ClaimLinker
Linking Text to a Knowledge Graph of Fact-checked Claims

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ClaimLinker in a nutshell

• An API and Web Service that annotates on the fly a text with fact-checked claims mined from popular fact-checking sites and integrated into a rich knowledge graph
  • Offering a novel kind of semantic annotation of unstructured content!
  • Fully unsupervised, modular, efficient, scalable, effective (76% Precision@1)

Obama can complain about Republicans in the House as much as he wants. But in the first two years, he had, you know, huge majorities in the House and Senate, and did nothing with them to create jobs.

Chris Christie FALSE

“Chris Christie claims Barack Obama did nothing to create jobs during his first two years”
Dog-owners face 78% higher risk of catching Covid-19 and home grocery deliveries DOUBLE the risk, study finds.

Experts said effect of dog ownership was comparable to returning to the office. Dogs may catch coronavirus or transport it after touching unclean surfaces. Scientists said dogs should be included in social distancing rules by owners.

By SAM BLANCHARD SENIOR HEALTH REPORTER FOR MAILONLINE PUBLISHED: 17:09 BST, 16 November 2020 | UPDATED: 14:24 BST, 25 November 2020

Walking your pet dog may raise your risk of catching coronavirus by 78 per cent and getting groceries delivered to your home could double the risk, a study has claimed. Spanish researchers looked at how different behaviours change people's likelihood of catching the virus — and found getting supermarket deliveries and dog walking.

Research suggesting increased Covid-19 risk for dog-owners may be barking up the wrong tree.

OUR VERDICT
This is based on research which has many flaws. In particular, suggestions this is down to dogs acting as a Covid-19 vector are based on limited evidence.
Motivation

• Explosive growth of fake news on the Web
  • Potential to affect public opinion towards important decisions (e.g., vaccination)
  • Erosion to democracy and public trust!

• Already, non-profit organizations in many countries fact-check tens of claims every day
  • PolitiFact, FullFact, Snopes, CheckYourFact, ...
  • Very time consuming process!

• Need for mechanisms to facilitate the detection of false/misleading information
  • Especially when the same information has already been fact-checked!

- How to quickly check if a statement’s veracity has been already examined by a trustworthy fact-checking portal?
  - How to check if there are fact-checked claims that can provide information about a statement’s veracity?
Background – ClaimsKG

https://data.gesis.org/claimskg/

- RDF knowledge graph of fact-checked claims
  - Generated through a pipeline which periodically harvest data from highly reputable fact-checking portals
  - Claims and review articles are annotated with DBpedia entities
  - RDFS model based on established vocabularies such as schema.org
  - It currently contains metadata for around 35K fact-checked claims

- Enables running complex structured (SPARQL) queries
  - About truth values, authors, dates, related entities, topics, and other contextual information
  - E.g., “Give me false claims of 2017 mentioning both Donald Trump and the FBI”
Claim Linking – Problem Definition

• Given:
  • A knowledge graph of fact-checked claims (e.g., ClaimsKG)

• Input:
  • A text (e.g., a sentence in a news article, a tweet, etc.)

• Output:
  • A set of claim annotations of the form:

  <text snippet, position, ranked list of <claim URI, score> pairs>

Obama can complain about Republicans in the House as much as he wants. But in the first two years, he had, you know, huge majorities in the House and Senate, and did nothing with them to create jobs.

• http://data.gesis.org/claimskg/claim12 (score: 0.85)
• http://data.gesis.org/claimskg/claim17 (score: 0.60)
System Overview

**Pre-processing**
- Claims KG → Indexing → Search Service Provision → Search API

**Real Time**
- **INPUT:** text
- **OUTPUT:** Claim annotations

**Detection of check-worthy text**
- Consider all text sentences as check-worthy:
  - Limiting false negative cases
  - Compatible with our use case scenarios

**Candidate Generation**
- Query Elasticsearch:
  - Considering the whole sentence as the query keywords
  - Using the default similarity model of Elasticsearch (Okapi BM25)
  - Retrieving the top-30 results and filtering out claims with low Elasticsearch relevance score (<5)

**Candidate Ranking**
- Combination of Elasticsearch score and 8 textual similarity measures:
  - Common words, lemm. words, named entities, disambig. entities, POS tags, n-grams, n-chargrams, cosine similarity
  - Lightweight and fully unsupervised

**Use of Elasticsearch**
- Efficiency, scalability
- Indexed fields for each claim:
  - Claim text, headline of fact-checking article, claim URI, truth value, author name, URL of fact-checking article
Evaluation results

• **Ground truth:**
  • Test set of CLEF2020 Check-That! 2020 Task 2 (*verified claim retrieval*)
    • 200 tweets to be matched against 10,373 fact-checked claims (v.3.0 of the dataset)
  • No training, no tuning! Tweet pre-processing: removal of URLs

<table>
<thead>
<tr>
<th>Ranking method</th>
<th>Correct claim in top position (P@1)</th>
<th>Correct claim in top-3 list</th>
<th>Correct claim in top-5 list</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elasticsearch score (100%)</td>
<td>71.5%</td>
<td>79.0%</td>
<td>80.5%</td>
</tr>
<tr>
<td>Textual Similarity Measures (100%)</td>
<td>62.0%</td>
<td>77.5%</td>
<td>82.5%</td>
</tr>
<tr>
<td>Combination (50% / 50%)</td>
<td>76.0%</td>
<td>80.0%</td>
<td>83.5%</td>
</tr>
</tbody>
</table>

• Our combined method **outperforms all unsupervised methods** participated in the challenge
• P@1 can reach ~**90%** if we consider a higher Elasticsearch score threshold (20 instead of 5)
  • However, then recall drops to ~63%
System components & use cases

• Java Library
  • It communicates with an Elasticsearch service and offers the claim linking functionality

• Web Service
  • It accepts HTTP requests and returns the results in JSON

• Web application
  • It offers a form where the user can give some text and check if there are fact-checked claims linked to that text
  • Demo at: http://users.ics.forth.gr/~fafalios/claimlinker/

• Bookmarklet
  • It allows a user to select a piece of text in any web page (e.g., in an online news article) and check if there are fact-checked claims linked to the selected text
  • Usage guidelines at http://users.ics.forth.gr/~fafalios/claimlinker/

All available as open source: https://github.com/malvag/ClaimLinker
Web Application

http://users.ics.forth.gr/~fafalios/claimlinker/

(1) Give some text and click on Submit

(2) Check the linked fact-checked claims and their verdicts

(3) Start browsing ClaimsKG

April 2021
The Web Conference 2021
Bookmarklet

http://users.ics.forth.gr/~fafalios/claimlinker/

Drag and drop the link in your bookmarks
Bookmarklet
http://users.ics.forth.gr/~fafalios/claimlinker/

While browsing...

Select a text and click the bookmark

Check the linked fact-checked claims

Exploration of claim-related Linked Data

verdict

This is based on research which has many flaws. In particular, suggestions this is down to dogs acting as a Covid-19 vector are based on limited evidence.
Conclusions

- **ClaimLinker**: linking text to fact-checked claims of a knowledge graph
  - Offering a **novel kind of semantic annotation** of unstructured content!
  - Fully unsupervised, modular, efficient, scalable, effective (**76% Precision@1**)
    - Outperforming existing unsupervised methods

- Through the claim URIs of an annotation, one can browse the knowledge graph and explore the claim-related **Linked Data**
  - For example, we can find other claims related to the same or similar entities, or claims originating from the same source

- **Future Work**:
  - Consider more advanced approaches to candidate generation and ranking (in order to better cater for the **vocabulary mismatch problem**)
    - E.g., Self-supervised (transformer-based) language models
Thank you!


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