GraphMatcher System Presentation

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Abstract
Ontology matching finds a relationship or correspondence between two or more entities in two or more ontologies. To solve the interoperability of the domain ontologies, semantically correspondence entities in these ontologies must be identified and aligned before merging them. GraphMatcher is an ontology matching system using a graph attention approach to compute higher-level representation of a class together with its surrounding terms.

Keywords
graph attention, graph representation, ontology matching

1. Presentation of the system

GraphMatcher [1] is an ontology matching system based on graph representation learning using a graph attention [2] along with a neighbourhood aggregation approach. The graph representation learning approach has utilized the graph attention and introduces a neighbourhood aggregation algorithm that reveals the contextual meaning of the centre class and property.

1.1. Proposal and general statement

Using the domain ontologies together developed by different domain experts in an application raises their interoperability problem. Therefore, before merging them, the correspondences between ontologies have been found. This interoperability problem has been resolved by ontology matching approach which finds correspondences between two or more entities in two or more independent ontologies. To understand the actual meaning of a class, the contextual information of the class or property is needed.

GraphMatcher tries to resolve two weaknesses of the machine learning based ontology matching approaches [3, 4]: (i) the lack of contextual information about the property and class and (ii) how to represent the ontology’s data [1]. The former limitation has been tackled by aggregating the neighboring terms of the center class or property, and later has been addressed by representing the data in the ontology via an arbitrary graph. We aim to develop a graph representation learning model based on a graph attention mechanism [2] using Siamese
networks [5, 6, 4] to find the semantically correspondence concepts within the ontologies. The graph attention mechanism computes the higher-level representation of a concept and its surrounding concepts. The model then finds similarity scores between the concept pairs.

1.2. Specific techniques used

GraphMatcher [1] utilises a graph representation learning approach using the graph attention [2], and the supervised machine learning algorithm whose network has five layers. The main contribution is the adaptation of the graph attention to compute the higher level representation of the contextual embedding of the center class. Please note that this year, we submitted the model which gives the best performance results in the its hyperparameter tuning process. There is no other improvement and changes in the model.

1.3. Adaptations made for the evaluation

The GraphMatcher’s framework has been developed in Python with PyTorch and Ontospy, and is packaged by SEALS using MELT [7]. However, due to the Universal Sentence Encoder’s tensorflow hub dependency, the model might be run on machines which do not support this library. In this case of the dependency problem, please use another sentence encoder.

1.4. Parameter settings

The model’s parameters are 0.01 of learning rate, five epochs, 0.01 of weight decay and 32 of batch size. The threshold is computed from false positive alignments in the validation data as how the VeeAlign [4] system proposes 1. The parameters have been computed by leveraging five-fold cross validation. Its codes are available at https://github.com/sefeoglu/gat_ontology_matching

2. Results

The results of the GraphMatcher in the OAEI 2023 conference tracks are available at https://oaei.ontologymatching.org/2023/results/conference/.

3. General Comments

We will change the algorithm as an unsupervised machine learning approach in its next version, since there is no explicit rule about the supervised machine learning approach in the OAEI. With light of the study introducing the graph attention approach [2], this algorithm has also been converted to the unsupervised approach.

References


1The project uses VeeAlign’s approach directly to compute the threshold with the permission of the first author.


