

OPINION

by **Corr. Member Lyubka Atanasova Doukovska, DSc**
on the Thesis for awarding scientific degree “**Doctor of Sciences**”,
under the Professional Area 4.6. Informatics and Computer Sciences,

Author of the DSc Thesis: **Prof. Stefka Fidanova, PhD**

DSc Thesis Title:

“Ant colony optimization for solving combinatorial optimization problems”

In accordance with order of the Director of the Institute of Information and Communication Technologies at the Bulgarian Academy of Sciences, I have been appointed as a member of the Scientific Jury regarding the DSc thesis titled: “**Ant colony optimization for solving combinatorial optimization problems**”, with author **Prof. Stefka Fidanova, PhD** for awarding the scientific degree “**Doctor of Sciences**” (DSc) in the Scientific Field 4. Natural Sciences, Mathematics and Informatics, the Professional Area 4.6. Informatics and Computer Sciences.

As a member of the scientific jury, I received a DSc thesis, an abstract to it and the accompanying administrative documentation.

In order to form the final evaluation of the dissertation, 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:

Art. 12. (announced as anti-constitutional by a Decision of the Constitutional Court No. 11 of 2010 – SG 81/10; new – SG 101/10) (1) (Suppl. - SG 30/18, in force from 04.05.2018) The scientific degree of Doctor of Science shall be awarded to a person with an educational and scientific degree of a Doctor who meets the minimum national requirements under Art. 2b, Para. 2 and 3.

(2) For awarding of the scientific degree of a Doctor of Sciences the person referred to in Para. 1 must defend a dissertation paper subject to the terms and conditions and following the procedure of this act.

(3) (New - SG 30/18, in force from 04.05.2018) Admitted to defend their dissertation shall be persons who meet the minimum national requirements under Art. 2b, Para. 2 and 3.

(4) (Previous Art. 3 - SG 30/18, in force from 04.05.2018) The dissertation paper under Para. 2 must contain theoretical conclusions and solutions of major scientific and applies scientific problems, which correspond to the up-to-date achievements and can be regarded as a considerable and original contribution to science.

(5) (Previous Art. 4 - SG 30/18, in force from 04.05.2018) The dissertation paper referred to in Para. 2 shall be prepared independently and may not repeat literally the topic and a considerable part of the content of the paper presented for awarding of the educational and scientific degree of Doctor of Philosophy.

I accept that the requirement of Art. 12, Para. 1 of the *Development of Academic Staff Act in the Republic of Bulgaria* is met, as Prof. Stefka Fidanova has an educational and scientific PhD degree, according to a decision of the Presidium of the Higher Attestation Commission at the Council of Ministers of the Republic of Bulgaria, with diploma No. 26466 from 01.02.2000.

According to the presented reference, Prof. Stefka Fidanova fulfills the minimum national requirements under Art. 2b, Para. 2 and 3.

I accept that that the requirement of Art. 12, Para. 5 of the *Development of Academic Staff Act in the Republic of Bulgaria* is met, because publications on this DSc thesis do not coincide with the publications for the educational and scientific PhD degree, also the reviewed dissertation does not literally repeat the topic and a significant part of the content of the dissertation for the educational and scientific PhD degree.

The subject of the presented DSc thesis is the combinatorial optimization. The subjects of the research are algorithms based on the ant colony method for solving tasks from real life and industry.

The research point of view of the DSc thesis is that one of the most successful metaheuristic methods for solving combinatorial optimization problems is the ant method.

The DSc thesis has a volume of 189 pages, including 16 figures and 76 tables. Its structure includes an introduction, six chapters, a conclusion, contributions of the DSc thesis research, a statement of originality and a bibliography. The list of used literature includes 127 literary sources.

The cited sources in the DSc thesis are sufficiently diverse and are mostly written by foreign authors. The presence of Bulgarian authors in the used literature makes a good impression.

I accept that such defined DSc thesis's contributions can be defined as enriching the existing scientific field with new knowledge.

The publications on the DSc thesis are nineteen and include, one monograph, one publication in a journal with an impact factor, eleven publications in publications with an impact rank, five publications in publications referenced in Scopus and one publication in a publication of the Polish Information Society.

A list of fifty-two citations to the papers of Prof. Stefka Fidanova is presented. I accept that this issue is until the submission of the documents for the competition and does not include new citations.

The presented data give me reason to conclude that the results of the DSc thesis are provided with the necessary publicity.

The DSc abstract has a volume of 49 pages. It faithfully reflects the essence and content of the DSc thesis, including the purpose, subject, object and tasks of DSc thesis research and the ways of their realization.

In order to form the final evaluation of the dissertation, the requirements of the *Development of Academic Staff Act in the Republic of Bulgaria* and its Implementation Rules are to be taken into account, according to which I have the following remarks and recommendations:

1. There are stylistic errors in the text, and I find the use of the pronoun “we” inappropriate, given the nature of the dissertation and the claims to the independence of the research.

3. The contributions of the DSc thesis are not convincingly formulated so as to contain theoretical generalizations that correspond to modern achievements and represent a significant and original contribution to science.

I accept that the requirements of the *Development of Academic Staff Act in the Republic of Bulgaria*, the specific requirements in the Act’s Institutional Regulation and the Rules for the specific conditions for acquisition of academic degrees and occupation of academic positions in the IICT-BAS are fulfilled. After an assessment of the DSc 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 scientific degree DSc to **Prof. Stefka Fidanova, PhD** in the Professional Area 4.6. Informatics and Computer Sciences, the Scientific Field 4. Natural Sciences, Mathematics and Informatics.

Signature:

НА ОСНОВАНИЕ
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