WASOTA: What Are the States Of The Art?

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ABSTRACT

Presently, an amount of publications in Machine Learning and Data Mining contexts are contributing to the improvement of algorithms and methods in their respective fields. However, with regard to publication and sharing of scientific experiment achievements, we still face problems on searching and ranking these methods. Scouring the Internet to search state-of-the-art information about specific contexts, such as Named Entity Recognition (NER), is often a time-consuming task. Besides, this process can lead to an incomplete investigation, either because search engines may return incomplete information or keywords may not be properly defined. To bridge this gap, we present WASOTA, a web portal specifically designed to share and readily present metadata about the state of the art on a specific domain, making the process of searching this information easier.

Keywords

State of the art methods, Metadata, MEX, Interoperability, Provenance, Scientific Experiments

1. INTRODUCTION

We have seen a variety of publications describing new algorithms and methods on Machine Learning (ML) and Data Mining (DM) contexts, many of them contributing to overcome the state of the art in their respective fields. However, experimental results are often not exported in a common machine-readable way, causing the information extraction and processing to be tricky and burdensome. In case an up-to-date survey paper is not available, a natural approach is to rely on web searches in order to find the desired content. To this aim, searching on academic web portals such as Google Scholar[1], Zotero[2], ResearchGate[3] and digital library proceedings such as ACM[4] and ACL[5] are also frequent. A typical (general) scenario is pictured in fig. 1.

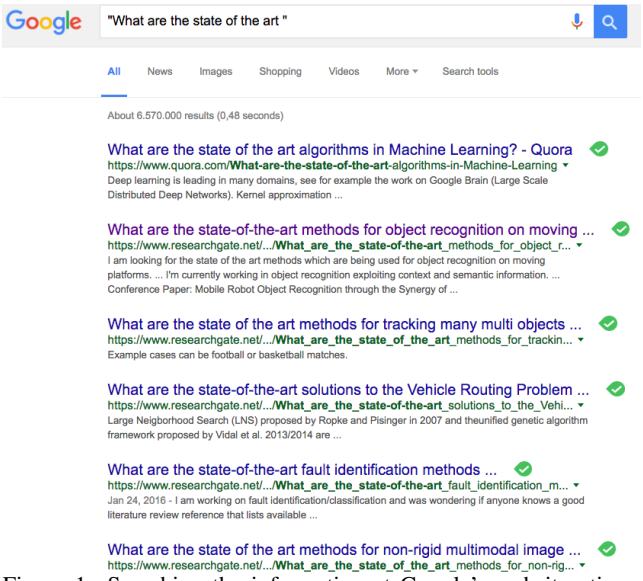

Figure 1: Searching the information at Google's website: time-consuming process for obtaining the desired information.

However, these approaches fail at readily collecting and presenting concise information about methods and algorithms for a given domain. Therefore, to answer a simple question such as *"what are the state-of-the-art algorithms for named entity recognition?"*, to date, there is no tool available.

To bridge this gap, we present WASOTA, acronym for *"What are the states of the art?"*, a web portal which relies on the MEX Vocabulary, an interchange format for ML experiments metadata [1]. WASOTA is specifically designed to share and readily present metadata about specific domains, optimizing the process of searching state-of-the-art methods and algorithms and their performance measures. To the best of our knowledge, this is the first work in literature presenting a web portal specifically designed to concisely manage metadata from scientific results generated by state-of-the-art approaches in different domains.

This paper is organized as follows. Section 2 introduces motivation and related works. Section 3 describes current system indicators and presents the demo, showing its features and usability. Finally, Section 4 presents our future work and conclusions.

[1]https://scholar.google.de/
[2]https://www.zotero.org/
[3]http://researchgate.net/
[4]http://dl.acm.org/proceedings.cfm
[5]http://aclweb.org/anthology/

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2. MOTIVATION AND RELATED WORK

Recently, a few web repositories have been released to share general experiment configurations and scientific workflows. *RunMyCode* [2] is a platform which enables scientists to openly share the code and data grounded in their research publications. Analogously, *CodaLab*[6] is an open-source platform which has been designed to address reproducible research issues providing an ecosystem for conducting computational research. In addition, *myExperiment* [3] is a repository and social network for the sharing of bioinformatics workflows. *OpenML* [4] is a repository to upload machine learning experiments. Therein, information about experiments is enriched with tasks and flows, as well as datasets, which are provided as sets of feature vectors. Finally, the Association for Computational Linguistics attempted at collecting information on the state of the art in several research areas within Natural Language Processing. Results are reported in a wiki platform, storing data such as the system name, description, main publication, link to the software, and license type [5].

None of the above projects, however, provide a straightforward way to gather information about the states of the art through an organized taxonomy of domains. Instead, they aim at being platforms for sharing complex meta-information about an experiment. Although some of them still allow users to get informed on how well different approaches perform on a given task, none comes as a semantic, light-weight aggregator of such performance values. Moreover, the domain scope of WASOTA is wider than just Machine Learning or Natural Language Processing. For instance, OpenML algorithms are evaluated on datasets where features have already been engineered; whilst WASOTA considers an algorithm as a black box, which optionally contains the feature engineering process and can process raw data, such as text, images, or RDF graphs.

Due to the diversity of schemata which they are built upon, finding information about the state of the art in these environments, as well as in domain-specific benchmarks, may become even trickier than just performing web queries to search engines. Often, even within the same environment, data is shown in unannotated web tables and the containing HTML pages share no common structure [6, 7]. Therefore, a common schema is needed in order to quickly get information about state-of-the-art results of benchmarks and experiments on popular datasets. The aim of our work is to provide the necessary tools towards an automatized integration and aggregation of these results in a centralized reference repository. That being said, existing platforms and benchmarks can be thus considered as complementary to WASOTA.

3. WASOTA PORTAL

3.1 Implementation

WASOTA is an open-source project and consists in a front-end and a back-end. The front-end[7] was created using AngularJS[8] framework and Bootstrap[9]. The back-end[10] was implemented in Java and uses two external libraries: Apache Jena[11] for parsing RDF data and the Spring Framework[12] to create the API/REST services. The project home page is portrayed in Figure 2.

[6]http://codalab.org/
[7]Source code available at https://github.com/cirola2000/wasota
[8]https://angularjs.org/
[9]http://getbootstrap.com/
[10]https://github.com/cirola2000/wasota_core
[11]https://jena.apache.org/
[12]https://spring.io/

Figure 2: Home page of the WASOTA web interface, available at the URL http://wasota.aksw.org/.

3.2 Architecture

The metadata used by WASOTA relies on the MEX Vocabulary [1] The current demo implements performance indicators (e.g.: Accuracy, TP Rate, Error, Recall) obtained from *mex-perf*[13] and contexts (e.g.: POS Tagger, Stock Market Predictions, Named Entity Recognition, etc.) from *mex-core*[14] layer, respectively. Table 1 details some of the existing variables, just to name a few. MEX is available as a Java library which can be used to wrap different metrics of experiments results. More details and examples of creating MEX files are available at MEX webpage[15].

Figure 3 depicts the overall system's architecture where different researchers export metadata[16] from their experiments to WASOTA, regardless programming-language or framework. The system consolidates and groups the information automatically, providing a platform to readily present best existing methods (based on a performance measure) for a specific domain. Further indicators are also possible to be applied, such as "dataset", for instance. Due to the metadata be semantic enriched with linked data, more detailed information can also be discovered, e.g.: the hardware configuration of given environment, if it is provided.

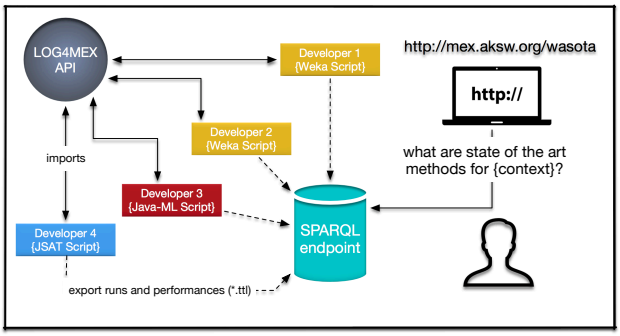


Figure 3: WASOTA: A blueprint of the WASOTA architecture. A simple solution to reduce the searching time for state of the art methods and a central repository of metadata for ranking

WASOTA filters out the metadata obtained from *MEX* files, in order to reduce the searching time for obtaining the best methods for such domain.

[13]http://mex.aksw.org/mex-perf
[14]http://mex.aksw.org/mex-core
[15]http://aksw.github.io/mexproject/
[16]http://mex.aksw.org/

Vocabulary	Indicator
mexcore:Context	Computer Vision Named Entity Recognition Stock Market Prediction Detecting Credit Card Frauds Question Answering Machine Translation Text Similarity
mexperf:PerformanceMeasure	Accuracy True False Positive True False Negative AUC Chebyshev distance Chi Square F-Measure

Table 1: WASOTA Metadata: Example of Performance Indicators and Contexts

3.3 Features

WASOTA provides multiple ways to share data about scientific experiments. This section describes the three main features of the WASOTA project, the web interface, REST API, and the SPARQL Endpoint.

3.3.1 *Web Interface: on-the-fly Publishing and Querying Benchmark Data*

WASOTA web interface has four main features which assist users in searching and managing state-of-the-art experiments.

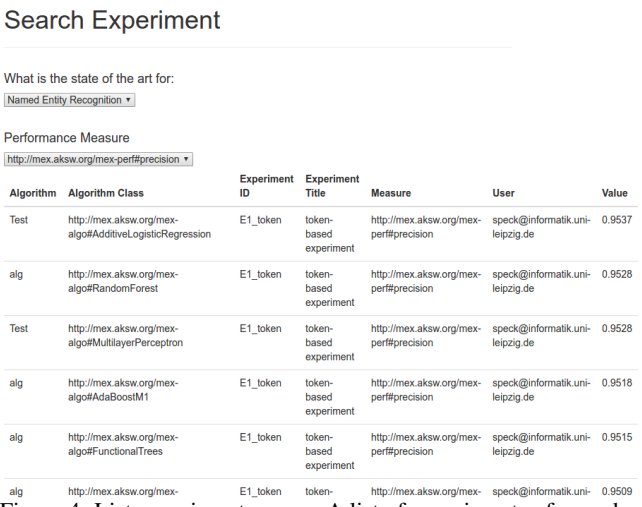
- *Browsing for experiments:* Users can search for experiments based on the context, algorithms, benchmarks, experiments and performance measures. WASOTA provides an updated list of the top experiments sorted by the performance value. Each experiment contains information about the experiment title/type, algorithm type, and experiment creator. Further, a link is provided which redirects the user to a more detailed explanation of the experiment. Figure 4 shows a list of experiments provided by the web interface.

- *Publishing new experiments:* New experiments can be published and made publicly available. The experiments should be described in an RDF file using MEX vocabulary. In addition, users can choose a graph name for each uploaded file making easy to create queries limiting the results for a unique graph. Figure 5 shows the screen where a user can add new experiments.

- *Managing experiments:* Users can choose whether their experiments will be publicly available or not. Hence, users are required to register in WASOTA in order to access the admin area and manage their own experiments. Figure 6 shows the *admin area* where the users are able to manage their experiments.

- *Consuming RDF data:* Each uploaded experiment is automatically available as RDF data. Hence, querying RDF is possible using the WASOTA SPARQL endpoint (cf. Section 3.3.3).

In summary, the web interface is an easy way to fetch state of the art results and manage experiments descriptions.



Algorithm	Algorithm Class	Experiment ID	Experiment Title	Measure	User	Value
Test	http://mex.aksw.org/mex-algo#AdditiveLogisticRegression	E1_token	token-based experiment	http://mex.aksw.org/mex-perf#precision	speck@informatik.uni-leipzig.de	0.9537
alg	http://mex.aksw.org/mex-algo#RandomForest	E1_token	token-based experiment	http://mex.aksw.org/mex-perf#precision	speck@informatik.uni-leipzig.de	0.9528
Test	http://mex.aksw.org/mex-algo#MultilayerPerceptron	E1_token	token-based experiment	http://mex.aksw.org/mex-perf#precision	speck@informatik.uni-leipzig.de	0.9528
alg	http://mex.aksw.org/mex-algo#AdaBoostM1	E1_token	token-based experiment	http://mex.aksw.org/mex-perf#precision	speck@informatik.uni-leipzig.de	0.9518
alg	http://mex.aksw.org/mex-algo#FunctionalTrees	E1_token	token-based experiment	http://mex.aksw.org/mex-perf#precision	speck@informatik.uni-leipzig.de	0.9515
alg	http://mex.aksw.org/mex-	E1_token	token-	http://mex.aksw.org/mex-	speck@informatik.uni-	0.9509

Figure 4: List experiment screen: A list of experiments of a predefined performance sorted by value.

3.3.2 *WASOTA Public API*

The web interface might be not provide sufficient features for users that need raw data. Thus, WASOTA provides a public REST API which can be used for use cases which are not covered by our web interface. Different use-cases can be covered with the API, for instance, based on the API is possible to make custom operations, integration with other APIs, and interface with other systems. An example would be to retrieve the complete list of experiments available in the WASOTA endpoint. This is possible by making an API request[17], which will bring the list of experiments in JSON format. All operations available in the web interface can be done via API and the complete list of the API commands can be found on the back-end project web page.

3.3.3 *SPARQL Endpoint: Flexibility to Export*

Besides the web interface, we also provide a SPARQL endpoint[18] to allow flexibility for the searching process. Therefore, the data management process benefits from the characteristic of the metadata. More generic queries can be performed directly over the database, such as *"What are my best two models based on F-measure?"*, as shown in Listing 1.

```
SELECT DISTINCT ?ExecutionID ?Algorithm ?
    Performance ?fMeasure WHERE {
  ?execution prov:used ?alg;
             prov:id ?ExecutionID.
  ?Performance prov:wasGeneratedBy  ?
    execution.
  ?Performance mexperf:f1Measure ?fMeasure.
  ?alg a mexalgo:Algorithm.
  ?alg rdfs:label ?Algorithm.
}
ORDER BY DESC (?fMeasure)
LIMIT 2
```

Listing 1: Straightforward and adaptable solutions with SPARQL queries.

[17]Using endpoint http://wasota.aksw.org/api/experiments/list.
[18]http://mex.aksw.org/sparql

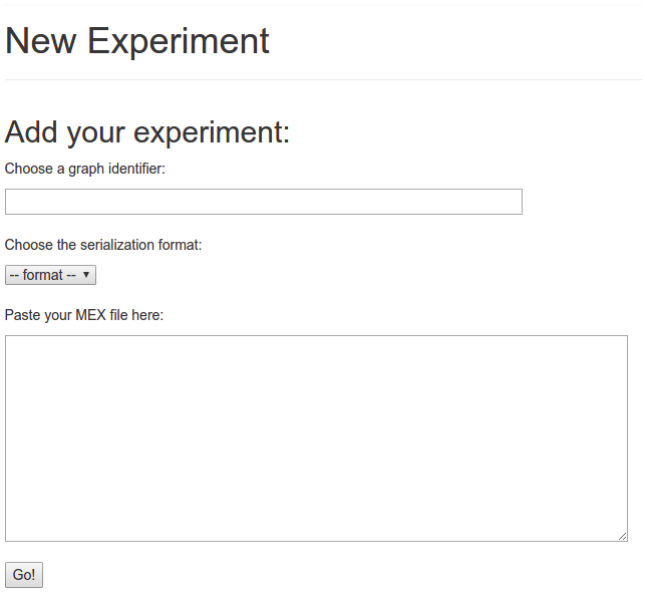


Figure 5: Add new experiment screen: The simplicity of WASOTA web interface allows users to add new experiments uploading a file or pasting RDF data. An identifier can be used case the user eventually needs to query filtering a graph or download the original RDF file.

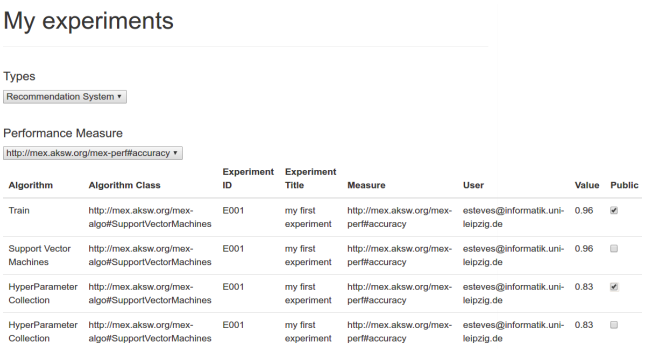


Figure 6: Manage experiment screen: The last column will change the experiment to be publicly available or not. Each registered uses has his own admin screen.

4. CONCLUSIONS AND FUTURE WORK

In this demo paper we presented WASOTA, a web repository for sharing state of the art information about scientific experiments. Thus, we aim to gracefully reduce the searching time of current state of the art methods and algorithms for a given domain. The system provides an intuitive and simple interface for uploading the metadata. Also, the repository processes the metadata on-the-fly, readily updating and interlinking related works in a given research area. Finally, we argue that benchmarking systems could also benefit of such metadata. As future work, we plan to integrate WASOTA and current scientific web repositories, such as OpenML. We also plan to integrate WASOTA in existing scientific frameworks and benchmarks, such as openQA [8] and DBtrends [9], in order to automatically export metadata for running experiments. Moreover, we plan to give users the possibility to insert metadata manually without any knowledge of the underlying vocabulary through CRUD (Create, Read, Update, Delete) webforms. Finally, we plan to expand the features in order to support the representation of specific tasks and challenges. Therewith, users would be able to upload metadata files and link them to a specific shared task.

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6. REFERENCES

[1] Diego Esteves et al. MEX Vocabulary: A lightweight interchange format for machine learning experiments. In *SEMANTiCS 2015*, 2015.

[2] Victoria Stodden, Christophe Hurlin, and Christophe Pérignon. Runmycode. org: a novel dissemination and collaboration platform for executing published computational results. In *E-Science (e-Science), 2012 IEEE 8th International Conference on*, pages 1–8. IEEE, 2012.

[3] Carole A Goble, Jiten Bhagat, Sergejs Aleksejevs, Don Cruickshank, Danius Michaelides, David Newman, Mark Borkum, Sean Bechhofer, Marco Roos, Peter Li, et al. myexperiment: a repository and social network for the sharing of bioinformatics workflows. *Nucleic acids research*, 38(suppl 2):W677–W682, 2010.

[4] Joaquin Vanschoren, Jan N Van Rijn, Bernd Bischl, and Luis Torgo. Openml: networked science in machine learning. *ACM SIGKDD Explorations Newsletter*, 15(2):49–60, 2014.

[5] The Association for Computational Linguistics Wiki. http://www.aclweb.org/aclwiki/index.php?title=State_of_the_art, 2016. [Online; accessed 1-July-2016].

[6] The Ontology Alignment Evaluation Initiative. http://oaei.ontologymatching.org/, 2016. [Online; accessed 1-July-2016].

[7] Question Answering Over Linked Data. http://greententacle.techfak.uni-bielefeld.de/~cunger/qald/, 2016. [Online; accessed 1-July-2016].

[8] Edgard Marx, Ricardo Usbeck, Axel-Cyrille Ngomo Ngonga, Konrad Höffner, Jens Lehmann, and Sören Auer. Towards an Open Question Answering Architecture. In *Proceedings of the 10th International Conference on Semantic Systems*, SEMANTiCS 2014, 2014.

[9] Edgard Marx, Amrapali Zaveri, Mofeed Mohammed, Sandro Rautenberg, Jens Lehmann, Axel-Cyrille Ngonga Ngomo, and Gong Cheng. DBtrends : Publishing and Benchmarking RDF Ranking Functions. In *2nd International Workshop on Summarizing and Presenting Entities and Ontologies, co-located with the 13th Extended Semantic Web Conference (ESWC 2016)*, SumPre 2016, 2016.