R E V I E W

On a documents, submitted for participation in a competition for the academic position "Professor" by professional field 5.3 "Communication and computer equipment", specialty „Administration of local and Internet networks "

at the Department of Computer Science and Technology

in Faculty of Computer Sciences and Automation
at Technical University of Varna, published in the State Gazette no. 29/31.03.2023

of Assoc .prof. Hristo Georgiev Valchanov, PhD

from Prof. Michail Petkov Iliev, PhD, D.Eng. Sc

1. Brief biographical data

In the competition for professor, announced in the State Gazette, issue 29, 31.03.2023 and on the website of the Technical University - Varna (TU-Varna) for the needs of the Department of "Computer Science and Technology" at the "Faculty of Computer Science and Automation" one candidate participates - Assoc.prof. Hristo Georgiev Valchanov, PhD, who is associate professor at TU-Varna.

Hristo Georgiev Valchanov acquired her Master's degree in Computer Science in the Technical University of Varna. In 2008 he received her PhD on "Communication and Computer Engineering", and since 2014 he was elected as "Associate Professor" in professional field 5.3 "Communication and Computer Engineering" at TU-Varna.

2. General description of the submitted materials

The candidate has submitted 84 scientific papers for participation in the competition, including:

- **70** scientific publications (articles and papers);
- **14** teaching books.

The candidate's publications are grouped as follows:

- **14** publications equivalent to a monograph;

- **22** publications in journals, referenced and indexed in world-famous databases of scientific information;
- **34** publications in unreferred journals with scientific review, incl. 6 independent.

3. General characteristics of the research and scientific-applied activity of the candidate

Of the publications submitted for review, 12 are in Bulgarian and 58 in English.

According to the presentation forum, the distribution of publications is as follows:

- 8 papers presented in Bulgaria in Bulgarian;
- 49 papers presented in Bulgaria in English, incl. 36 indexed in SCOPUS and Web of Science;
- 1 paper, presented abroad in English;
- 5 articles, published in Bulgaria in Bulgarian;
- 5 articles, published in Bulgaria in English;
- 2 article, published abroad in English.

According to the composition of the author's team, the publications are distributed as follows:

- 6 independent;
- 26 with one co-author;
- 28 with 2 co-authors;
- 10 with 3 and more co-authors.

Thematically, the scientific publications presented for participation in the competition are in the following 4 main areas:

- 20 research in the field of methods and tools for improving the Quality of Services (QoS) in modern wireless networks;
- 24 research in the field of cloud services;
- 12 research in the field of security of modern computer networks;
- 14 research in the field of computer systems and technologies.

Assoc. Prof. Hristo Valchanov, PhD has participated in 19 national and 3 international scientific or educational projects. 9 of the national projects are after the first habilitation. As of the date of writing the review in the SCOPUS database for the candidate, 46 publications with h-index 6 are visible. There is an information about 71 citations or reviews in scientific journals, referenced and indexed in world-famous databases with

scientific information or in monographs and collective volumes and 36 citations in monographs and collective volumes with scientific review.

4. Assessment of the pedagogical preparation and activity of the candidate

Assoc. Prof. Hristo Valchanov, PhD has been working as a lecturer at the Department of Computer Science and Technology at the Technical University of Varna since 1990. He has taught many subjects in the Bachelor's and Master's degrees in Bulgarian and English. He has participated in the development of numerous curricula and he has lectured at various European universities under the Erasmus program. The candidate works actively with students. He has supervised more than 70 successfully defended graduates in Bachelor's and Master's degrees and he has reviewed over 60 diploma thesis of students in different degrees. Hristo Valchanov is a certified instructor at the CISCO Network Academy at the Technical University of Varna. For the period of work in TU-Varna he published 20 textbooks /14 after first habilitation/. In general, the educational and pedagogical activity of Assoc. Prof. Hristo Valchanov, PhD is diverse and meaningful.

5. Main contributions

The main contributions in the scientific works of the candidate for participation in the competition are oriented in the following thematic areas:

- Methods and tools for improving the quality of service (QoS) in modern wireless networks;
- Cloud services;
- Computer network security;
- Computer systems and technology

Scientific and scientific-applied contributions:

Direction "Methods and tools for improving the quality of service (QoS) in modern wireless networks":

- An algorithm for resource allocation in LiFi network based on prioritization of traffic classes is proposed;
- Algorithms and approaches for improving QoS for LTE networks based on traffic prioritization in the Scheduler are proposed;
- An algorithm for building an energy-balanced ZigBee network is proposed;

- An algorithm for allocating resources in a 6loWPAN network based on traffic prioritization is proposed;
- An algorithm for finding the best route in a LoRaWAN network is proposed;
- Approaches to improve QoS for wireless sensor networks based on LiFi, ZigBee, 6loWPAN and BLE technologies are proposed.

Direction "Cloud services":
- Smart contract based insurance models on private blockchain, public blockchain and combined solution are proposed.
- A property insurance model based on smart contract on blockchain is proposed.
- A life insurance model based on a smart contract on a private blockchain is proposed.
- An approach for the implementation of a cloud service for booking medical examinations is proposed.
- An IoT and blockchain integration model for intelligent transportation is proposed.
- An IoT and blockchain integration model for hospitalization tracking is proposed.
- Models for implementation of vaccination based on a smart contract on a private blockchain are proposed.
- A model for tracking higher education subsidies based on a smart contract on a private blockchain is proposed.
- Algorithms and approaches for balanced in SDN and finding the best route between hosts are proposed.

Direction "Computer network security":
- A botnet attack detection approach based on genetic algorithms is proposed.
- An approach for testing vulnerabilities in wireless networks is proposed.

Direction "Computer systems and technology":
- An approach for transferring multimedia traffic over low-speed global networks is proposed.
- An approach to building hybrid multi-threaded libraries is proposed.
- A method for activating a wearable device with a touch-sensitive bezel with 2 fingers is proposed.

o A pose recognition method when activating a wearable device interface is proposed.

Applied contributions:

Direction "Methods and means of increasing the quality of service (QoS) in modern wireless networks":

o Prototypes for LiFi communication have been developed.

o A prototype of an indoor LiFi network implementing horizontal handover was developed.

o A simulation environment has been developed for LTE, 6loWPAN, ZigBee, LoRaWAN and BLE networks, implementing proposed and known algorithms.

o An experimental network for implementing 6loWPAN, ZigBee and BLE technologies has been implemented.

Direction "Cloud services":

o The proposed models have been implemented through smart contracts on:
- Public blockchain – Ethereum;
- Private Blockchain - Hyperledger Fabric.

o A web-based system for the sale of crypto-tokens for ICO (Initial Coin Offering) based on the Ethereum blockchain has been created.

o Web-based and cloud-based systems for booking medical examinations have been developed.

Direction " Security of computer networks":

- A simulator of botnet DoS attacks was developed.
- A botnet DoS attack generator has been developed.
- A botnet attack recognition system based on genetic algorithms has been developed.
- A hardware system for recognizing and protecting against attacks has been developed.
- A wireless data collection hardware system suitable for the war-driving technique has been developed.

Direction "Computer systems and technologies":

- A system for indexed search on a local Windows network has been developed.
- 2 prototypes of a smartwatch were created - with buttons and with a touch-sensitive bezel.
- A test environment was created to collect readings for enabling a touch interface on a 2-finger wearable device.
- A system for the analysis and diagnosis of digital images of blood samples has been developed.
- A hybrid multithreading library has been developed.
- An experimental virtual infrastructure for training in disciplines related to computer networks has been implemented.

6. Fields of application

The proposed models, approaches, algorithms and software tools can be used for:
- Development of simulation models and study of systems from various fields.
- Increasing the efficiency of work in a cloud environment.
- Methodological and software-technological support for organizations and companies developing and implementing solutions to increase QoS in communication networks based on wireless technologies.
- Supporting the educational activities of the KNT department at TU-Varna, as well as related departments in other universities and colleges, in a number of disciplines such as "Wireless technologies", "Network security", "Integrated computer systems and networks", "Administration of local and Internet networks", "Network infrastructures", "Computer networks", "Basics of computer communications", "Operating systems", "Computer and network security", etc.
- Organizing and conducting distance learning.

7. Significance of contributions for science and practice

I comprehensively assess the contributions of Assoc. Prof. Dr. Hristo Georgiev Valchanov as significant and classify them as follows:
- Beneficiation of knowledge and systems by formulating innovative approaches in existing scientific fields;
- Creation of modified algorithms, methods and schemes for obtaining confirmatory facts.

8. Assessment of the personal contribution of the candidate

The candidate participated in the competition with 84 scientific papers, incl. 70 publications and 14 textbooks. 6 publications /Г.8.1, Г.8.2, Г.8.4, Г.8.7, Г.8.11, Г.8.24/,1 textbook and 1 study aid are independent. In 10 publications / B.4.11, B4.12. B4.13, B.4.14, Г.8.3, Г.8.6, Г.8.8, Г.8.22, Г.8.23, Г.8.30/ and 2 study aid the candidate is the first author. For the publications in which the candidate is a co-author, I have not been presented with a separation protocol for share participation, therefore I accept the participation of the authors as equal. I know Assoc. Prof. Hristo Valchanov, PhD. I wrote an opinion on her materials for the first habilitation. This, as well as the analysis of the scientific papers submitted for review, give me reason to believe that the contributions presented above are the work of Assoc. Prof. Hristo Valchanov.

9.Critical remarks and recommendations

Based on the analysis of the papers submitted to me for review, I make the following remarks and recommendations for the future work of Assoc. Prof. Eng. Hristo Georgiev Valchanov, PhD:

1. To look for opportunities to write a monograph on computer networks and technologies;
2. To activate his work with doctoral students and outstanding young teachers;
3. To intensify its work with researchers from the country and abroad, in order to create a team with the capacity to obtain more significant results and participate in national and international research projects and programs.

10. Personal impressions and opinion of the reviewer on the other aspects of the candidate's activity

I have known the candidate for the competition, Assoc. Prof. Eng. Hristo Georgiev Valchanov,PhD for more than 10 years. I know her scientific and teaching work. I have worked with her colleagues who have always given positive feedback about her, her teaching and research work. This gives me the reason to believe that I have formed an adequate opinion about the candidate and her scientific work.

11. Has a creative environment been created to transfer the accumulated experience and knowledge to younger colleagues

Assoc. Prof. Eng. Hristo Georgiev Valchanov,PhD has made a significant contribution to the education of students from TU-Varna in many academic disciplines. From the presented materials it is clear that he worked on many scientific research projects in teams with young professors, students and doctoral students.

Conclusion

The scientific papers proposed for review for participation in the competition meet the requirements set out in the Law on the Development of Academic Staff and in the regulations of the Technical University - Varna for the acquisition of the academic position "Professor". Assoc. Prof. Eng. Hristo Georgiev Valchanov,PhD has performed the necessary teaching and research work, received results and published scientific papers with the necessary contributions. In general, her scientometric results significantly exceed the minimum ones provided for the academic position of "Professor".

Given the above, I propose Assoc. Prof. Eng. Hristo Georgiev Valchanov,PhD to be elected "Professor" in professional field 5.3 "Communication and Computer Engineering", scientific specialty "Computer Systems, Complexes and Networks" (discipline "Administration of local and Internet networks") at the Department "Computer Science and Technology" at the "Faculty of Computer Science and Automation" at the Technical University -

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