OPINION

on the procedure for the defense of Doctoral Thesis:

„Aided decision making for public transportation optimizations using Big Data"

for the acquisition of the educational and scientific degree "Doctor"

of

Ph.D. Candidate: **Georgi Kalinov Yosifov**

Scientific field: **4. Natural sciences, mathematics and informatics**

Professional field: **4.6 Informatics and Computer Science**

Doctoral program: "Software Technologies – Software engineering"

at **Department of Software Technologies**

Faculty of Mathematics and Informatics (FMI)

Sofia University "St. Kliment Ohridski" (SU)

The opinion is written by Prof. Olga Ilieva Geirgieva, Department of Software Technologies, FMI – SU as a member of the scientific jury according to order № РД-38-599/28.10.2022 г. of the Rector of Sofia University "St. Kliment Ohridski".

1. General characteristics of Doctoral Thesis and the presented materials

The Doctoral Thesis is divided into six chapters - introductory, four substantive chapters and a concluding chapter, also contributions to the thesis and a literature reference in the volume of 159 pages. Additionally, the following documents are enclosed: Index of figures, Index of tables, Glossary of terms and abbreviations, Processed segments of the city of Edinburgh and their graphs, Analysis of the distribution of the data in their pure and logarithmic form. The thesis contains 76 figures and 17 tables. The text refers to 108 literary sources.

2. Data and personal impressions about the candidate

Georgi Yosifov graduated with a bachelor's degree in "Computer Science" and a master's degree in "Software Technologies", both obtained from FMI SU.

I know the candidate as a master's student, and my impressions are of his very good performance in the exams. I have a more direct view on his work since the time of enrollment as a PhD student at Department of Software Technologies on February, 2018. As a PhD student,

he performed his duties conscientiously, performed well in the annual attestation and presentations.

3. **Analysis of the scientific and the scientific-applied achievements of the candidate, contained in the presented doctoral thesis and the publications enclosed to it according to the procedure**

The doctoral thesis aims to present a comprehensive study and development of a method for assessment of the current and predicted traffic in an urban environment. The results can be used to optimize the transport organization in a city, and thus to achieve optimization of the resources, good transport planning and development.

The contributions of the dissertation can be divided into two groups:

- **Scientific-applied results**

- Investigated and demonstrated a direct positive relationship between the transport times of the urban transport through a road section and the level of the road traffic. This allows to draw conclusions about the traffic situation in a city with public transport easily and with a small resource.

- A traffic rating index of an urban environment is proposed and an algorithm for its calculation is developed. The practical applicability to use the index has been assessed through analysis of simulation and real data.

- A model for traffic prediction on the basis of collected information for an individual road section, as well as for the entire city is developed. For this purpose, a neural network model is proposed through a comparative analysis of the model accuracy to select an appropriate structure.

- **Applied results**

- Software solutions for collecting, processing, calculating and visualizing the level of the traffic in an urban environment is developed using the proposed traffic rating index and the corresponding algorithm for its calculation.

4. **Approbation of the results**

The PhD Candidate has submitted three titles reflecting the results of the thesis work. All of them have been published in international scientific editions of established publishers - ACM and Springer. In all three publications, the candidate is the first author. Declarations of equal participation of the co-authors in the publications are presented.

The three publications are indexed in the scientific database SCOPUS and have an impact rank. They collect in total 90 points out of the required 30 points to fulfill the minimum national requirements. Two citations of a publication to this procedure are visible in the SCOPUS system. It can be concluded with confidence that the scientific works meet the minimum national requirements (according to Art. 2b, paras. 2 and 3 of the Law of Development of the Academic Staff in the Republic of Bulgaria) and, accordingly, the additional requirements of Sofia University "St. Kliment Ohridski" for the acquisition of an educational and scientific degree "Doctor" in the scientific field of the procedure.

There is no proven plagiarism in the submitted thesis and scientific works under this procedure.

5. Quality of the thesis abstract

The thesis abstract is presented in Bulgarian in 46 pages and in English in 43 pages. The content follows the presentation of research in the dissertation work. It accurately and sufficiently summarizes the analyzes and results described in the dissertation.

6. Critical notes and recommendations

I recommend that the results be published in a scientific journal so that the work is visible by a wider group of specialists in the field.

7. Conclusion

Having familiarized myself with the doctoral thesis presented by the procedure and the scientific works accompanying it and based on the analysis of their significance and the scientific and scientific-applied contributions contained in them, **I confirm** that the presented dissertation work and the scientific publications to it, as well as the quality and originality of the results and achievements presented in them meet the requirements of the Law of Development of the Academic Staff in the Republic of Bulgaria, the Rules for its application and the relevant Rules of the SU "St. Kliment Ohridski" for the candidate's acquisition of the educational and scientific degree "Doctor" in the scientific field 4. Natural sciences, mathematics and informatics and professional field 4.6. Informatics and Computer Science. In particular, the candidate satisfies the minimum national requirements in the professional field and no plagiarism has been found in the scientific works submitted for the competition.

Based on the above, **I recommend the scientific jury to award Georgi Kalinov Yosifov an educational and scientific degree "Doctor" in scientific field 4. Natural sciences, mathematics and informatics, professional field 4.6. Informatics and Computer Science**.

18.01.2023   Prepared the opinion: ....

/ **Prof. Olga Georgieva /**