

## Preface - SMART 2020

SMART 2020 [1] was the first edition of the SeMantic AnswER Type prediction task (SMART), which part of the ISWC 2020 Semantic Web Challenge. It was co-located with the 19<sup>th</sup> International Semantic Web Conference (ISWC 2020)<sup>1</sup>. Given a question in natural language, the task of SMART challenge is, to predict the answer type using a target ontology. The challenge had 2 tracks, one using the DBpedia ontology and the other using Wikidata ontology. Eight teams participated in the DBpedia track and three teams in the Wikidata track. This volume contains peer-reviewed system description papers of all the systems that participated in the challenge. More details about the challenge can be found at <https://smart-task.github.io/>.

### Challenge Description

This challenge is focused on answer type prediction, which plays an important role in Question Answering systems. Given a natural language question, the task is to produce a ranked list of answer types of a given target ontology. Previous such answer type classifications in literature are performed as a short-text classification task using a set of coarse-grained types, for instance, either six types [2, 3, 4, 5] or 50 types [6] with TREC QA task<sup>2</sup>. We propose a more granular answer type classification using popular Semantic Web ontologies such as *DBpedia* and *Wikidata*.

Table 1 illustrates some examples. The participating systems can be either supervised (training data is provided) or unsupervised. The systems can utilise a wide range of approaches; from rule-based to neural approaches.

Table 1: Example questions and answer types.

Question	Answer Type	
	DBpedia	Wikidata
Give me all actors starring in movies directed by and starring William Shatner.	dbo:Actor	wd:Q33999
Which programming languages were influenced by Perl?	dbo:ProgrammingLanguage	wd:Q9143
Who is the heaviest player of the Chicago Bulls?	dbo:BasketballPlayer	wd:Q3665646
How many employees does Google have?	xsd:integer	xsd:integer

<sup>1</sup><https://iswc2020.semanticweb.org/>

<sup>2</sup><https://trec.nist.gov/data/qamain.html>

## Presentations

Eight teams competed in SMART 2020 and presented their systems at the ISWC 2020 conference. Table 2 shows their presentation titles along with the authors.

Slot	Title / Authors
Session 6A: Thursday, 5 <sup>th</sup> November, 2020	
09:00 - 9:15	<b>Augmentation-based Answer Type Classification of the SMART dataset</b> <i>Aleksandr Perevalov and Andreas Both</i>
09:15 - 9:30	<b>Semantic Answer Type Prediction Using BERT</b> <i>Vinay Setty and Krisztian Balog</i>
09:30 - 09:45	<b>Two-stage Semantic Answer Type Prediction for QA using BERT and Class-Specificity Rewarding</b> <i>Christos Nikas, Pavlos Fafalios and Yannis Tzitzikas</i>
09:45 - 10:00	<b>COALA – A Rule-Based Approach to Answer Type Prediction</b> <i>Nadine Steinmetz and Kai-Uwe Sattler</i>
Session 8A: Thursday, 5 <sup>th</sup> November 2020	
12:00 - 12:15	<b>A Methodology for Hierarchical Classification of Semantic Answer Types of Questions</b> <i>Ammar Ammar, Shervin Mehryar, and Remzi Celebi</i>
12:15 - 12:30	<b>Hierarchical Contextualized Representation Models for Answer Type Prediction</b> <i>Natthawut Kertkeidkachorn, Rungsiman Nararatwong, Phuc Nguyen, Ikuya Yamada, Hideaki Takeda, and Ryutaro Ichise</i>
12:30 - 12:45	<b>Fine and Ultra-File type Embeddings for Question Answering</b> <i>Sai Vallurupalli, Jennifer Sleeman, and Tim Finin</i>
12:45 - 13:00	<b>Question Embeddings for Semantic Answer Type Prediction</b> <i>Eleanor Bill and Ernesto Jiménez-Ruiz</i>

Table 2: Presentation Schedule for the Participating Systems

## Leaderboards

For each natural language question in the test set, the participating systems are expected to provide two predictions: answer category and answer type. Answer category can be either ‘resource’, ‘literal’ or ‘boolean’. If the answer category is ‘resource’, the answer type should be an ontology class (DBpedia or Wikidata, depending on the dataset). The systems could predict a ranked list of classes

from the corresponding ontology. If the answer category is ‘literal’, the answer type can be either ‘number’, ‘date’ or ‘string’.

## DBpedia Dataset

Category prediction will be considered as a multi-class classification problem and accuracy score will be used as the metric. As DBpedia follows DBpedia ontology for its classes, thus for type predication, we will use the metric lenient NDCG@k with a linear decay, adopted from Balog & Neumayer [7].

System	Accuracy	NDCG@5	NDCG@10
Setty et al	0.98	0.80	0.79
Nikas et al	0.96	0.78	0.76
Perevalov et al	0.98	0.76	0.73
Kertkeidkachorn et al	0.96	0.75	0.72
Ammar et al	0.94	0.62	0.61
Vallurupalli et al	0.88	0.54	0.52
Steinmetz et al	0.74	0.54	0.52
Bill et al	0.79	0.31	0.30

Table 3: Leader-board for DBpedia dataset

## Wikidata Dataset

Here again the category prediction will be considered as a multi-class classification problem and accuracy score will be used as the metric. Wikidata does not follow a strict ontology for the classes, it has a very large and rather flat set of classes and subclasses. Thus for type prediction, we use a mean reciprocal rank (MRR) based scoring system [8], where the expected type prediction is a list.

System	Accuracy	MRR
Setty et al	0.97	0.68
Kertkeidkachorn et al	0.96	0.59
Vallurupalli et al	0.85	0.40

Table 4: Leader-board for Wikipedia dataset

## Organisation

In this section, we list the people who organised and contributed to the success of this event.

## Challenge Chairs

- Nandana Mihindukulasooriya (IBM Research AI)
- Mohnish Dubey (University of Bonn and Fraunhofer IAIS)
- Alfio Gliozzo (IBM Research AI)
- Jens Lehmann (University of Bonn and Fraunhofer IAIS)
- Axel-Cyrille Ngonga Ngomo (Universität Paderborn)
- Ricardo Usbeck (Fraunhofer IAIS Dresden)

## Challenge Programme Committee Members

The challenge programme committee helped to peer-review the eight system papers and the organisers would like to thank them for their valuable time.

- Ibrahim Abdelaziz (IBM Research AI)
- Sarthak Dash (IBM Research AI)
- Srinivas Ravishankar (IBM Research AI)
- Pavan Kapanipathi (IBM Research AI)
- Md Rashad Al Hasan Rony (Fraunhofer IAIS)
- Liubov Kovriguina (Fraunhofer IAIS)
- Mohnish Dubey (University of Bonn and Fraunhofer IAIS)
- Nandana Mihindukulasooriya (IBM Research AI)

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## References

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