

OPINION

in a competition for an academic position

"Associate Professor"

in professional field 4.5 Mathematics (Mathematical Logic) , for the needs of Sofia University "St. Kliment Ohridski "(Sofia University), Faculty of Mathematics and Informatics (FMI)

The opinion was prepared by Assoc. Prof. Dr. Hristo Alexandrov Ganchev (FMI, Sofia University) in his capacity as a member of the scientific jury of the competition.

The only candidate is Dr. Stefan Vladimirov Gerdjikov from FMI at Sofia University.

I. General description of the submitted materials

1. Details of the application

The documents submitted by the candidate comply with the Bulgarian legislation. The candidate has submitted a total of 9 publications in foreign scientific journals and scientific forums.

2. Details of the candidate

Dr. Stefan Gerdjikov was born in 1984 in the city of Sofia. He became a student at the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski" in 2002, and since then his life has been invariably connected with FMI. He completed his higher education in 2006 (Bachelor of Informatics), in 2008 he became a Master of Informatics (MP Logic and Algorithms), and in 2014 he acquired a PhD in Mathematical Logic. In 2012 he joined FMI as an assistant professor. In the period 2014-2016 he was a postdoctoral fellow (under the Marie Curie program) at Ludwig-Maximilians University in Germany.

Dr. Gerdjikov has participated in two projects with international and two projects with national funding. In 2013, together with Dr. Peter Mitankin , Assoc. Prof. Stoyan Mihov and Prof. Klaus Schultz, he won first place at the prestigious international scientific competition Scalable String Similarity Search / Join . This follows the awards he received as a student, including the Honor Award of "Kliment Ohridski" for achievements in mathematics, awarded by the Faculty of Mathematics and Informatics of Sofia University when he was a third-year student. Since 2008, with short breaks, Dr. Gerdjikov has participated in the preparation of the national mathematics team, and in 2020 he was the leader and deputy head of the national mathematics teams of the Balkan Olympics and the International Mathematical Olympiad, respectively.

3. General characteristics of the scientific works and achievements of the candidate

Dr. Gerdjikov has presented 9 articles. Five of them are in the field of finite state automata and their generalizations, namely finite state transducers and bi-machines, and related monoids; three of the articles are in the field of computational linguistics and more precisely the algorithms for effective approximate search; the ninth article is in the field of computational geometry. For all the presented articles which are co-authored (7 of the articles), I assume that Dr. Gerdjikov has an equal contribution with the other authors. All articles contain original results at a very high technical level, and there can be no suspicion of plagiarism.

The scientific papers submitted by the candidate do not repeat those of previous procedures for acquiring a scientific title and academic position. All of them have an Impact Factor and/or an Impact Rank. Two of the articles with Impact Factor fall into category Q1, one into category Q2, and one into category Q4. The articles are appropriately divided into two groups as the articles that replace the habilitation work have a common theme and actually consider and develop a common task. The candidate has also submitted 17 citations (in journals having at least an Impact Rank) of articles submitted for the competition.

The scientific works meet the minimum national requirements and respectively the additional requirements of Sofia University for holding the academic position of Associate Professor in the scientific field of the competition.

4. Characteristics and evaluation of the teaching activity of the candidate

Dr. Gerdjikov has an extremely rich teaching experience. He began his teaching career as a student. He has been teaching more than 15 different disciplines, four of which are new elective courses. He is a lecturer who is not afraid to teach complex subjects. He is able to present accessible and interesting constructions and algorithms that are difficult to access even for people with scientific experience in the relevant disciplines.

5. Content analysis of the scientific achievements of the candidate contained in the materials for participation in the competition

Five of the articles presented by Dr. Gerdjikov are devoted to some generalizations of finite state automata, namely finite state transducers and bi-machines, as well as the related monoids. Two algorithms for a direct construction of bimachines from functional transducers are presented in two of these articles. The second algorithm significantly improves the performance of the first. An example given in the paper shows this algorithm is close for being optimal. The other three articles are devoted to the study of monoids, in which the basic classical constructions for transducers can be performed. Properties (axioms) that are necessary (and seemingly sufficient) to be able to perform constructions such as determinization, canonization, and minimization are shown. The question of connection between the so-called mge-monoids (monoids in which the construction for a direct construction of a bi-machine from a functional transducers) and monoids, allowing maximal factorization, has also been studied.

Three of the articles are devoted to effective algorithms for approximate search. One of the articles proposes an extremely efficient algorithm for searching by the classical Levenstein distance. It won the first place in the international competition Scalable String Similarity Search / Join. The other two articles propose a new distance between words, as well as appropriate algorithms for working with it, which culminates in a fully functional system for normalization of historical texts.

The last article is again devoted to algorithms, but this time in the field of computational geometry. Specifically, it presents an algorithm for finding a minimal partitioning of simple polygons into convex polygons and pseudotriangles.

6. Critical remarks and recommendations

None.

7. Personal impressions of the candidate

I have known Dr. Gerdjikov for more than 15 years. He is an extremely conscientious and responsible person. Apart from being very erudite, he is a principled professional, as well as an ethical and honest person - qualities that unfortunately are less and less common. I also highly appreciate his scientific work, which in my opinion is at a very high level. I would also like to note that he actively participates in the academic life of the Faculty of Mathematics and Informatics, willingly accepting challenges, as well as doing a lot of ungrateful work.

8. Conclusion on the application

After getting acquainted with the materials and scientific works presented in the competition and based on the analysis of their significance and the scientific and applied contributions contained in them, I **confirm** that the scientific achievements meet the requirements of the legislation for holding the academic position Associate Professor in the scientific field of the competition. In particular, the candidate satisfies the minimum national requirements in the professional field and no plagiarism has been established in the scientific papers submitted at the competition.

I give my **positive** assessment of the candidacy.

II. OVERALL CONCLUSION

Based on the above, I **recommend** the scientific jury to propose to the competent authority to elect Dr. Stefan Vladimirov Gerdjikov to take the academic position of "Associate Professor" in the professional field 4.5 Mathematics (Mathematical Logic).

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Hristo Ganchev