

STATEMENT

of scientific works for participation in a competition for the academic position "Professor" in professional direction 5.3 "Communication and computer technology" (course "Administration of local and Internet networks") of the Department of Computer Science and Technologies at "Faculty of Computing and Automation" of the Technical University - Varna, announced in the Bulgarian State Gazette, No. 29 of 31.03.2023. of Assoc. Prof. Dr. Eng. Hristo Georgiev Valchanov by Prof. Dr. Georgi Hristov

1. General characteristics of the candidate's research and applied scientific activity.

The materials presented for the preparation of a statement reflect the scientific activity of Associate Professor Dr. Eng. Hristo Georgiev Valchanov at TU-Varna during the 8 years after the first habilitation. According to the attached list of publications, 70 scientific publications (excluding dissertations and those submitted for the first habilitation) have been submitted for participation in the competition. Thematically, the presented scientific publications can be categorized in the following 4 main directions:

1. Research in the field of cloud services;
2. Research in the field of methods and means of increasing the quality of services (QoS) in modern wireless networks;
3. Research in the field of security of modern computer networks;
4. Research in the field of computer systems and technologies;

The 70 scientific publications presented, according to the forum in which they were presented, are as follows:

- ✓ Reports presented in Bulgaria in Bulgarian- Г.8.1, Г.8.2, Г.8.4, Г.8.7, Г.8.8, Г.8.11, Г.8.13, Г.8.16 – 8 reports;
- ✓ Reports presented in Bulgaria in English:
 - Indexed in Scopus, Web of science: B.4.1-B.4.14, Г.7.1-Г.7.22 – 36 reports;
 - Not indexed: Г.8.6, Г.8.9, Г.8.17-Г.8.19, Г.8.22, Г.8.23, Г.8.25-Г.8.28, Г.8.30, Г.8.31 – 13 reports;
- ✓ Reports presented abroad in English: Г8.3 – 1 report;
- ✓ Articles published in Bulgaria in Bulgarian: Г.8.10, Г.8.14, Г.8.15, Г.8.24, Г.8.32 – 5 articles;
- ✓ Articles published in Bulgaria in English: Г.8.33, Г.8.20, Г.8.21, Г.8.29, Г.8.34 – 5 articles;
- ✓ Articles published abroad in English: Г.8.5, Г8.12 – 2 articles.

The scientific works of Assoc. Prof. Dr. Eng. Hristo Valchanov are known to the scientific community abroad, the documents in the competition indicate 71 citations and reviews in scientific publications, referenced and indexed in world-renowned databases and 36 citations in monographs and collective volumes with scientific review. The materials presented by Assoc. Prof. Dr. Eng. Hristo Valchanov for the competition exceed the minimum national requirements for the field of higher education 5. Technical Sciences, of the Regulations for the Implementation of the Law on the Development of the Academic Staff in the Republic of Bulgaria (PPZRASRB).

2. Assessment of the candidate's pedagogical preparation and activity.

Assoc. Prof. Dr. Hristo Valchanov works as a teacher in the "Computer Sciences and Technologies" department of TU-Varna since 1990. He holds classes in many academic disciplines in the "Bachelor" and "Master" education programs in Bulgarian and in English. He participated in the implementation of numerous curriculums and lectured at various European universities as part of the Erasmus program. The candidate works actively with students. He supervised more than 70 successful defenses of graduates in the Bachelor and Master's degree programs and reviewed more than 60 diploma projects of students in different universities. In summary, the educational and pedagogical activity of Assoc. Prof. Dr. Hristo Valchanov is diverse and meaningful.

3. Basic scientific and scientific-applied contributions.

The main contributions in the scientific works of the candidate for participation in the competition are categorized in the following thematic areas: Research in the field of cloud services; Research in the field of methods and means for improving the quality of services (QoS) in the modern wireless networks; Research in the field of network security in modern computer networks; Research in the area of Computer Systems and Technologies.

Scientific and scientific-applied contributions:

Direction 1:

- An algorithm is proposed for allocating resources in a LiFi network based on the prioritization of traffic classes.

- Algorithms and approaches are proposed to improve QoS for LTE networks based on traffic prioritization in the scheduler.

- 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 path 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 2:

- Insurance models based on smart contract for private blockchain, public blockchain and combined solution are proposed.

- A property insurance model based on smart contract for blockchain is proposed.

- A smart contract-based life insurance model for 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 transport is proposed.

- An IoT and blockchain integration model for hospitalization tracking is proposed.

- Models for implementation of vaccination based on a smart contract for a private blockchain are proposed.

- A smart contract-based model for tracking higher education subsidies for a private blockchain is proposed.

- Algorithms and approaches are proposed for load balancing in SDN and finding the best path between hosts.

Direction 3:

- A botnet attack detection approach based on genetic algorithms is proposed.

- An approach for testing vulnerabilities in wireless networks is proposed.

Direction 4:

- An approach for transferring multimedia traffic over low-speed global networks is proposed.

- An approach for building hybrid multi-threaded libraries is proposed.
- A method for activating a wearable device with a touch-sensitive bezel with 2 fingers is proposed.
- A pose recognition method is proposed when activating a wearable device interface.

Applied Contributions:

Direction 1:

- Prototypes for LiFi communication have been developed.
- A prototype of an indoor LiFi network implementing horizontal handover has been developed.
- A simulation environment has been developed for LTE, 6LoWPAN, ZigBee, LoRaWAN and BLE networks, implementing proposed and known algorithms.
- An experimental network for implementing 6LoWPAN, ZigBee and BLE technologies has been developed.

Direction 2:

- The proposed models have been implemented through smart contracts on:
 - Public blockchain – Ethereum;
 - Private Blockchain - Hyperledger Fabric.
- A web-based system for the sale of crypto-tokens for ICO (Initial Coin Offering) based on the Ethereum blockchain has been created.
- Web-based and cloud-based systems for booking medical examinations have been developed.

Direction 3:

- A simulator of botnet DoS attacks has been 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 hardware system for data collection for wireless networks suitable for the war-driving technique has been developed.

Direction 4:

- A system has been developed for indexed search in a local Windows network.
- 2 prototypes of a smart watch have been created - with buttons and with a touch-sensitive bezel.
- A test environment was created to collect readings for enabling a touch interface on wearable device navigated by 2 fingers.
 - 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 has been implemented for training in disciplines related to computer networks.

4. Significance of contributions for science and practice.

I comprehensively evaluate the candidate's contributions as scientific-applied and applied and classify them as enrichment of existing knowledge and technical systems, creation of new classifications, methods and algorithms, obtaining and proving confirmatory facts.

5. Critical notes and recommendations.

I have no comments regarding the submitted materials for participation in the competition.

