

REVIEW
on the competition for the academic position
“Associate Professor”
in the professional field 4.6. Informatics and Computer Sciences, Informatics
(Programming and Algorithms),
for the needs of Sofia university „St. Kliment Ohridski“ (SU),
Faculty of mathematics and informatics (FMI),
announced in SG No. 65 from 16 august 2019 and on the Internet sites of FMI and SU

Review prepared by: **prof. dr. Vladimir Todorov Dimitrov - FMI at SU “St. Kliment Ohridski“**, as a member of the scientific juri on the higher education area 4. Natural sciences, Mathematics and Informatics, professional field 4.6. Informatics and Computer Sciences and by the Order № ПД 38-591/11.10.2019 of the Rector of Sofia university.

Only one candidate has submitted the documents for participation in the announced competition: leading assistant, Dr. Nora Angelova Angelova, from the department Computer informatics, FMI, SU “St. Kliment Ohridski”.

I. COMMON DESCRIPTION OF APPLIED MATERIALS

1. Information about the application

The submitted documents from the applicant meet the requirements of the ADAS in RB, the RAADAS in RB and The Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Sofia University “St. Kliment Ohridski” (RTCAA-DOAPSU).

For participation in the competition, the candidate leading assist. prof. Nora Angelova Angelova applied a list of 23 titles, incl. 23 publications in Bulgarian and foreign scientific publications and scientific forums (10 in foreign scientific publications and scientific forums). 17 other documents (in the form of notes and certificates from an employer, project manager, funding organization or project sponsor, references and reviews, awards and other relevant evidence) supporting the applicant's achievements were also presented.

The presented list of documents meets the requirements of the ADAS in RB, the RAADAS in RB and RTCAADOAPSU for participation in the competition for “associate professor”.

2. Information about the candidate

Leading assistant, dr. Nora Angelova Angelova, graduated in 2012 with a Bachelor of Science in Computer Science, and in 2013 with a Master's degree in Informatics at FMI, SU “St. Kliment Ohridski” at Master's Degree Program in Electronic Business and Electronic Governance, and then in 2017 a “doctor” in Informatics at the Institute of Biophysics and Biomedical Engineering, BAS. The

topic of the dissertation is "Software Implementation of Generalized Nets and Modeling Applications".

In the period 2010-2015, she has been a part-time assistant at FMI at SU "St. Kliment Ohridski", and from 2017 until now, she is leading assistant. From 2012 until now, she is a senior software engineer at Astea Solutions.

3. General characteristics of the applicant's scientific work and achievements

The candidate has worked and continues to work in the following thematic groups:

1. Generalized nets - 3 publications;
2. Intuitionist fuzzy logic - 15 publications;
3. Intercriteria analysis - 4 publications;
4. Others - 1 publication.

A detailed examination of the scientific results is given in Section 5.

Following the examination, I find that the scientific papers meet the minimum national requirements (under Art. 2b, para. 2 and 3 of the ADAS in RB) and respectively the additional requirements of the SU "St. Kliment Ohridski" for the academic position of "associated professor" in the scientific field and the professional direction of the competition.

I have reviewed the publications presented in the previous competition and find that the scientific papers submitted by the applicant do not repeat those of the previous procedures for acquiring a scientific degree and academic position. The previous competition is the only one – in this case, it is for the "doctor" degree. The dissertation abstract from it is available on the Internet.

There is no legal plagiarism proven in the scientific works presented at the competition. I do not have any information about plagiarism of the candidate.

4. Characterization and evaluation of the applicant's teaching activity

The FMI candidate's teaching activities cover the following disciplines: Introduction to Programming, Object-Oriented Programming, Data Structures and Programming, Data Structures and Algorithms, and Communication and Presentation Skills. These disciplines are for the bachelors of specialties in the professional field 4.6. Computer science and informatics. The candidate led the first four not only as a lecturer, but also as a part-time assistant in the earlier years of her career.

I definitely have supervision over the work of the leading assistant professor, Dr. Nora Angelova Angelova as a lecturer, and I believe that she has the necessary skills for this activity.

5. Substantive analysis of the scientific and applied scientific achievements of the candidate contained in the materials for participation in the competition

The materials presented for the competition will be reviewed in the thematic areas identified by the candidate.

Generalized nets

Here are included 3 publications from the list: [4-6].

Within this topic, the possibilities of generalized nets for modeling and simulating discrete parallel processes are explored.

The main idea in [4] is to incorporate into the software a generalized net to lead the control flow for protection against reverse engineering and brute force attack.

Generalized nets are little known among computer scientists. Their control mechanism is implemented through a data flow, which would make it difficult to discover the control logic with reverse engineering.

Generalized nets have parallelism and nondeterminism. This allows a non-deterministic response to the brute force attacks, i.e. the hacker will receive different answers from the system that are difficult to analyze because of their diversity.

The idea behind embedding a control mechanism other than the direct logic of the application is the contribution of this publication.

In publication [4], the candidate is the first co-author of 4 co-authors. The publication is issued in a source with SJR (0.284 - 2018), SCOPUS Quartile: Q3.

Verification of generalized nets using the Floyd method is discussed in [5]. The problem is related to the nature of generalized nets. The latter are a generalization of Petri nets, which are an apparatus balancing between expressive power and verification for a class of parallel processes. For example, with Petri nets, it is much easier to describe parallel processes than with finite state machines, but these extensions limit the verification capabilities of the specified models. This staging is even greater for generalized nets where expressive power is at the expense of verification capabilities. As a result, generalized nets are more suitable for modeling and simulating specified models than for analyzation them.

The contribution of a publication [5] is the application of the Floyd method to generalized nets to compensate for their weak verification capabilities.

In publication [5], the candidate is the second co-author of 2 co-authors.

In [6], two new extensions of generalized nets are defined in the direction of intuitionist fuzzy generalized nets with interval values of the first and third types. More simply, it is an extension of generalized nets with fuzzy logic and interval values. This approach increases the expressive power of generalized nets, but complicates the verification of specified models. It is suitable for simulation of systems models.

In publication [6], the candidate is the third co-author of 3 co-authors.

Intuitionist fuzzy logic

The common theme is the research on a kind of fuzzy logic and the software tool to support it – IFSTool.

Publications included on this topic are [1-2, 9-13, 15-18, 20-23] – 15 in total.

[1] presents the current state and functionality of the product for the automatic verification of the properties of intuitionistic fuzzy implications and negations of IFSTool. This is a typical approach to stimulate the use of a theory based on the availability of tools.

In publication [1], the candidate is the only author – the paper has been accepted for print and a proof is presented. This publication is published by SJR (0.183 - 2018), SCOPUS Quartile: Q4.

In [2] a graphical representation of intuitionist fuzzy sets with interval values by radar diagrams is made. The value of the work lies in the visualization of artifacts from abstract theory to the end-user.

In publication [2], the candidate is the second co-author of 2 co-authors - accepted for print and a proof is presented. This publication is published by SJR (0.183 - 2018), SCOPUS Quartile: Q4.

The publications [9-10, 15] are too specialized. They present intuitionistic fuzzy conjunctions and disjunctions of three types 1-3. The IFSTool tool was used to generate disjunctions and conjunctions, and manual simplifications were applied. The text is minimalistic. These are more raw results than scientific publications.

In publication [9], the candidate is the first co-author of 3 co-authors. There is 1 citation in edition with SJR.

In publication [10], the candidate is the first co-author of 2 co-authors. The publication is referenced in Zentralblatt.

In publication [15], the candidate is the first co-author of 2 co-authors.

Publication [11] introduces the concept of "tautological asymmetric intuitionist fuzzy implication". It explores the newly introduced concept. A theorem is defined and one of the implications is proved. For the other implications of the theorem, program proof is applied. Two problems have been formulated that are open.

In publication [11], the candidate is the third co-author of 3 co-authors. The publication is referenced in Zentralblatt.

[12] examined the axiom of Rose, the axes of Cleary-Yuan, the law of contraposition, and other properties. 5 theorems are proved and 9 axioms are formulated.

In publication [12], the candidate is the fourth co-author of 4 co-authors. The publication is referenced in Zentralblatt.

In [13], the axiom of Meredith is checked, the axioms of intuitionist fuzzy logic, the axioms of Kolmogorov and Tarski. Four theorems have been formulated and one has been proved.

In publication [13], the candidate is the third co-author of 3 co-authors. The publication is referenced in Zentralblatt.

[17] examined the axiom of Rose, the law of contraposition, and other properties. 4 theorems have been formulated and 2 proved.

In publication [17], the candidate is the second co-author of 4 co-authors. The publication is referenced in Zentralblatt.

The three publications above are for three implications of intuitionist fuzzy logic. The most likely the product IFSTool is used in all three cases.

[16] formulated 6 theorems for intuitionistic fuzzy implications and proved 2 of them.

In publication [16], the candidate is the second co-author of 2 co-authors.

[18] formulated 22 theorems for intuitionistic fuzzy implications. The IFSTool product is most likely used to verify theorems.

In publication [18], the candidate is the second co-author of 2 co-authors. The publication is referenced in Zentralblatt.

In [20], 9 axioms and 1 theorem are formulated; formulated is one open issue. IFSTool was used to verify the validity of the axioms.

In publication [20], the candidate is the first co-author of 2 co-authors.

In [21], 2 theorems were formulated and proved; formulated is one open issue.

In publication [21], the candidate is the first co-author of 3 co-authors. The publication is referenced in Zentralblatt.

In [22], 17 axioms were formulated and 1 theorem proved; 4 identified problems have been identified.

In publication [22], the candidate is the first co-author of 2 co-authors.

In [23], 7 theorems were formulated and 1 theorem proved.

In publication [23], the candidate is the first co-author of 2 co-authors. The publication is referenced in Zentralblatt.

The work in this thematic area is purely theoretical. There is no clarity on the applicability of the studies performed. Light on the applicability of intuitionist fuzzy logic cast the publications in the next section on intercriteria analysis.

Obviously, the field of intuitionist fuzzy logic raises too many questions and problems, but the good side is the existence of a tool to test them – IFSTool, which has been actively used to get most of the results.

Intercriteria analysis

Research in this area is based on intuitionist fuzzy sets. The essence of research is to look for a link between the criteria set in the matrix.

4 publications are included here, namely [7-8, 14, 19].

Publication [7] reviews the application of intercriteria analysis on intuitionist fuzzy data. An example is also given. The work is theoretical, though it is an application.

In publication [7], the candidate is the fourth co-author of 5 co-authors. This publication is published with SCOPUS SJR (0.295 - 2017), SCOPUS Quartile: Q3. There is 1 citation in edition with SJR.

Publication [8] also examines the method of intercriteria analysis on intuitionist fuzzy data. The work is theoretical.

In publication [8], the candidate is the fifth co-author of 5 co-authors.

Publication [14] is a true application of intercriteria analysis. The problem of water treatment within one year is presented and analyzed. The results obtained are discussed.

In publication [14], the candidate is the second co-author of 4 co-authors.

Publication [19] applies intercriteria analysis to intuitionist fuzzy logic. The publication is theoretical in nature regarding the properties of implications for the axioms of the logic under consideration.

In publication [19], the candidate is the first co-author of 3 co-authors. The publication is referenced in Zentralblatt. There are 4 citations in editions with SJR.

Others

Here is the publication [3] about the game Life. The latter is reformulated for the three-dimensional case. The authors see an application of the presented approach to modeling different processes.

In publication [3], the candidate is the third co-author of 3 co-authors - accepted for print and proof is presented. This publication is published with SCOPUS SJR (0.183 - 2018), SCOPUS Quartile: Q4.

Co-authorship materials do not have a clear division of contributions.

The quotes listed here are only in editions with SJR, but there are also other editions. In total, there are 16 citations in 9 publications.

6. Critical notes and recommendations

The submitted materials lack a clear division of the candidate's personal contributions.

The scientific results presented are in a very narrow research niche and in the interest of a very narrow circle of researchers. This also distinguishes relatively narrow boundaries of interest from other authors in the obtained results.

7. Personal impressions of the applicant

I know the candidate since 2010 as a part-time lecturer and later on as a member of the department (leading assistant professor). I have a great impression of her teaching.

8. Conclusion on the application

Having become acquainted with the materials and scientific works presented in the competition and on the basis of the analysis of their importance and the scientific and applied contributions contained therein, I **confirm** that the scientific achievements meet the requirements of the ARAS in RB, the Regulations for its implementation and the corresponding Regulations of SU "St. Kliment Ohridski" for appointment on the academic position "associate professor" in the science area and professional field of competition. In particular, the candidate meets the minimum national requirements in the professional field and it is not found plagiarism in submitted of scientific works in the competition.

I give my **positive** opinion to the application.

II. OVERALL CONCLUSION

Based on the above, I recommend to the scientific jury to suggest to the competent authority in the selection of the Faculty of Mathematics and Informatics at SU "St. Kliment Ohridski" to elect leading assistant professor, Dr. Nora Angelova Angelova to take the academic position "associate professor" in the professional field 4.6. Computer science and informatics.

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