

OPINION

**on a procedure for the defense of dissertation work on the topic:
„*Intelligent Context-Aware Natural Language Dialogue Agent*“
for awarding educational and scientific degree “Doctor” (Ph.D.)
from**

Author: **Momchil Emilov Hardalov**

Area of Higher Education: **4. Natural Sciences, Mathematics, and Informatics**

Professional Field: **4.6. Informatics and Computer Sciences**

Doctoral program: **“Software Technologies” – Knowledge Discovery,**

Department: **Software Technologies,**

Faculty of Mathematics and Informatics (FMI),

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The opinion was prepared by **Prof. Daniela Ananieva Orozova, PhD - Trakia University,** in my capacity as a member of the scientific jury, according to Order No. ПД 38-600/ 28.10.2022 of the Rector of Sofia University.

1. General description of the presented materials

The author of the dissertation is Momchil Emilov Hardalov – a Ph.D. student in part-time education at the department “Software technologies” of the Faculty of Mathematics and Informatics at the Sofia University “St. Kliment Ohridski“, with supervisors Prof. Ivan Koichev PhD and Prof. Preslav Nakov PhD.

Momchil Hardalov’s dissertation “Intelligent Context-Aware Natural Language Dialogue Agent” contains 181 pages. Includes 18 figures and 39 tables in 6 chapters, general conclusions, contributions and 2 appendices. The bibliography covers 350 titles, all of which are in English.

The aims of this thesis are clearly defined on page 4 of the dissertation:

1. Develop efficient natural language processing-based approaches for building multi-component, task-orient, context-aware conversational agents, with the specific application for serving as customer support chatbots.

2. Create new resources and corpora that can help in the development of dialogue agents, on one hand, extending them to multiple languages, and on the other hand, allowing for

generating long-form answers (e.g., articles from knowledge bases), as opposed to the common short ones.

The set tasks in the dissertation correspond to the goal and the proposed methodology.

In Chapter 1 *“Introduction”*, the topic’s relevance in the field is considered and the goals and objectives of the dissertation work are defined. Chapter 2 *“Background and Related Work”* review state-of-the-art approaches related to conversation agents and their building components. Chapter 3 *“Semantic Parsing of Human-Generated Utterances”* describes a novel method for joint intent detection and slot filling is leverage the connection between the two tasks. Chapter 4. *“Curating Answers from External Knowledge Sources”* introduces new methods for curating answers. It is described as a novel weakly supervised method for collecting large-scale datasets of article–claim pairs, and learning from them with techniques for model self-adaptation to training on noisy data. In Chapter 5 *“Advanced Conversation”* are explored methods for advanced conversation. A new framework for multi-source response selection using a neural network-based re-ranking model is introduced. It is presented a new multi- and cross-lingual, question-answering dataset, and explores the abilities of several state-of-the-art multilingual models to transfer knowledge across languages. In chapter 6 *“Conclusion and Future Work”* summarizes the problems raised. The obtained results and the main contribution of the dissertation are noted. Prospects for the future development of the topic have been formulated.

2. Data and personal impressions about the Ph.D. student

The analysis of the current state of research in the field of conversation agents, made in the second chapter, the large number of studied literature sources, as well as the conclusion gives me the reason to conclude that the Ph.D. student has exhaustive knowledge of the subject of the dissertation.

I do not know the candidate personally. From the published materials and submitted documents, my impressions of Momchil Hardalov are entirely positive.

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

I accept the main results and contributions indicated by the Ph.D. student on pages 114 and 115 of the dissertation. The contributions have a scientific, scientifically applied, and

applied character. The realization of the dissertation requires in-depth scientific knowledge and high scientific and practical qualification, which its author undoubtedly possesses.

4. Approbation of the results

Results of the dissertation research are presented in 6 publications in peer-reviewed editions: 2 publications are in specialized journals and 4 publications are reports from international scientific conferences. All publications are in English.

The presented publications are distributed over time as follows:

Year	2018	2019	2020	2022
Number	1	2	2	1

All publications are co-authored. I accept that the Ph.D. student's contribution to the presented collective publications is comparable and commensurate to that of the other authors.

After a detailed review of the presented scientific works, I found that:

a) The scientific works meet the minimum national requirements (according to Article 2b, paragraphs 2 and 3 of the Development of Academic Staff Act in the Republic of Bulgaria) and respectively of the regulations on the terms and conditions for acquiring scientific degrees and occupying academic positions in Sofia University "St. Kliment Ohridski", for awarding educational and scientific degree "Doctor" (Ph.D.) in the scientific field and professional direction of the competition.

b) The scientific works presented by the candidate do not repeat those from previous procedures for acquiring a scientific title and academic position.

c) There is no evidence of plagiarism in the scientific works submitted for the competition.

5. Qualities of the abstract

The Bulgarian and English abstracts meet the requirements' volume and content for accurate, complete, and concise coverage of the dissertation.

6. Notes and recommendations

The documents show a successful and productive research activity of Momchil Hardalov. I recommend to the candidate in his future work to publish the results of his research in independent publications, which will strengthen his name in the scientific community.

7. Conclusion

After I got acquainted with the dissertation work presented in the procedure and the accompanying scientific works and on the basis of the analysis of their importance and the scientific and applied contributions contained therein, **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 Development of Academic Staff Act in the Republic of Bulgaria, the Regulations for its implementation and the corresponding Regulations of Sofia University "St. Kliment Ohridski" for awarding educational and scientific degree "Doctor" (Ph.D.) in the Area of higher education: 4. Natural Sciences, Mathematics, and Informatics, Professional field: 4.6. Informatics and Computer Sciences. 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.

Due to the above, I confidently give my *positive assessment* of the research presented by the dissertation reviewed above, abstract, results, and contributions, and *I propose to the Honorable Scientific Jury to award the educational and scientific degree "Doctor" to Momchil Emilov Hardalov* in the Area of higher education: **4. Natural sciences, mathematics and informatics**, Professional field **4.6. Informatics and computer sciences**, Doctoral program "**Software Technologies**" – **Knowledge Discovery**.

5.01.2023

Reviewer:
(Prof. Daniela Orozova, Ph.D.)