

P O S I T I O N

by

Dr. Krassimir Todorov Georgiev, Prof.

Institute of Information and Communication Technologies – BAS

Member of the Jury for the selection of the academic position "Professor"

Appointed by the Director of IICT-BAS (No. 132/13.05.2022)

Announcement:

State Gazette, Issue. 21/15.03.2022

Higher education area:

4. Natural sciences, mathematics and informatics

Professional area:

4.5 Mathematics

Scientific specialty:

Computational Mathematics

Applicants:

Dr. Stanislav Nikolaev Harisanov, Assoc. Prof. (sole candidate)

1. Brief biographical information

Stanislav Harizanov graduated with a higher education at Sofia University "St. Kl. Ohridski" in 2005 acquired a qualification: Bachelor of Mathematics.

Subsequently, he continued his education at Jacobs University, Bremen, Germany, where in 2008 he acquired the Master of Mathematics in 2011. He acquired the Doctor's scientific and educational degree at the same university. He speaks the free level of English, and at a good level of Russian and German. In the period 2002 and 2008, he worked as an assistant in the study part at FMI-Sofia University, from 2005-2008 at Jacobs University, Bremen, Germany, where he was a research associate from 2009-2011. In the period 2011-2013 he was in a post-doctorship position at the University of Kaiserslaut and Fraunhofer Itwm, Germany. From 2014 and so far it has been in different positions in IIC -BAS -2014 -2016 Assistant, 2016 -2018 Chief Assistant, 2018 -2022 Associate Professor.

At that time, the applicant had the following activities: (a) a member of the scientific council of the IIC-BAS since 2018; (b) Deputy Chairman of the Biomomatics and Scientific Calculations section of the SMB of 2021; (c) Member of the Management Board of the Union of Mathematicians in Bulgaria since 2021; (d) a member of the program committees at international conferences; (e)

Chairman of the National Committee for 2021/2022 for the holding of the Mathematics, Act and Decree for students from grades 8 to 12 at the Ministry of Education and Science; (f) Head of the National Mathematics Team for Students since 2019.

2. General description of the materials presented

The materials presented to me by Assoc. Prof. Stanislav Harizanov on the announced competition include: (a) CV in the form; (b) a diploma for the educational and scientific degree "Doctor"; (c) Certificate of position occupied in IIC -BAS and experience in the specialty; (d) a list of scientific publications presented for participation in the competition with the applicant's participation; (e) copies of the scientific publications presented for participation in the competition with the applicant's participation; (f) a list of citation; (g) authorship; (h) Short sums of Bulgarian and English languages of the scientific publications presented for participation in the competition; (i) a reference to meet the requirements for occupation of the academic position "Professor" and (k) a declaration of lack of established plagiarism; (l) Diploma for Associate Professor. All the materials provided to me are carefully prepared and I have no doubt about their accuracy.

3. Reflection of the Candidate's Scientific Publications in the Literature (known citations)

I accept the "list of independent cited" submitted by the applicant, which is made in detail and complete and contains all the necessary information. This list and the table to it reflect **40 cited 4 publications** with his participation (**one publication was cited 19 times, one - 10, one - six times, one - five times**).

4. General characteristics of the applicant's activities

4.1. Scientific and applied scientific activity

I agree to the "Reference to Original Scientific and Applied Contributions" statement from the applicant that *"the list of publications for participation in the competition includes 17 titles, 6 articles of which are impact factor (5 in Q1 and one in Q3 according to the WEB of science), 9 articles are impact Rank, one is a chapter of a book referred and indexed in the databases Web of Science and Scopus, and one is a teaching aid published in the series "Lectures on Computer Science and Technology Technologies at the Bulgarian Academy of Sciences ". 15 of the articles came out while 2 are under print. All publications are in the period 2019 - 2022, that is, after my*

academic position "Associate Professor" and have not been used in previous procedures". The review of the applicant's publications for participation in the competition shows that **the applicant has no independent publications submitted for the competition**. The co-authors of Dr. Stanislav Harizanov are the representatives of various European scientific schools. I have no doubt about the candidate's personal contribution to each of the publications. The main results are in the field of the announced competition, they are presented in detail, in depth and understandable in the author's inquiry and can be determined in several subsequent ones, where I will focus on the most important results in my opinion:

- (1) *Effective numerical methods for solving tasks with anomalous diffusion* (publications under numbers 1, 2, 5, 7 and 14)

New quasi-optimal methods and algorithms have been developed for the numerical solution of tasks with a vast degree of the diffusion operator (in the spectral sense) and homogeneous limit conditions of Dirichle. These methods are based on the element of the best evenly rational approximation (Bura) of a function at the single interval. A detailed theoretical analysis of both the aproximation error and the properties of the respective Bura element have been made and published in the presence of an additional linear member. Tasks with homogeneous borderline conditions of the Numin type have been tasted. Robast evaluations of the error error have been derived, the effectiveness of the proposed methods is further confirmed by illustrative numerical experiments.

- (2) *Almost optimal numerical algorithms for solving large tasks with anomalous diffusion* (publications under numbers 1, 3, 4, 11 and 17)

Various modifications of the Bura method have been studied, where the element of the best approximation is replaced by an element of appropriate approximation (URA) in order to improve the performance of the algorithm. They are analyzed theoretically and experimentally, two modifications to the Bura algorithm based on truncation (truncation) of some of the fractions in the decomposition of the Bura element or as an amount or as a work of elementary fractions. Algorithms have been developed with significantly improved computing efficiency. Theoretical evaluations are supported by numerous representative numerical experiments.

(3) *Applications of mathematics in biology* (publications under numbers 9, 10 and 15)

A mathematical model of the dynamics of the distribution of Covid-19 on the territory of the Republic of Bulgaria has been developed. The model is based on a dependent-time reverse SEIR model in which the incubation period is considered constant, while the coefficient of infection and healing is a function of time and changes day to day. The model allows prediction of the dynamics of distribution up to two weeks ahead, with errors small in strict measures and greater with weakened measures. The contribution of vaccination was also taken into account.

A hybrid model has been developed to calculate the distance skull-leather, based on semi-unleashed cylinders with a fixed radius. This model is useful and applicable in the modeling of human faces relative to a cranial surface model, and especially in modeling of persons in sectors with large local curvature or irregular sectors from the surfaces where the triangle is designed at too long and when applying a neural neural Network This causes distortion of the facial region. This problem is strongly pronounced in areas where the front and cranial surfaces have relatively diverse forms (for example, in the oral region).

(4) *Process optimization* (publications under numbers 6, 8, 12 and 13)

A new class of interface blocks has been developed for solving connected tasks of high size, which are obtained after discretization of the reverse Laplace fraction operator, which is replaced by its Bura analogue. It has been proven that the translucents under consideration have optimal computing complexity. An assessment of the Bura-based translucent reprovers has been derived, with evaluations being completely analogous to the positive and negative value of the fractional degree.

An experimental comparative analysis was conducted on the quality of the parallel realization of two algorithms for the restoration of digital images, contaminated with Poisson noise.

An algorithm is proposed for optimizing energy management in a building based on the optimal location of the network infrastructure inside the building.

A model for the early detection of anomalies in the work of a distributed information system using micro -system architectures is proposed. This model allows for more detailed monitoring of the network components.

There is no information presented on participation with reports in international scientific conferences. From my personal observations, I can say, however, that Dr. Harizanov has a significant participation in international scientific conferences with the topics, including the subject of this competition, both held in Bulgaria and abroad.

4.2. Educational activities (work with students, PhD students and postdoctoral)

I accept as a credible and true information presented in the applicant's autobiography information about teaching and pedagogical activity at an assistant level at FMI of Sofia University and Jacobs University, Bremen, Germany,.

4.3. Management and participation in research projects

I consider to be reliable information on the guidance and participation of the candidate in the scientific and research projects – 20 Bulgarians and international, in four of which Stanislav Harizanov is the leader. For seven of the projects, evidence is presented.

4.4. Contributions (scientific, scientific, applied)

The applicant's scientific production shows that he is a constructed, highly qualified scientist, with essential scientific and scientific and applied contributions in the field of numerical analysis, theory of approximation, calculation and complexity of algorithms, analysis of efficiency and optimization, as well as practical applications of mathematics. Scientific, scientific-applied or applied contributions can be found in any of the publications presented by Dr. Harisanov. All such are duly and understandably described by him in the summary of scientific publications for participation in the competition for a professor and a reference for original scientific and scientific and applied contributions, with which I fully agree and do not consider it necessary to recount again. For me personally, the most representative is the results relating to:

- The developed new quasi-optimal methods and algorithms for the numerical solution of tasks with a fractional degree of diffusion operator (in the spectral sense) and homogeneous boundary conditions of the Dirich, based on the element of the best evenly rational approximation (BURA) of function in the single interval. The developed algorithms with significantly improved computing efficiency.
- The developed mathematical model of the dynamics of the distribution of Covid-19 on the territory of the Republic of Bulgaria, which allows prediction of the dynamics of

distribution up to two weeks ahead, and which also takes into account the contribution of vaccination.

- The developed hybrid model for the distance calculation of the skull-leather, based on semi-unleashed cylinders with a fixed radius.

5. Assessment of the applicant's personal contribution

I have no doubt about the personal contribution of the candidate in each of the publications presented.

6. Critical notes

I have no critical notes that would be essential for determining my opinion and conclusion in this competition. However, I will note the following:

- ❖ Although the studies that are in the scientific interest of Dr. Stanislav Harizanov are interdisciplinary is good if his own articles are also published in the future;
- ❖ The submitted materials would be much more complete and supported the work of the jury members if there was information about the applicant's participation in international scientific conferences and the reports.

7. Personal impressions

I know Stanislav Harisanov from our joint work in the section "Scientific Calculations". I can confidently say that he has built himself up as an excellent, highly qualified specialist in his field of competence.

8. Conclusion

All the written above forms in me a positive attitude towards the candidate and I suggest **Assoc. Prof. Dr. Stanislav Nikolaev Harisanov TO BE ELECTED "PROFESSOR"** in the field of higher education **4. Natural sciences, mathematics and informatics, professional field: 4.5 Mathematics, scientific specialty: "Computational Mathematics"**

September, 2021

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