

## REVIEW

by Prof. Stanimir Nedyalkov Stoyanov, PhD,  
about the materials submitted for participation in the  
competition for the academic position of 'Associate Professor'  
at the Prof. Dr. Assen Zlatarov University  
higher education field 4. Natural sciences, Mathematics and Informatics,  
professional direction 4.6 Informatics and Computer Science  
(Programming and using computers)

In the 'Associate Professor' application, announced in the State Gazette, issue 45/17.06.2022, for the needs of the Prof. Dr. Assen Zlatarov University, the city of Burgas, as a candidate participated Assistant Professor Deyan Georgiev Mavrov, Ph.D., from the Department of Computer and Information Technologies.

### 1. Общо представяне на получените материали

By order № РД-21-1241 of 29.06.2022 of the Rector of Prof. Dr. Assen Zlatarov University, I was appointed a member of the scientific jury in an application for the academic position of 'Associate Professor' at Prof. Dr. Assen Zlatarov University in the higher education field 4. Natural Sciences, Mathematics and Informatics, professional direction 4.6 Informatics and Computer Sciences (Programming and using computers) announced for the needs of the Prof. Dr. Assen Zlatarov University.

The only candidate in the announced competition is Assistant Professor Deyan Mavrov, PhD, from the Department of Computer and Informations Technologies.

The set of materials presented by the candidate is in accordance with the Regulations for the Development of the academic staff of the Prof. Dr. Assen Zlatarov University and includes the following documents:

1. Application to the Rector for admission to the application;
2. Copy of the announcement in the Official Gazette;
3. CV;
4. Diploma of higher education;
5. Diploma for PhD degree;
6. Document proving work experience;
7. Documents for participation in research projects;
8. Reference for educational and teaching activity;
9. Declaration of degree of participation in publications;
10. Certificate of fulfillment of the minimum requirements;

11. Complete list of publications;
12. List of publications for participation in the contest;
13. Author reference and summaries of the scientific contributions of the works;
14. Reference to the citations in which the candidate's publication is cited;
15. Copy of scientific works;
16. Copies of the educational publications written by the candidate.

## **2. Brief biographical data of the candidate**

In 2010, the candidate graduated with a bachelor's degree in informatics and computer sciences, and in 2012 with a master's degree in Business Information Technologies at the Burgas Free University. In 2016, he defended his doctoral dissertation at the Prof. Dr. Assen Zlatarov University. Since 2016, he has been an assistant in the Computer and Information Technologies Department of the Prof. Dr. Assen Zlatarov University. He also works at the Regional Inspectorate of Education, Burgas.

## **3. General characteristics of the candidate's research activities**

Until now ch. assistant professor Dr. Deyan Mavrov leads lecture courses in the bachelor's programs at the University "Prof. Dr. Asen Zlatarov" in the following disciplines: "Synthesis and Analysis of Algorithms", "Informatics - Part I and II", "Programming and Use of Computers - Part I and II", "Introduction to Programming", "Object oriented programming", "Programming languages", "Modeling and design of software systems", "Audio-visual and information technologies in education". In the master's programs of the same university, he read lectures on the following disciplines: "Software technologies", "Computer systems and technologies", "Programming", "Programming for Microsoft .NET Framework", "Information and communication technologies and work in digital environment". Regularly fulfills auditor employment above the stipulated norm. In his teaching activity, Assistant Professor Deyan Mavrov participated in the development of the following curricula: "Programming and use of computers - Part II", "Synthesis and analysis of algorithms", "Programming languages", "Object-oriented programming - Part I" , "Object Oriented Programming - Part II". He reviewed the theses of a large number of students and was the supervisor of one graduate.

For the application, the candidate submitted a total of 12 publications, 2 of which replace the required habilitation work. 2 of the publications are in Q1, 1 is in Q2, 1 is in Q4, 9 publications are with SJR, 7 are referenced in WoS and all publications are referenced in Scopus. All publications are co-authored and in English. I accept for review all publications submitted for the application. I



would like to point out that, despite the small number, the works have been published in reputable issues.

Accepting the submissions in the author reference I would summarize the applicant's contributions into groups as presented below.

**Habilitation work.** Two of the publications (No. 1.1, 1.2) presented by the candidate for participation in the application replace the required habilitation work. The first paper (No. 1.1) presents an application software program for performing two-dimensional activation propagation simulation using Atanasov's Game Method for Modeling (GMM), called FireGrid. The software applies a propagation model with one or more initial activation points on a planar grid of square cells, which represent an idealized terrain of activatable areas of vegetation and those of rocks and water bodies. The applications also allow locating the starting activation points by subtracting the initial configuration from the final configuration and reducing all affected and neighboring cells by one. In addition to predetermining the activation propagation pattern, manual propagation control is allowed during the simulation by selecting the cells to be activated in the next iteration. The second publication (No. 1.2) addresses a problem discussed in a series of publications - it concerns the occurrence and development of forest fires. The cellular automata-based game method of modeling (GMM) models a certain area as an orthogonal grid of square cells whose values change according to predefined rules. The article presents a simulation of a real forest fire, taking into account the wind, characterized by direction and intensity, and evaluating the impact of the fire iteratively with respect to time intuitionistic fuzzy sets that support the information about the degree of burned and unaffected areas. The results of the software product FireGrid, implementing the GMM-model developed by the authors, are also compared with the results of the software application FlamMap. In addition, the paper presents for the first time the basic properties of defined operations and operators on time intuitionistic fuzzy pairs.

**Summary of results presented in other publications.** The shared theme in the other publications (No. 2.1,2.2,2.3,2.4,2.5,2.6,2.7,2.8,2.9,2.10) from the list, could be summarized as research results for searching for possibilities the theoretical apparatus of intuitionistic fuzzy logic and indexed matrices to be applied for practical analyzes on various types of data. The majority of publications are related to various applications of intercriteria analysis. I accept the research in this area as a continuation of those from the candidate's dissertation work. Intercriteria analysis generates intuitionistic fuzzy estimates of the interdependence between a given number of criteria by which the same objects are evaluated, and the evaluations are located in an indexed matrix. If the evaluations of two criteria increase and decrease in parallel, the criteria are considered to be in positive consonance, if when the evaluations of one increase, those of the other decrease – in

negative consonance, and if no dependence is detected - in dissonance. The intercriteria analysis was applied to numerical data from medicine (No. 2.1, 2.5) and from transport (No. 2.2). A variant of the analysis is used to search for triplets criteria is used as an aid to reduce the number of variables at the input of neural networks (No. 2.4). In the article (No. 2.6) the operator  $N\gamma$  was used to define in a new way the thresholds at which the criteria are considered in consonance and a way was proposed to calculate the parameter  $\gamma$  using the topological operators "open" and "close-not". . Another group of publications discusses the use of program libraries for working with indexed matrices (also a continuation of research from the candidate's dissertation work) in applications for analyzing statistical and other algorithms. Working with these programs makes it easy to implement and correct these algorithms. The libraries allow working with indexed arrays of different value types and using new operations. A new data type has been developed for storing intuitionistic fuzzy pairs, interval pairs, and interval-valued IRDs. In two publications, one-factor (No. 2.10) and two-factor (No. 2.7) intuitionistic fuzzy ANOVA with indexed matrices were implemented and the developed programs were applied to analyze, respectively, the influence of the factor "geographical location" (No. 2.10) and the combination of the factors "population density" and "climate zone" (No. 2.7) of countries in Europe on the spread of COVID-19 in them. In a third publication, an intuitionistic fuzzy approach to selecting an outsourcing contractor using indexed matrices and intuitionistic fuzzy interval value pairs is implemented (No. 2.8). Two of the publications create generalized network models that are used to model parallel processes – one on a cluster analysis process (No. 2.3) and one on a wildland fire surveillance system with unmanned aerial vehicles (No. 2.9).

The applicant has attached a list of 95 citations, which I found no self-citations in. Assistant professor Deyan Mavrov, PhD, participated in 3 national and 3 university projects.

Summarizing, I want to emphasize that the publications present considerable originality, innovation and number of results, with a certain scientific and practical contribution. I believe that all presented scientific works are from the field of the competition. Publications in renowned publications and conference materials acquaint interested researchers with the information obtained from Associate Professor Deyan Mavrov, PhD, results in the professional field "Informatics and Computer Sciences (Programming and using computers)".

#### **4. Evaluation of the candidate's personal contribution**

From the documents submitted for application, I am convinced of the personal merit of the candidate in the contributions presented in the publications. I think that the publications despite being co-authored undoubtedly include a significant contribution from the candidate.

#### **5. Personal impressions**



I personally know Assistant Professor Deyan Mavrov, PhD, as a member of the scientific jury for his dissertation defense. I'm impressed by the persistence of his scientific interests and the conduct of scientific research.

## **6. Critical Notes**

I think, the author reference could have been prepared more thoroughly. There is a discrepancy between the numbering of the posts in it and that of the list of posts. In the author reference, unexplained abbreviations are used, which makes it difficult to understand the claimed contributions - especially since these abbreviations are in English in the articles.

And one recommendation; it would be good to compare the modeling results with those achieved with other methods. This is especially appropriate for the fire example; there is a chromatic model of this problem, also using a cellular automaton, which is implemented with the DEVS (Discrete Event System Specification) approach.

I would also recommend that in the future he be more active in the scientific guidance of your student.

## **CONCLUSION**

The documents and materials presented by Assistant Professor, Deyan Georgiev Mavrov, PhD, meets all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria and the relevant Regulations of the Prof. Dr. Asen Zlatarov University. The candidate in the competition has presented a significant number of scientific works published after the materials used in the defense of his PhD thesis and the application for Assistant Professor. The candidate's works contain original scientific and applied contributions that have received international recognition, a representative part of which has been summarized and published in journals and scientific collections issued by international academic publishing houses. The candidate's theoretical developments have practical applicability. The scientific and teaching qualifications of Assistant Professor Deyan Mavrov, PhD, is unquestionable.

After getting acquainted with the materials and scientific works presented in the application, analyzing their significance and the scientific, scientific-applied and applied contributions contained in them, I find it reasonable to give my positive assessment and recommend the Scientific Jury to prepare a report-proposal to the Academic council for choosing Assistant Professor, Deyan Georgiev Mavrov, PhD, to the academic position of 'Associate Professor' at the Prof. Dr. Asen

Zlatarov University in professional direction 4.6 Informatics and computer sciences (Programming and using computers).

07.11. 2022

---

Reviewer:

(Prof. Stanimir Stoyanov)