. *Information Sciences*, *177*(2), 360–377.

574) Mendel, J. M. (2007). Advances in type-2 fuzzy sets and systems. *Information sciences*, *177*(1), 84–110.
575) Wu, D., Tan, W. W. (2006). Genetic learning and performance evaluation of interval type-2 fuzzy logic controllers. *Engineering Applications of Artificial Intelligence*, *19*(8), 829–841.
576) Mendel, J. M., Wu, H. (2006). Type-2 fuzzistics for symmetric interval type-2 fuzzy sets: Part 1, forward problems. *IEEE Transactions on Fuzzy Systems*, *14*(6), 781–792.
577) Mendel, J. M., John, R. I., Liu, F. (2006). Interval type-2 fuzzy logic systems made simple. *IEEE transactions on fuzzy systems*, *14*(6), 808–821.
578) Tan, D. W. W. W. (2006). A simplified type-2 fuzzy logic controller for real-time control. *ISA transactions*, *45*(4), 503–516.
579) Yimin, L., Xihao, S., Chongying, G. (2006). Niche width and niche overlap: a method based on type-2 fuzzy sets. *Ecological research*, *21*(5), 713–722.
580) Mitchell, H. B. (2006). Correlation coefficient for type-2 fuzzy sets. *International journal of intelligent systems*, *21*(2), 143–153.
581) Mencattini, A., Salmeri, M., Bertazzoni, S., Lojacono, R., Pasero, E., Moniaci, W. (2006). Short term local meteorological forecasting using type-2 fuzzy systems. *Lecture notes in computer science*, *3931*, 95.
582) Mendel, J. M. (2005). On a 50% savings in the computation of the centroid of a symmetrical interval type-2 fuzzy set. *Information Sciences*, *172*(3), 417–430.
583) Wang, S. T., Chung, F. L., Li, Y. Y., Hu, D. W., Wu, X. S. (2005). A new gaussian noise filter based on interval type-2 fuzzy logic systems. *Soft Computing*, *9*(5), 398–406.
584) Niewiadomski, A. (2005, January). On Two Possible Roles of Type-2 Fuzzy Sets in Linguistic Summaries. In *AWIC* (pp. 341–347).
585) Kim, D. W., Park, G. T. (2005). Using interval singleton type 2 fuzzy logic system in corrupted time series modelling. In *Knowledge-Based Intelligent Information and Engineering Systems* (pp. 907–907). Springer Berlin/Heidelberg.
586) Hung, W. L., Yang, M. S. (2004). Similarity measures between type-2 fuzzy sets. *International Journal of Uncertainty, Fuzziness and Knowledge--Based Systems*, *12*(06), 827–841.
587) Hagras, H. A. (2004). A hierarchical type-2 fuzzy logic control architecture for autonomous mobile robots. *IEEE Transactions on fuzzy systems*, *12*(4), 524–539.
588) Türkşen, I. B. (2004). Belief, plausibility, and probability measures on interval-valued type 2 fuzzy sets. *International journal of intelligent systems*, *19*(7), 681–699.
589) Melin, P., Castillo, O. (2004). A new method for adaptive control of non-linear plants using type-2 fuzzy logic and neural networks. *International Journal of General Systems*, *33*(2-3), 289–304.
590) Castillo, O., Melin, P. (2004). A new approach for plant monitoring using type-2 fuzzy logic and fractal theory. *International Journal of General Systems*, *33*(2-3), 305–319.
591) Mendel, J. M. (2004). Computing derivatives in interval type-2 fuzzy logic systems. *IEEE Transactions on Fuzzy Systems*, *12*(1), 84–98.
592) Montalvo, G., Soto, R. (2004). Methodology for handling uncertainty by using interval type-2 Fuzzy Logic Systems. *Lecture notes in computer science*, 536–545.
593) Wu, H., Mendel, J. M. (2002). Uncertainty bounds and their use in the design of interval type-2 fuzzy logic systems. *IEEE Transactions on fuzzy systems*, *10*(5), 622–639.
594) Mendel, J. M., John, R. B. (2002). Type-2 fuzzy sets made simple. *IEEE Transactions on fuzzy systems*, *10*(2), 117–127.
595) Starczewski, J., Rutkowski, L. (2001, September). Connectionist structures of type 2 fuzzy inference systems. In *PPAM* (pp. 634–642).
596) Karnik, N. N., Mendel, J. M. (2001). Operations on type-2 fuzzy sets. *Fuzzy sets and systems*, *122*(2), 327–348.
597) Karnik, N. N., Mendel, J. M. (2001). Centroid of a type-2 fuzzy set. *Information Sciences*, *132*(1), 195–220.
598) Liang, Q., Mendel, J. M. (2000). Interval type-2 fuzzy logic systems: theory and design. *IEEE Transactions on Fuzzy systems*, *8*(5), 535–550.
599) Liang, Q., Mendel, J. M. (2000). Designing interval type-2 fuzzy logic systems using an SVD-QR method: Rule reduction. *International Journal of Intelligent Systems*, *15*(10), 939–957.
600) Liang, Q., Karnik, N. N., Mendel, J. M. (2000). Connection admission control in ATM networks using survey-based type-2 fuzzy logic systems. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, *30*(3), 329–339.
601) John, R. I., Innocent, P. R., Barnes, M. R. (2000). Neuro-fuzzy clustering of radiographic tibia image data using type 2 fuzzy sets. *Information Sciences*, *125*(1), 65–82.