OPINION

by **Professor Lyubka Doukovska, PhD, DSc**

from the Institute of Information and Communication Technologies,

at the Bulgarian Academy of Sciences,

on the Thesis for awarding educational and scientific degree PhD,

under the Scientific Field: **4. Natural Sciences, Mathematics and Informatics**,

the Professional Area: **4.6. Informatics and Computer Sciences**,

the Scientific Specialty: **01.01.12. Informatics**

Author of the PhD Thesis: **Kristina Ivanova Dineva**

PhD Thesis Title: **Integration of heterogeneous data from distributed IoT devices**

In accordance with Order No. 211 from 02.11.2020 of the Director of the Institute of Information and Communication Technologies - BAS, I have been appointed as a member of the Scientific Jury regarding the PhD thesis of **Kristina Ivanova Dineva** for awarding the educational and scientific degree "Doctor of Philosophy" (PhD) in the Scientific Field **4. Natural Sciences, Mathematics and Informatics**, the Professional Area **4.6. Informatics and Computer Sciences**, the Scientific Specialty **01.01.12. Informatics**.

As a member of the Scientific Jury I have received:

1. Order No. 211 from 02.11.2020 of the Director of the Institute of Information and Communication Technologies - BAS.

2. Dissertation for the educational and scientific degree PhD.

3. Abstract of the dissertation for the educational and scientific degree PhD.

4. Copies of the publications included in the PhD thesis.

5. Reference to the implementation of the minimum requirements of the Institute of Information and Communication Technologies - BAS for obtaining the educational and scientific degree PhD, as well as other documents accompanying the procedure.

In order to form the final evaluation of the PhD thesis, the requirements of the *Development of Academic Staff Act in the Republic of Bulgaria* are implemented the specific requirements in the Act's Institutional Regulation shall be taken into consideration, where the respective norms are:

1. Pursuant to Art. 6 (3) of the *Development of Academic Staff Act in the Republic of Bulgaria*, PhD thesis should contain scientific or scientific-applied results, which represent an original contribution in science. The PhD thesis must indicate that the candidate has in-depth theoretical knowledge of the relevant specialty and ability for independent research.

2. According to Art. 27 (2) of the specific requirements in the Act's Institutional Regulation, PhD thesis should be presented in a form and volume corresponding to the specific requirements of the primary unit. The PhD thesis should contain: a cover page; content; introduction; exhibition; conclusion - a summary of the results obtained with a declaration of originality; bibliography.

The PhD thesis consists of 166 pages. Its structure includes introduction, five chapters, the PhD thesis scientific contributions, guidelines for future development, a list of publications, a list of citations, a request for originality, a list of 175 cited sources and applications.

The aim of the PhD thesis is to develop a system and tools for processing, modelling and integration of heterogeneous data obtained by distributed IoT devices.

To accomplish this, the following tasks have been set:

1. To propose a methodology for processing, modelling and integration of heterogeneous data obtained from distributed IoT devices.

2. To develop modular hardware system architecture and to design an appropriate method for communication between distributed IoT devices.

3. To propose an architecture of a software platform and an approach for the organization of the services for the intelligent processing of heterogeneous data from an IoT system.

4. To construct valid machine learning models for experimental validation of the proposed methodology.

5. To provide possible application in intelligent agriculture of the proposed system and tools for integration of heterogeneous data obtained from IoT distributed devices.

I find that the aim and the problems formulated reflect the topicality and significance of the presented dissertation work, as well as the possibility to apply the results obtained in the engineering practice.

The submitted lists of publications contains twelve papers and nineteen citations. The data presented in this way give me reason to conclude that the study was done on its own and was provided with the necessary publicity.

I accept that the contributions so formulated could be considered to have scientific and common application. This separation would allow detailing the results obtained in accordance with the specificity of their significance. Such defined contributions can be defined as enriching the existing scientific field with new knowledge.

The PhD abstract has a volume of 36 pages. It faithfully reflects the essence and content of the PhD thesis, including the purpose, subject, object and tasks of PhD thesis research and the ways of their realization.

In order to form the final evaluation of the PhD thesis, the requirements of the *Development of Academic Staff Act in the Republic of Bulgaria* and its Implementation Rules are to be taken into account, so I should note that all remarks made by me during the preliminary discussion of the PhD thesis are reflected in its final version.

In conclusion, I accept that the requirements of the *Development of Academic Staff Act in the Republic of Bulgaria* and the specific requirements in the Act's Institutional Regulation are fulfilled. After my introduction to the dissertation thesis and its publications, an analysis of their significance and the contributions they make, I give my positive assessment and I recommend to the Honorable Jury to award the educational and scientific degree PhD to **Kristina Ivanova Dineva** in the Scientific Field **4. Natural Sciences, Mathematics and Informatics**, the Professional Area **4.6. Informatics and Computer Sciences**, the Scientific Specialty **01.01.12. Informatics**.

20.11.2020
Sofia

Signature:

/Prof. I