STATEMENT

from

Assoc. Prof. Emil Georgiev Delinov, PhD,

Department of Informatics and Mathematics,

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(PF 4.6. Informatics and computer sciences)

for

dissertation on a topic
"IoT ENVIRONMENT FOR INTELLIGENT LIVESTOCK"

with author Evgeni Vladimirov Valchev

for awarding the educational and scientific degree **"Doctor"**

Scientific area: 4. Natural sciences, Mathematics and Informatics,
Professional field: 4.6. Informatics and Computer Science,
doctoral program: Informatics

The Statement was written and presented on the basis of order No. RD-22-772 of 27.03.2025 of the Rector of Plovdiv University "Paisii Hilendarski", as well as a decision of the scientific jury, taken at its first meeting on 31.03.2024, on the basis of which I am appointed as a member of the scientific jury, which prepares an Statement on the procedure for the defense of a dissertation on the topic "IoT ENVIRONMENT FOR INTELLIGENT LIVESTOCK" for the acquisition of the educational and scientific degree **"Doctor"**. The author of the dissertation is Evgeni Vladimirov Valchev - a full-time doctoral student at the Department of Computer Systems, at the Faculty of Mathematics and Informatics of the Plovdiv University "Paisii Hilendarski", with scientific supervisors Prof. Stanimir Nedyalkov Stoyanov, PhD and Prof. Todorka Atanasova Glushkova, PhD.

General description of the materials presented.

As a member of the scientific jury, I have received a set of materials on electronic media in accordance with Art. 36 (1) of the Regulations for the Development of the Academic Staff of the University of Plovdiv.

The submitted documents contain data from which it can be concluded that the doctoral student Evgeni Vladimirov Valchev has in-depth knowledge and extensive experience in the field of computer science and software development. He completed his bachelor's degree in 2016 at the Faculty of Mathematics and Informatics of Plovdiv University and his master's degree in 2019 at the same University. Both are in computer science - "Business Information Technologies" and "Business Informatics with English Language", respectively. Throughout his entire career from 2009 to the present, he has been working in the same field. He has over 15 years of experience in various areas of the life cycle of software products, information systems and services related to them.

Relevance of the topic, knowledge of the problem, appropriateness of the set goals and objectives. The topic of the dissertation is very relevant, useful and with prospects for future developments and implementations. In the time of need for more and more food products and reducing the footprint of human activity on the natural resources of our planet, intelligent systems are those that can significantly contribute to achieving some of the related goals. Elements of the Internet of Things (IoT) are one of the main components for building and developing such systems. Along with the means of artificial intelligence (AI), they are increasingly focusing scientific and practical interest. The presented documents present data from which it can be concluded that the doctoral student has a thorough knowledge of the essence of the researched problem - 111 sources are listed in the bibliography. The doctoral student has presented two publications on the topic, in which he is a co-author with a number of authoritative scientists.

Research methodology. The research methodology, presented on page 8 of the dissertation, is described as based on a step-by-step, iterative approach that goes through: familiarization with the problem; design and development of various approaches and models; prototyping; testing and conclusions.

Characteristics and evaluation of the dissertation work. The dissertation work is 133 pages long, consists of an introduction, three chapters and a conclusion. The literature used is up-to-date and appropriately selected in accordance with the nature of the research. I

have a note regarding the “online” sources from the Internet – no dates of last viewing/access are indicated.

In my opinion, the dissertation is structured logically, correctly and consistently. It presents the stages and progress of the research.

The introduction discusses the relevance of the topic and clearly formulates the goal and objectives of the dissertation - 4 in number. The main goal is defined on page 7 of the dissertation and on page 4 of the Abstract in Bulgarian and page 4 of its English version. The first chapter is an overview of the state of the problem and the need for such developments. The second chapter presents the software architecture and the individual modules of the IoT platform for intelligent animal husbandry. The technical means are described and the design and implementation of the sensor network and IoT sensor devices are discussed. Attention is also focused on the functionalities for collecting, processing and visualizing the dynamically incoming and accumulated information to date, as well as on the several successive prototypes of individual components of the platform. The third chapter is focused on the results of the implementation of the prototypes of the IoT platform for intelligent animal husbandry. An approach for processing and analyzing the received data and conclusions about the behavior and activities of animals is presented.

The abstract summarizes the content and results of the dissertation work and is prepared in accordance with the requirements.

The dissertation and the abstract present 4 contributions/results:

1. A general concept has been created for building an IoT ecosystem in the field of smart animal husbandry.

2. Specific models have been created for the application of the developed concept in the adaptation of the reference ViPS architecture in the field of intelligent pasture animal husbandry.

3. Prototypes have been created to test the application of the designed IoT environment for smart livestock farming.

4. An approach is proposed for processing and analyzing the obtained data to study the behavior of cows during pasture farming in the created prototypes.

I accept that the contributions are of a scientific and applied nature.

The doctoral student Evgeni Vladimirov Valchev has presented four publications on the topic of the dissertation published in 2020, 2021. and 2022 Three of them were published in publications indexed in the WoS, Scopus and IEEE databases. With this, the doctoral student has fulfilled the minimum national requirements under Art. 2b, p. 2 and 3 of ZRASRB and accordingly according to Art. 24, p. 1 of the Regulations for the implementation of the ZRASRB for the acquisition of the educational and scientific degree "doctor". My opinion is that they summarize the results of the research presented in the dissertation. From the materials presented, I believe that the achieved results are the personal work of the doctoral student.

Critical remarks and recommendations. I have no critical remarks towards the doctoral student.

I recommend that the doctoral student consider in the future the possibilities for implementing such types of systems in smaller animals and birds.

CONCLUSION

Based on the documents presented in the procedure, I conclude that the doctoral student:

- satisfies the minimum national requirements in the professional field, as well as the provisions of the ZRASRB and the rules for its implementation, as well as the relevant Rules for the acquisition of scientific degrees in the PU "Paisiy Hilendarski";

- possesses in-depth theoretical and practical knowledge in the specialty "Informatics" and proven abilities for scientific research.

This gives me grounds for a positive assessment and I confidently propose to the respected scientific jury to award the doctoral candidate **Evgeni Vladimirov Valchev** the educational and scientific degree **"Doctor"** in the Scientific area 4. Natural sciences, Mathematics and Informatics, Professional field 4.6. Informatics and Computer Science.

20.04.2025 Member of the scientific jury:

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(Assoc. Prof. Emil Delinov, PhD)