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Rule-based technique for coreference resolution

Nikhil Verma · Following
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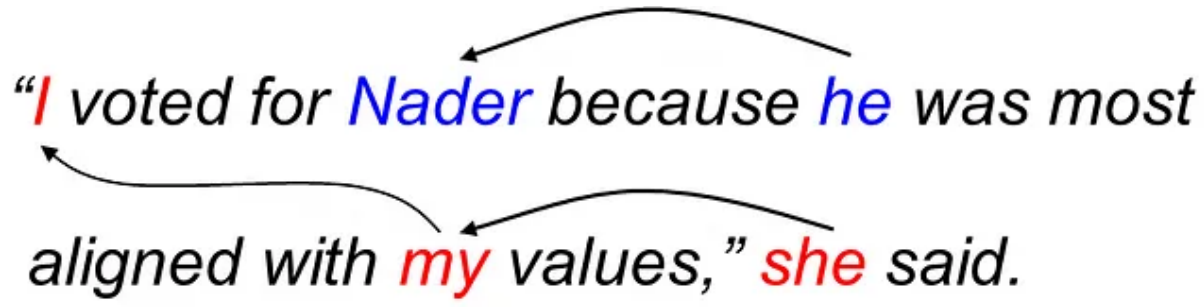

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Set of sentences that convey an understanding of text, when read together are referred to as discourse. In these sentences, the words that can be grouped by identity of reference are called as coreference. Using intuition from the past that coreference resolution mechanism using syntactic/semantic rules could outperform ML based techniques, the authors present a two layer model which uses hand-written rules called as sieves. It uses linguistic features from text and is entity based. It uses an entity centric approach i.e. coreference decision is globally informed. It helps in sharing features across each sieve in the framework.

The Mention Detection stage, which is a high recall stage, stands at the top of the stack because we do not want to miss mentions that are guaranteed to affect the final score. Following it the featurised text is passed through coreference resolution slabs. These slabs focus on increasing precision of the system. Here text is processed through 10 sieves. The system's precision ordering allows it to first link high-confidence mention-pairs, and only later consider lower confidence sources of information [1].

Notable sieves worth mentioning that contribute around 97% model improvement in paper are:-

- Exact string match: Two mentions are linked if they have the exact same string. Notable is that this sieve may not always improve precision as in the field of biomedical [2].
- Strict head match: Linking a mention to an antecedent based on the matching of their head words which are not just naive but follow some constraints.
- Pronominal coreference resolution: All sieves focus on nominal coreference resolution so in the end it's important to focus on pronominal coreference by considering features such as number, gender, person, animacy, NER label and pronoun distance.

Why rule-based method is competitive against pattern-recognition

No doubt that rule-based systems are only based on a certain set of rules and are static in nature whereas pattern recognition algorithms define their own rule-set that are based on input and outputs it receives.

The sieve based architecture incorporates lexical, syntactic and semantic information, and has access to document-level information. Pattern Recognition techniques mostly use a mention detection for entity recognition and then mention clustering (or graph partitioning) to split them into few different groups which hinders global information sharing.

Unlike sieve based approaches which focus first on recall and then on precision, mention clustering can lead to cascading of errors and depleting model's performance. ML techniques (such as Mention-pair, Entity-Mention and Mention-Ranking etc.) performed poorly due to insufficient knowledge or features for hard common mention cases.

It's only lately in 2017 after attention and transformer architecture introduction that the community started using LSTM and attention based techniques for end-to-end coreference resolution [3].

How to improve it?

To improve ML models, one idea is to consider all possible mentions simultaneously and assign probability for being a coreferrant w.r.t coreferee. Another thought is to create a neural net having fed a pair of coreference clusters and then try to merge clusters if required. This approach might outperform 2013 ML models but not [3].

References

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2. Bell, Dane, et al. “Sieve-based coreference resolution in the biomedical domain.” arXiv preprint arXiv:1603.03758 (2016).

3. Lee, Kenton, et al. “End-to-end neural coreference resolution.” arXiv preprint arXiv:1707.07045 (2017).

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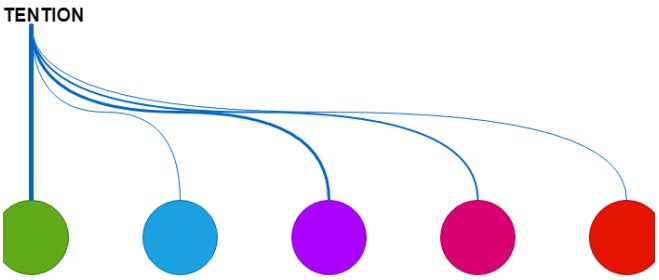

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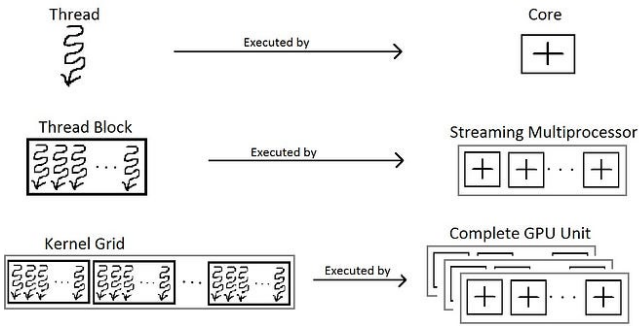

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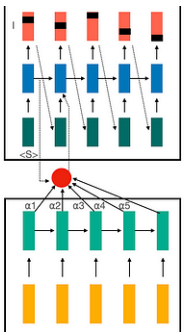

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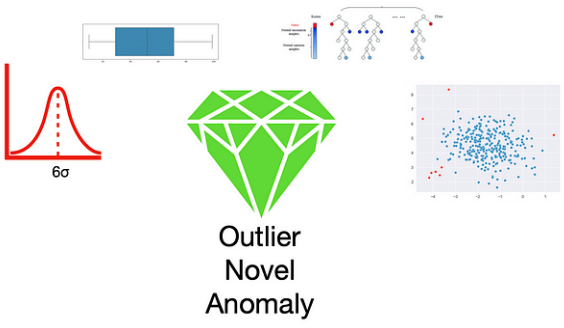

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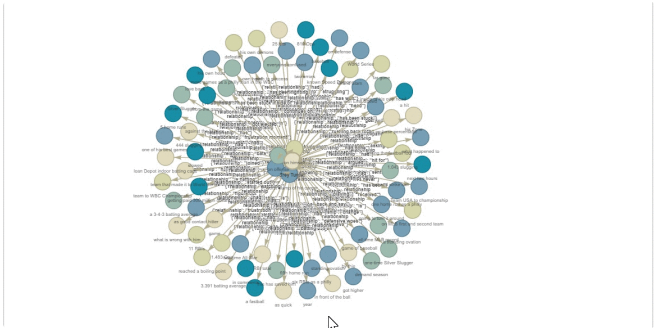

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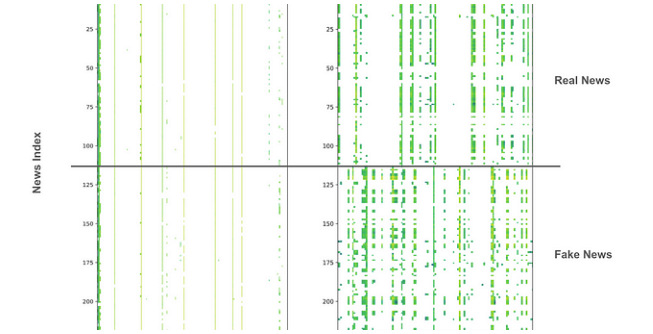

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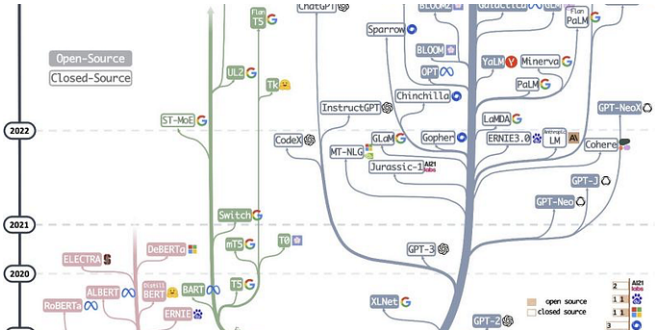

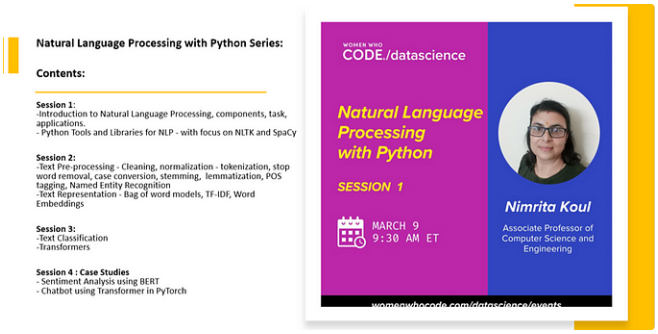

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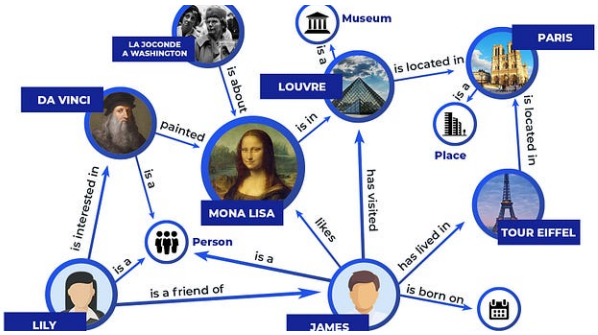

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