Relational Graph Attention Network for Aspect based Sentiment Analysis

-- Stargazers

Aspect Based Sentiment Analysis

- Aspect Based Sentiment Analysis aims to determine the sentiment polarities towards one or more aspects appearing in a single sentence.
- An example of this task is, given a review "*great food but the service was dreadful*", to determine the polarities towards the aspects food and service.
- Since the two aspects express quite opposite sentiments, just assigning a sentence-level sentiment polarity is inappropriate.
- In this regard, ABSA can provide better insights into user reviews compared with sentence-level sentiment analysis.

Objective of the Work

- obtain the dependency tree of a sentence using an ordinary parser
- reshape the dependency tree to root it at a target aspect and pruning of the tree is performed to retain only edges with direct dependency relations with the aspect
- encode the new dependency trees with relational graph attention network (R-GAT) model

Related Work

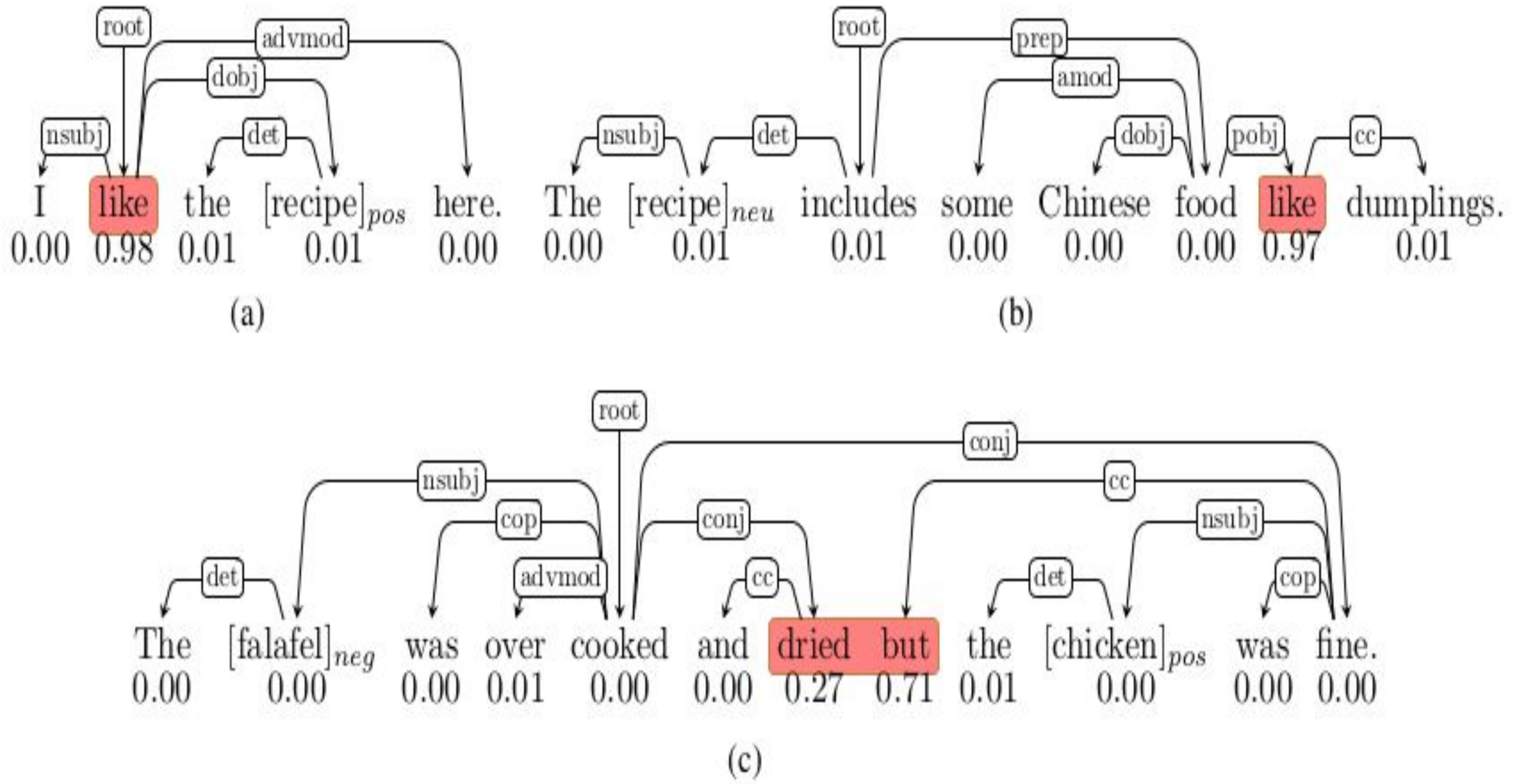
- early attempts rely on handcrafted syntactic rules (Qiu et al., 2011; Liu et al., 2013), though they are subject to the quantity and quality of the rules.
- Dependency-based parse trees are then used to provide more comprehensive syntactic information. For this purpose, a whole dependency tree can be encoded from leaves to root by a recursive neural network (RNN) (Lakkaraju et al., 2014; Dong et al., 2014; Nguyen and Shirai, 2015; Wang et al., 2016a) or the internal node distance can be computed and used for attention weight decay (He et al., 2018a).
- Recently, graph neural networks (GNNs) are explored to learn representations from the dependency trees (Zhang et al., 2019; Sun et al., 2019b; Huang and Carley, 2019).

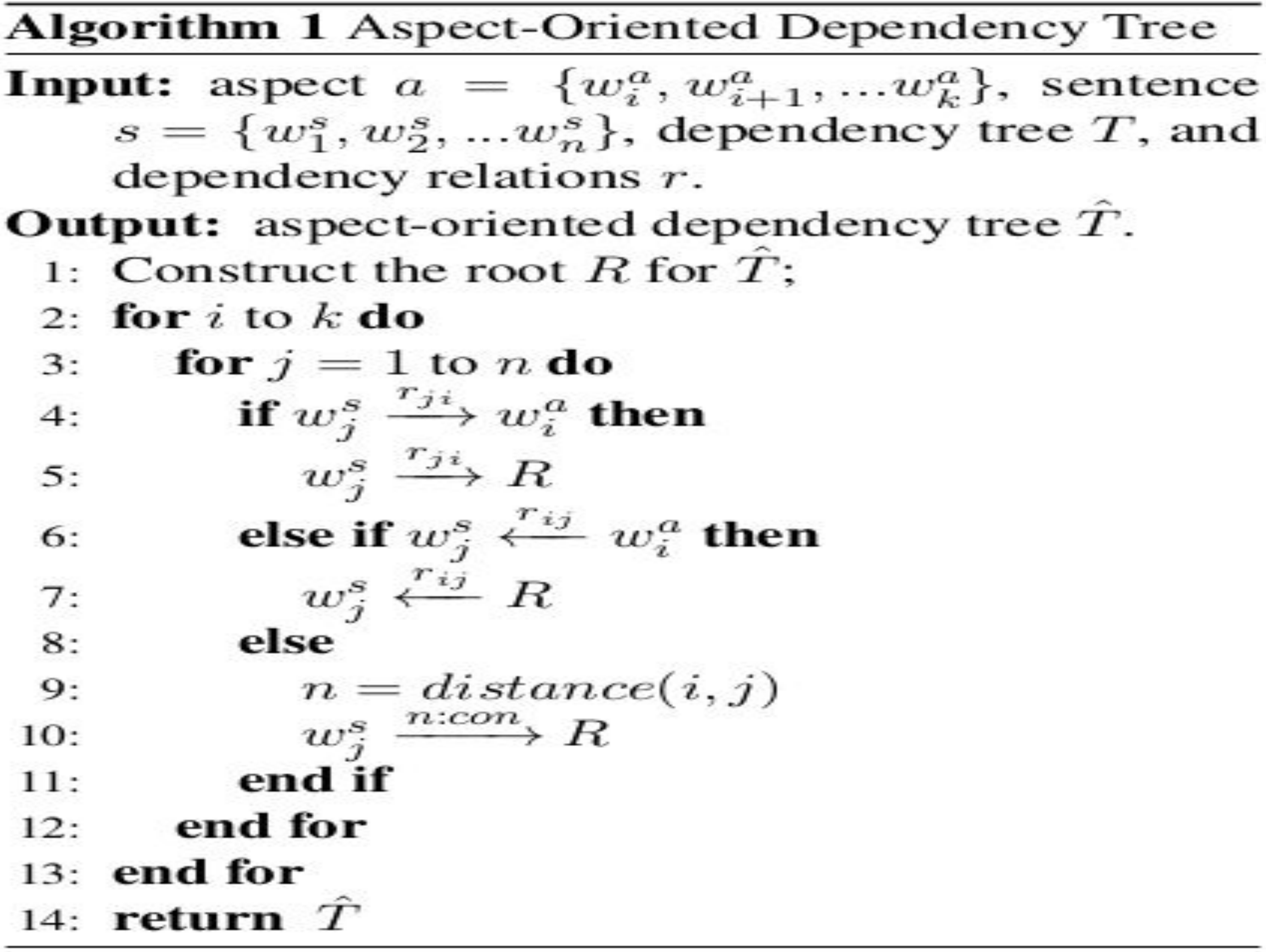
Shortcomings of these Approaches

- the dependency relations, which may indicate the connections between aspects and opinion words, are ignored.
- empirically, only a small part of the parse tree is related to this task and it is unnecessary to encode the whole tree.
- the encoding process is tree-dependent, making the batch operation inconvenient during optimization.

Aspect, Attention and Syntax

- Intuitively, connecting aspects with their respective opinion words lies at the heart of ABSA.
- Most recent efforts (Wang et al., 2016b; Li et al.,2017; Ma et al., 2017; Fan et al., 2018) resort to assorted attention mechanisms to achieve this goal and have reported appealing results.
- However, due to the complexity of language morphology and syntax, these mechanisms fail occasionally.


root
advmod
dobj
nsubj
det
I like the [recipe]$_{pos}$ here.
0.00 0.98 0.01 0.01 0.00
(a)
root
prep
amod
nsubj
det
dobj
pobj
cc
The [recipe]$_{neu}$ includes some Chinese food like dumplings.
0.00 0.01 0.01 0.00 0.00 0.00 0.97 0.01
(b)
root
conj
nsubj
cc
cop
conj
nsubj
det
advmod
cc
det
cop
The [falafel]$_{neg}$ was over cooked and dried but the [chicken]$_{pos}$ was fine.
0.00 0.00 0.00 0.01 0.00 0.00 0.27 0.71 0.01 0.00 0.00 0.00
(c)



Algorithm 1 Aspect-Oriented Dependency Tree

```
Input: aspect $a = \{w_i^a, w_{i+1}^a, ...w_k^a\}$, sentence
    $s = \{w_1^s, w_2^s, ...w_n^s\}$, dependency tree $T$, and
    dependency relations $r$.
Output: aspect-oriented dependency tree $\hat{T}$.
Construct the root $R$ for $\hat{T}$;
for $i$ to $k$ do
    for $j = 1$ to $n$ do
        if $w_j^s \xrightarrow{r_{ji}} w_i^a$ then
            $w_j^s \xrightarrow{r_{ji}} R$
        else if $w_j^s \xleftarrow{r_{ij}} w_i^a$ then
            $w_j^s \xleftarrow{r_{ij}} R$
        else
            $n = distance(i, j)$
            $w_j^s \xrightarrow{n:con} R$
        end if
    end for
end for
return $\hat{T}$
```

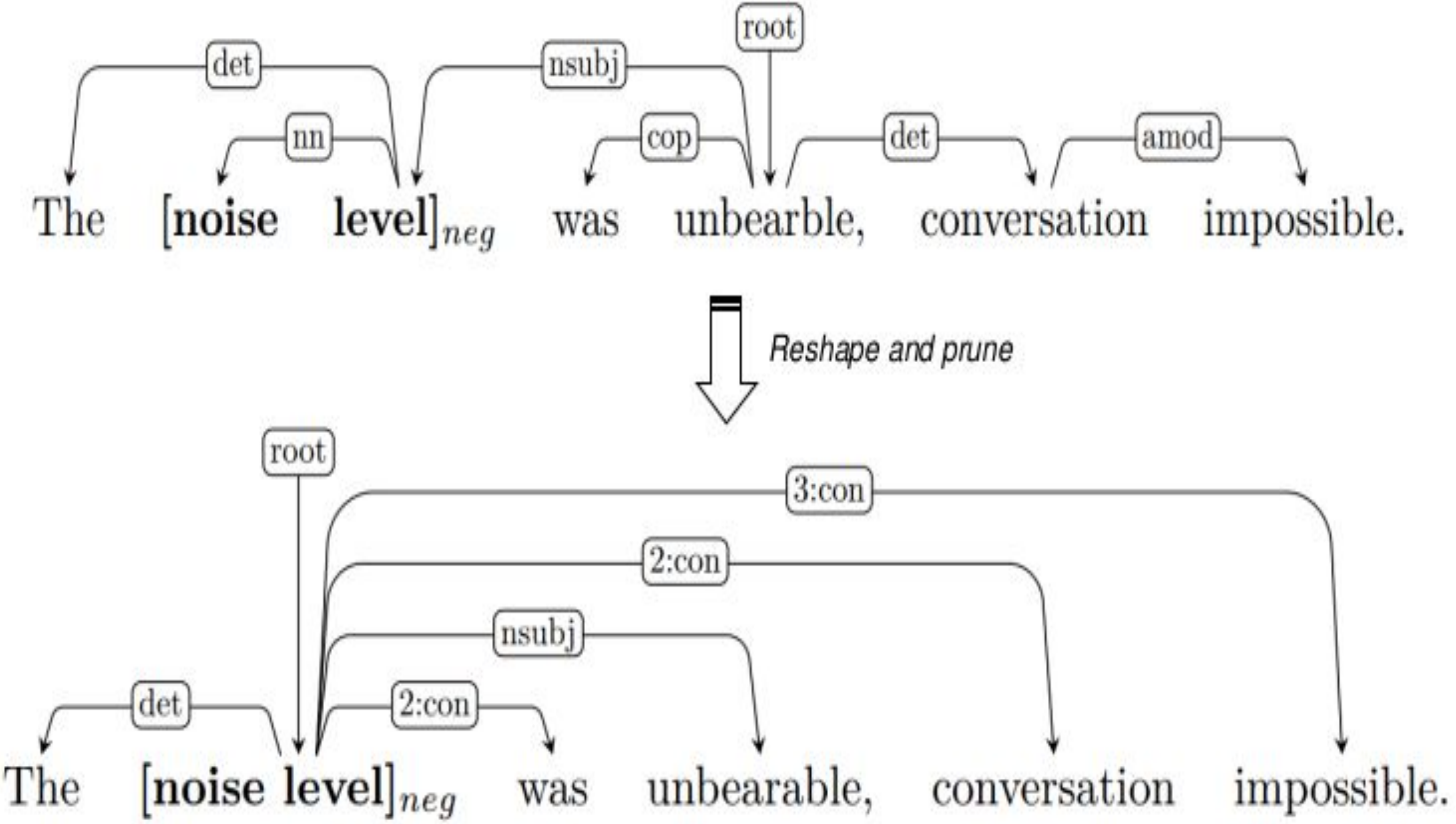

root
det
nn
nsubj
cop
det
amod
The [noise level]$_{neg}$ was unbearble, conversation impossible.
Reshape and prune
root
3:con
2:con
nsubj
det
2:con
The [noise level]$_{neg}$ was unbearable, conversation impossible.

Figure 2: Construction of an aspect-oriented dependency tree (bottom) from an ordinary dependency tree (top).

Thank You!