

Opinion

On the procedure for receiving educational and scientific degree “Doctor” in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.5. Mathematics, in the PhD program Mathematical Logic

1. General characteristics of the dissertation and the presented materials

The candidate begins his research with the consideration of misconceptions related to AI (Artificial Intelligence). The first misconception describes AI as a memoryless function. The candidate shows that the statement “AI is a memoryless function” is not precise enough and improves it. The second misconception related to AI, considered in the thesis, is that AI is a pseudoscience. The candidate shows that also this statement is wrong. In particular, the candidate discusses the following three questions: 1) What is AI?; 2) How we can create AI?; 3) What are the consequences of AI?. The candidate points out that the third question is the most important question of these three questions, moreover, it is the most important ones if one deals with AI. In the theses, the candidate translates the first both questions in a language of Mathematical Logic, i.e. he takes a function(s) f , which he denotes as world(s). The aim is to describe that function(s) f by a countable language, called as “description of the world”. The description of the function(s) world(s) is realized in such a way, that one becomes able to give an answer to the previous mentioned questions. The theses give examples for languages for the description of words, but unfortunately, does not answer the question “What is a language for description of worlds?”

The dissertation consists of 107 pages distributed in an Introduction and three chapters. Each chapter consists of several very short sections and subsections, respectively. The dissertation ends with a List of References, Conclusions, a List of 19 publications and one patent of the candidate related to the dissertation as well as of a List of the five publications for the defense.

2. Data of the candidate

Dimitar Dimitrov Dobrev was born 1966 in Sofia. In 1995 he obtained his Master’s Degree in Mathematics at the Faculty of Mathematics and Informatics of Sofia University. Since 1996 until now, Dimitar Dimitrov Dobrev works at the BAS, Institute for Mathematics and Informatics. I know him as a very active colleague since 2017. He was member of five scientific projects and has six patents.

3. Content analysis of the candidate's scientific and scientific-applied achievements, contained in the presented dissertation and the publications to it, included in the procedure

The Introduction describes the problems considered in the dissertation. In particular, the Introduction justifies that the dissertation concerns a problem related to Mathematical Logic, since the candidate uses methods of Mathematical Logic. The Introduction gives a clear structure of the remaining (main) part of the dissertation.

In the first Chapter, the candidate discusses the question “What is AI?” The candidate distinguishes between a formal and an informal definition. After some clarifications, the candidate gives an informal definition of AI: “AI will be such a program which in an arbitrary world will cope not worse than a human.” in the first section. This definition gives room for discussion, in my opinion. The more important question about a formal definition of AI is discussed in the second section of this chapter. This definition is basic for the dissertation. At first, the candidate introduces the idea of a formal definition of AI as a policy. This kind of definitions seems quite interesting, but gives several questions, which not all be answered in the dissertation. But the candidate could sufficiently justify this kind of definition in the dissertation, in my opinion. The candidate considers also the concepts “General Intelligence” and “Inductive Intelligence”. The candidate gives some definitions concerning policy, grad of policy, and agent. The main result is an algorithm, which represents a computable policy.

In the second Chapter, the candidate provides a new approach to the exploration of AI. In my opinion, the most interesting result of the dissertation. The candidate has an opposite approach to AI as the mainstream. He assumes that the “world” is unknown and has be found. So, the theses provide a particular description of the “world”. It is explained by the chess game. This becomes possible since the candidate could reduce the problem of creating AI to an entirely logical problem. The candidate has created a language to describe the “world”. The main building blocks of that language are so-called Event-Driven models. The second chapter brings us a step forward to the main task “to understand the world”.

In the third Chapter, the candidate considers some philosophic and historical facts. Since I am not strong enough involved in that subject, I am not able to evaluate that chapter. But I can state that this chapter gives an interesting presentation of the problem: What are consequences of AI.

4. Approbation of the results

There are five publications related to the dissertation, none of them is a joint publication. Two of them are related to the first Chapter, published in PC-Magazine-Bulgaria and at arXiv. Two other papers, which are published in Serdica Journal of Computing, are related to the second Chapter. The fifth paper is related to the third Chapter and is published in the International Journal “Information Content and Processing”. I wonder that none of the five publications are in journals with impact factor, as fare I can see. On the other hand, the five publications are enough to fulfil minimum national requirements for obtaining the degree “Doctor”. Generally, the present papers cover the minimum national requirements in the professional field the corresponding rules at the IMI-BAS for the acquisition by the candidate of the degree “Doctor” in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.5 Mathematics.

5. Citations of the candidate’s papers

The candidate gives five citations for the defense. All of them are for one paper. Three of them are in Scopus journals. There are 119 further citations, which are for three papers.

6. Quality of the abstract

In my opinion, the Abstract gives a good picture of the aim(s) and results of the dissertation. But the Abstract could be better organized. I wonder, why the candidate begins the Abstract with a statement about the computable function class. It seems that these functions are the subject of that thesis, contradicting with the title of the dissertation.

7. Conclusions

Having become acquainted with the dissertation theses and the accompanying scientific papers and based on the analysis of their significance, I confirm that the dissertation by Dimitar Dimitrov Dobrev and the scientific publications to it, as well as the quality and originality of the results achievement presented in them, meet the requirements of the Law of the Development of the Academic Staff in the Republic Bulgaria, the Rules for its Implementation, and corresponding Regulations for its Implementation at BAS and at IMI-BAS, for the acquisition of the educational and scientific degree "Doctor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.5 Mathematics. In particular, the candidate satisfies the minimum national requirements in the professional field and no plagiarism has been found in the presented dissertation and scientific papers. Based on the above, **I recommend the scientific jury to award Dimitar Dimitrov Dobrev an educational and scientific degree "Doctor" in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.5 Mathematics.**

24.05.2024

Signature

/Prof. Dr. Jörg Koppitz/