REVIEW

by ***Prof. Dr Sc Ketty Georgieva Peeva***, FAMI, TU-Sofia
by competition of the **University Prof. Dr. Asen Zlatarov"-Burgas**
to hold the Academic Position of **Associate Professor**
in the area of Higher Education **4. Natural Sciences, Mathematics and Informatics**,
Professional Field **4.6 Informatics and Computer Science**,
Scientific specialty "Informatics (Quantitative Methods, Mathematical Modeling and Intuitionistic Fuzzy Statistics)"
announced by State Gazette No. 105 of 11.12.2020
with candidate Ch. Assistant Professor Dr. **Velichka Nikolova Traneva**

According to order РД-35/09.02.2021 of the Rector of the University "Prof. Dr. Asen Zlatarov "- Burgas in a competition to borrow AP "Associate Professor " I was appointed to a scientific jury under the above procedure. At the first meeting of the scientific jury I was chosen as a reviewer of the works of the single candidate Ch. Assistant Professor Dr. Velichka Nikolova Traneva. I received a folder with personal documents and with content according to the attached list in the candidate's application for participation in the competition, as well as her works according to the list of scientific works. All documents are presented as required Art. 67 para. (1), (2) Section III of the Statute of the University.

Velichka Nikolova Traneva participated in the competition with 16 scientific works. Data for 15 citations are presented; list of participations in conferences; information about the teaching activity at the University; list of guided graduates; certificate for participation in 8 national research contracts; certificate for participation in a competition under the National Scientific Program for young scientists and postdoctoral students; certificate of organizational activity in university and international scientific forums; certificate as reviewer in the international scientific journal **Soft Computing**.

1. Education and professional development

Velichka Nikolova Traneva graduated in 1995 at Sofia University "St. Cl. Ohridski as a master of mathematics, with a qualification and a teacher of mathematics and informatics. In 2000 she graduated from the University of National and World Economy - Sofia with a master's degree in finance with a qualification in management. She receives Educational and Scientific Degree (ESD) "Doctor" in 2017 in PF 4.6. Informatics and Computer Science.

Velichka Traneva has been working since 1996, initially she was a teacher of mathematics and informatics, from 2001 to 2012 she was an inspector of mathematics and informatics in Burgas, from 2012 - at the University "Prof. Dr. Asen Zlatarov "- Burgas as an assistant (2012-2017) and Ch. Assistant (from 2017 until now) in Informatics, Quantitative Methods, Mathematical Modeling and Optimization, Chemical Technology Systems. She has25 years of experience as a teacher.

2. Evaluation of scientific and practical results and contributions

A. General description of the presented scientific materials

Velichka Nikolova Traneva participated in the competition with 16 scientific works:

- A monograph (without co-authors) in English;
- one monograph (co-authored),
- 11 articles (co-authored), of which: one with IF; seven with SJR; three indexed in Scopus;

• three textbooks without co-authors (1 textbook and 2 textbooks).

I accept for review all of them. They are in the area of the competition and the candidate has not used them in previous procedures. For the latter, separate lists are given - 11 publications for ESD "Doctor" and 18 publications for AP Ch. Assistant Professor.

The scientific works are in the fields of: quantitative methods, mathematical modeling and intuitionistic fuzzy statistics.

B. The habilitation work 6.1 is in the field of **quantitative methods**. The monograph ***V. Traneva, Index Matrices in the Assessment of Human Recourses,*** *Union of Scientist in Bulgaria, Sofia, 2019* offers an intercriteria approach to optimization problems based on intuitionistic fuzzy sets (IFS) and indexed matrices (IM). The book is a natural continuation of the scientific research from her dissertation for ESD "Doctor". IM: two- and three-dimensional, extended and n-dimensional are presented; operations and relations with them; basic methods of intercriteria analysis with extensions from two-dimensional to three-dimensional multicriteria. Object ratings are preserved in 3-D intuitionistic multilayer IMs. Three-dimensional, three-dimensional multilayer, n-dimensional and extended intercriteria analysis for intuitionistic fuzzy data have been developed. Applications of these theoretical settings for solving optimization problems in oil refinery, in a mobile company and in a fast food chain are given. The comparison of the obtained results with the traditional methods for statistical correlation analysis shows that only the intercriteria analysis can be applied to extract information from multidimensional fuzzy data. The monograph is written precisely and at a high professional level.

C. Scientific publications

C1. Publications in the area of **quantitative methods** are three chapters in monograph 6.2, several articles and a textbook.

In ***6.2. V. Traneva, St. Tranev, Indexed Matrices as a Tool for Management Decision Making***, *Union of Scientists in Bulgaria, Sofia, 2017*, a new methodology for decision making through IMs is presented. Two-dimensional and three-dimensional IMs with elements real numbers, logical variables or predicates, intuitionistic fuzzy IMs and their extensions - two-dimensional and three-dimensional (and multilayer) extended IMs, operations and relations with them are introduced. It is shown that the extended and multilayer IMs are suitable for modeling generalized types of multidimensional transport problems, and the introduced operations are tool for algorithmization of the optimal solution of the transport problem.

6.3 Scaled aggregation operations over two- and three-dimensional index matrices, was published in the international journal *Soft Computing*, with **IF 2.5**. It investigates two- and three-dimensional IMs with elements - intuitionistic fuzzy pairs. To aggregate the elements of these IMs, nine operations have been introduced, allowing ordering.

The next two papers (with SJR 0.18) are on human resource management:

6.8. Intuitionistic Fuzzy InterCriteria Approach to the Assessment in a Fast Food Restaurant proposes an application of intercriteria analysis in restaurant practice. The aim is to find relationships between pairs of evaluation criteria both in the traditional case and in a fuzzy environment. The method is applied to establish correlations between pairs of criteria related to real data in a fast food restaurant. The comparative analysis of the classical methods with the intercriteria approach shows that only the latter can be applied to fuzzy estimates. In addition, only the intercriteria approach allows the detection of dependencies between the evaluation criteria. In ***6.10. Optimization of an Oil Refinery Valuation System Through the Intuitionistic***

Fuzzy InterCriteria Analysis, 3-D extended Intuitionistic Intercriteria Analysis is applied to human resource management and decision making in an oil refinery in fuzzy data. The approach is based on IMs and IFS. The effectiveness of the method for optimizing the personnel evaluation system is shown. The obtained results are compared with those of the classical correlation methods.

The textbook ***V. Traneva, "Quantitative methods and optimization",*** *Avangard Prima, 2020,* presents classical methods and algorithms of linear and dynamic programming with applications in decision making, management, economics and business; game theory and the relatively new aspects of intuitionistic fuzziness in intercriteria analysis. The textbook is written readable, interestingly, competently, correctly, innovatively and at a high professional level.

C2. Scientific publications in the field of **mathematical modeling**:

In the series of articles 6.4, 6.5, 6.7, ***Index matrices and OLAP-Cube, Parts 3, 4, 5***, *Advanced Studies in Contemporary Mathematics*, (**SJR 0.29**), data analysis by OLAP-cube and some operations with IMs is used. The papers concern simulation of a generalized net model and its interpretation with OLAP cube with the IMs apparatus. Intercube Set and Data cube operations (6.4) are defined as well as Drill-Across (6.5) and practical examples of these operations are given by multidimensional expressions. The analysis of the data in OLAP-cube has been expanded by applying some of the operations with IMs (6.7) - multiplication, transposition, automatic reduction and decomposition, substitution. Some of them work with big sets of multidimensional data from two or more OLAP cubes. 3-dimensional extended matrices and 3-dimensional multilayer extended matrices are used, as well as multidimensional data.

In 6.6. **Generalized Net Model Simulation of Cluster Analysis Using CLIQUE: Clustering in Quest**, (**SJR 0.22**) a generalized net (GN) model of the real-time data clustering algorithm CLIQUE has been constructed and a simulation of the model using platform-independent software has been proposed, called GN-integrated development environment. Open source software was used to verify the results of the simulated cluster procedure.

In 6.11, based on IFS and IMs, two algorithms for finding a fuzzy Hamiltonian cycle in an intuitionistic fuzzy graph are proposed. One of the algorithms is illustrated with an example of an intuitionistic fuzzy graph from Wizz air airlines. Three new operations on IMs are presented.

Object on 6.12. is the transport problem in which transport costs, supply and demand are intuitionistic fuzzy pairs, depending on the price of diesel, road conditions, weather, etc.. Additional restrictions on transportation costs are included. The main goal is to achieve optimal management of transport supplies. A new fuzzy zero-point method is proposed. The IFS and IMs apparatus is used. The algorithm of the solution is illustrated with a suitable numerical example.

C3. **Intuitionistic fuzzy statistics** is the subject of one article and two textbooks. The main settlements are presented in the article. The textbooks summarize the results of the article and develop software applications for one-factor intuitionistic fuzzy analysis of variance.

6.9. **Intuitionistic Fuzzy Analysis of Variance of Movie Ticket Sales** (**SJR 0.18**) proposes an extension of one-factor analysis of variance based on the concepts of intuitionistic fuzzy statistics and IMs for data analysis in a fuzzy environment. An intuitionistic fuzzy approach through IFS and IMs on a real example from the film industry is proposed. The effectiveness of the method based on intuitionistic fuzziness is shown.

V. Traneva has published the following two textbooks:

6.13 "„**Някои приложения на статистиката в екологията**“, (Some Applications of Statistics in Ecology)", Avangard Prima, 2021, for students and doctoral students in ecology, as well as for economic and engineering specialties at the University "Prof. Dr. Asen Zlatarov". Practical guide, theoretical formulations are supported by working examples from ecology and control questions, richly illustrated with tables, suitable figures and graphs. A software application for 6.9 has been developed.

6.14. "**From Classical to Intuitionistic Fuzzy Analysis of Variance**", *Avangard Prima, Sofia, 2020* is for Erasmus+ students, PhD students and others. in the University "Prof. Dr. Asen Zlatarov", prepared according to a scientific project. The textbook gives a modern interpretation of the classical analysis of variance through indexed intuitionistic matrices and IFS. The manual summarizes results from 6.9 and 6.13 and offers a software application for one-factor intuitionistic fuzzy analysis of variance.

Three of the papers (6.8, 6.9, 6.10) were presented at scientific conferences in Turkey, and another two (6.11, 6.12) - at scientific conferences in Bulgaria.

D. Citations of scientific publications.

Data for 15 citations of 7 of the scientific papers, without self-citations, are presented. The citation of article 6.3 is impressive. *V. Traneva, St. Tranev, M. Stoenchev, Kr. Atanassov*, **Scaled aggregation operations over two- and three-dimensional index matrices**, by **RR Yager** et al. in the prestigious international scientific journal **Soft Computing**.

3. Teaching, research and applied resear4ch activities of the candidate.

A. Teaching activities. The candidate has over 25 years of teaching experience, participating fully in the process - teaching, curriculum development and provision of teaching aids.

She is lectures in two disciplines in the Bachelor's Degree (Quantitative Methods in Management and Mathematical Modeling and Optimization) and one in the Master's Degree (Methodology of Teaching Informatics with Control and Evaluation of the Teaching Process) and has exercises in 11 Bachelor's/Master's Degree in Quantitative Methods; Mathematical Modeling; Mathematical Programming; Informatics; Methodology of Education in Informatics with Control and Evaluation of the Teaching Process; Statistics; Statistical methods in ecology; Statistical processing of information and databases, etc. Attached is a reference for the last four years for the hours worked by Ch. Assistant Professor Dr. Velichka Traneva lectures and exercises. I am impressed by the rich variety of courses in PF 4.6 (basic and auxiliary) and their provision with teaching aids. The textbooks are designed for Bachelor's degree students and are in accordance with the curricula of the respective disciplines at the University (economics and engineering).

Head of two successfully defended graduates Bachelor's degree.

I highly appreciate her teaching and pedagogical activity. She shows stability, high professionalism and potential.

B. Research projects. The candidate has participated in eight research contracts: Head of two and a member of a team of 6 (3 internal institutional projects at the University "Prof. Dr. Asen Zlatarov" and 3 national contracts with the Research Fundand the Ministry of Education and Science).

C. Scientific and applied activities. She participates in the organization of university and international scientific forums on optimization and optimization and

business management. She is a reviewer in the international scientific journal Soft Computing.

She is a member of the Union of Scientists and the Union of Mathematicians in Bulgaria.

These activities evidently speak about the qualities of the candidate - stable scientific interests, valuable publishing activity, empathy for the educational process and its provision, active organizational scientific activity.

4. Significance of contributions to science and practice

The presented scientific works for participation in the competition have scientific, scientific-applied and applied contributions.

The main scientific contributions are in **enriching existing theories** (IFS, IM, generalized nets), **creating methodologies and models** for processing multidimensional and multilayer databases in correlation intercriteria analysis and in mathematical modeling. Scientific and applied contributions concern **platforms** for multidimensional data modeling in various areas of management - human resources management, logistics management and process management. IFS, IMs, simulation of a generalized net model, interpretation of the OLAP cube with the IM apparatus, intercriteria intuitionistic analysis were used. Fuzzy **algorithms** have been developed for solving transport problems for the needs of optimal management.

All contributions are correctly reflected in the submitted author's report.

The quantitative indicators of the criteria for borrowing AP "Associate Professor" are satisfied. The minimum national requirements have been met and exceeded in three of the groups.

Personal impressions. I know part of the academic development of Chief Assistant. Dr. Velichka Traneva. In 2017 I was a member of the Scientific Jury and reviewer of her dissertation for "Doctor" on 4.6. "Informatics and Computer Science", Informatics. The dissertation was characterized by in-depth development in the specific scientific field and precision, as well as scientific potential for the realization of original ideas.

I have no critical remarks on the submitted materials and on the candidate.

5. CONCLUSION

Based on the presented scientific production and their contributions, the pedagogical activity of Ch. Assistant Professor Dr. Velichka Nikolova Traneva and the fulfilled minimum national requirements, I consider it reasonable to propose Ch. Assistant Professor Dr. **Velichka Nikolova Traneva to borrow AP "Associate Professor" at the University "Prof. Dr. Asen Zlatarov "- Burgas in PF 4.6 Informatics and Computer Science**.

Date: 22.03.2021

Reviewer:

K. Peeva, Prof. Dr.Sci.