Preface

The sixth BioASQ workshop on biomedical semantic indexing and question answering took place in Brussels, Belgium on November 1st, 2018 as part of the EMNLP 2018 conference and was hosted by the SQUARE Brussels meeting centre. The workshop was supported by the BioASQ project, which organizes the corresponding annual challenge. The goals of the workshop were to present the results of the sixth BioASQ challenge and further the interaction with the wider community of biomedical semantic indexing and question answering. The presenters represented research teams from different parts of the globe and with different viewpoints to the problem. This contributed to a very lively and interesting discussion among the participants of the workshop.

Ten papers were presented during the workshop. All were selected by peer review for presentation. This volume includes all ten papers. The first paper gives an overview of the challenge, including especially the datasets that were used throughout the challenges and the overall results achieved by the participants.

The remaining nine papers are those presented at the workshop. The first of these papers presents an analysis of the use of Semantic Role Labeling (SRL) tools in question-answering. The second paper presents a system which uses deep learning and reinforcement learning approaches for the generation of ideal answers. Deep learning techniques for the document and snippet retrieval tasks is the object of discourse of the third workshop paper. The fourth paper presents a system for document and snippet retrieval, which makes use of semantic similarity patterns that are evaluated and measured by a convolutional neural network architecture. The system presented in the fifth paper uses a novel end-to-end model, which utilizes deep learning and attention mechanism to index MeSH terms to biomedical text. In the sixth paper, the authors move toward abstractive summarization, which attempts to distill and present the meaning of the original text in a more coherent way. They incorporate a sentence fusion approach, based on Integer Linear Programming. A named-entity based method for answering factoid and list questions, and an extractive summarization technique for building paragraphs are presented in the seventh paper of the workshop. The eighth paper studies the influence of enriching the training data by manually annotated variants of gold standard answers on the evaluation performance. The last paper focuses on a system for ideal answer generation, using ontology-based retrieval and a neural learning-to-rank approach, combined with extractive and abstractive summarization techniques.

We wish to thank all who participated to the success of this workshop, especially the authors, reviewers, speakers and participants.

Ioannis A. Kakadiaris, George Paliouras and Anastasia Krithara
November 2018
Organizers:
Ioannis A. Kakadiaris, University of Houston, USA
George Paliouras, NCSR "Demokritos", Greece and University of Houston, USA
Anastasia Krithara, NCSR "Demokritos", Greece

Program Committee:
Ion Androutsopoulos, Athens University of Economics and Business, Greece
Nicolas Baskiotis, Université Pierre et Marie Curie, France
Dimitris Galanis, National Technical University of Athens, Greece
Aris Kosmopoulos, NCSR “Demokritos”, Greece
Sherri Matis-Mitchell, Consultant Text and Data Analytics at BioTraceIT, USA
Prodromos Malakasiotis, Athens University of Economics and Business, Greece
Jim Mork, National Library of Medicine, USA
Diego Molla, Macquarie University, Australia
Henning Müller, University of Applied Sciences, Switzerland
Claire Nedellec, INRA, France
Mariana Neves, University of Potsdam, Germany
Harris Papageorgiou, ILSP, Greece
Ioannis Partalas, Viseo group, France
John Prager, Thomas J. Watson Research Center, IBM, USA
Francisco J. Ribadas-Pena, University of Vigo, Spain
Hagit Shatkay, University of Delaware, USA
Grigoris Tsoumakas, Aristotle University of Thessaloniki, Greece

Invited Speaker:
Jin-Dong Kim, DBCLS, Japan
# Table of Contents

*Results of the sixth edition of the BioASQ Challenge*
  Anastasios Nentidis, Anastasia Krithara, Konstantinos Bougiatiotis, Georgios Paliouras and Ioannis Kakadiaris ................................................................. 1

*Semantic role labeling tools for biomedical question answering: a study of selected tools on the BioASQ datasets*
  Fabian Eckert and Mariana Neves .............................................................. 11

*Macquarie University at BioASQ 6b: Deep learning and deep reinforcement learning for query-based summarisation*
  Diego Molla .................................................................................................. 22

*AUEB at BioASQ 6: Document and Snippet Retrieval*
  George Brokos, Polyvios Liosis, Ryan McDonald, Dimitris Pappas and Ion Androutsopoulos . . 30

*MindLab Neural Network Approach at BioASQ 6B*
  Andrés Rosso-Mateus, Fabio A. González and Manuel Montes-y-Gómez ......................... 40

*AttentionMeSH: Simple, Effective and Interpretable Automatic MeSH Indexer*
  Qiao Jin, Bhuwan Dhingra, William Cohen and Xinghua Lu .................................... 47

*Extraction Meets Abstraction: Ideal Answer Generation for Biomedical Questions*
  Yutong Li, Nicholas Gekakis, Qiuze Wu, Boyue Li, Khyathi Chandu and Eric Nyberg .......... 57

*UNCC QA: Biomedical Question Answering system*
  Abhishek Bhandwaldar and Wlodek Zadrozny .................................................. 66

*An Adaption of BIOASQ Question Answering dataset for Machine Reading systems by Manual Annotations of Answer Spans.*
  Sanjay Kamath, Brigitte Grau and Yue Ma ...................................................... 72

*Ontology-Based Retrieval & Neural Approaches for BioASQ Ideal Answer Generation*
  Ashwin Naresh Kumar, Harini Kesavamoorthy, Madhura Das, Pramati Kalwad, Khyathi Chandu, Teruko Mitamura and Eric Nyberg .................................................. 79
Conference Program

9:00-9:10 Welcome
9:10-10:10 Invited Talk: “Towards Explainable Question-Answering for Biomedical Applications”
Jin-Dong Kim, DBCLS, Japan

10:10-10:30 Results of the 6th edition of BioASQ Challenge
Anastasios Nentidis, Anastasia Krithara, Kostas Bougiatiotis, Georgios Paliouras and Ioannis Kakadiaris

10:30-11:00 Coffee break

11:00-11:20 Semantic role labeling tools for biomedical question answering: a study of selected tools on the BioASQ datasets
Fabian Eckert and Mariana Neves

11:20-11:40 Macquarie University at BioASQ 6b: Deep learning and deep reinforcement learning for query-based summarisation
Diego Molla

11:40-12:00 AUEB at BioASQ 6: Document and Snippet Retrieval
George Brokos, Polyvios Liosis, Ryan McDonald, Dimitris Pappas and Ion Androutsopoulos

12:00-12:20 MindLab Neural Network Approach at BioASQ 6B
Andrés Rosso-Mateus, Fabio A. González and Manuel Montes-y-Gómez

12:20-14:00 Lunch break

14:00-14:20 Ontology-Based Retrieval & Neural Approaches for BioASQ Ideal Answer Generation
Ashwin Naresh Kumar, Harini Kesavamoorthy, Madhura Das, Pramati Kalwad, Khyathi Chandu, Teruko Mitamura and Eric Nyberg

14:20-14:40 Extraction Meets Abstraction: Ideal Answer Generation for Biomedical Questions
Yutong Li, Nicholas Gekakis, Qiuze Wu, Boyue Li, Khyathi Chandu and Eric Nyberg

14:40-15:00 UNCC QA: Biomedical Question Answering system
Abhishek Bhandwaldar and Wlodek Zadrozny

Sanjay Kamath, Brigitte Grau and Yue Ma

15:20-16:00 Coffee break

16:00-16:20 AttentionMeSH: Simple, Effective and Interpretable Automatic MeSH Indexer
Qiao Jin, Bhuwan Dhingra, William Cohen and Xinghua Lu

16:20-16:30 Award Announcements
16:30-17:30 Panel Discussion