Sequential Convolutional Neural Network for Opinion Target Extraction

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Task Description

"The food was delicious"

"The pizza was great and the service was attentive"

"Awesome decoration but the price was too expensive"

Task Description

"The **food** was delicious"

"The **pizza** was great and the **service** was attentive"

"Awesome **decoration** but the **price** was too expensive"

DataSet

SemEval-2015: Task 12: Aspect Based Sentiment Analysis

Restaurant Domain	Training	Test
Reviews	254	96
Sentences	1315	685
Opinion Target Expression	1654	845

Preprocessing

```xml
<sentence id="1004293:3">
    <text>The food was lousy — too sweet or too salty and the portions tiny.</text>
    <Opinions>
        <Opinion target="food" category="FOOD#QUALITY" polarity="negative" from="4" to="8"/>
        <Opinion target="portions" category="FOOD#STYLE_OPTIONS" polarity="negative" from="52"
            to="60"/>
    </Opinions>
</sentence>
<sentence id="1004293:4">
    <text>After all that, they complained to me about the small tip.</text>
    <Opinions>
        <Opinion target="NULL" category="SERVICE#GENERAL" polarity="negative" from="0" to="0"/>
    </Opinions>
</sentence>
```

Data Format

Apply IOB-2 Format -> Really Good for Sequential Labelling Tasks

Review   [

    Sentence [(The, O) (food, B) (was, O) (delicious, O)]

    Sentence [(The, O) (live, B) (music, I) (was, O) (awesome, O) (too, O)]

       ]

Sliding Window

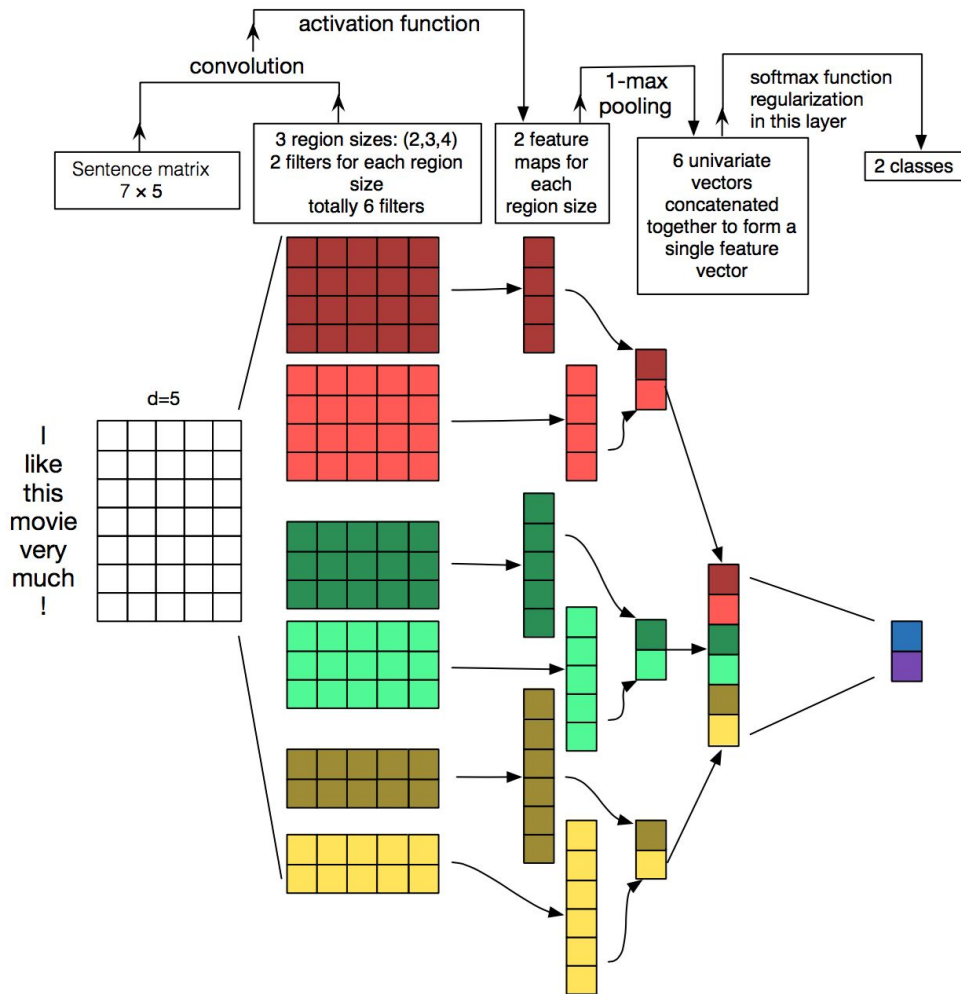Using Context Words to predict whether the word in the middle is an OTE

PADDING	O	B	O	O	PADDING
""	The	food			
	The	food	was		
		food	was	delicious	
			was	delicious	""

Model

Convolutional Neural Network with the following layers

1) Word Embedding
2) Convolutions
3) Max-pooling
4) Dropout
5) Output

Model

Hyperparameters

Hyperparameters	Description
Embedding Dimension	The dimension of the vectors coming from word2vec
Filter Sizes	Defines the dimension of the filters.
Filter Amount	Number of filters per size
Dropout Probability	Percentage of cells to be kept for the classification
Word Context	Number of past and future words to be taken as the context

Experiments

Word Context	Filters	Filter Amount	Precision	Recall	F1
1	[1,2]	50	0.535	0.549	0.542
1	[2,3]	100	0.613	0.57	**0.595**
2	[3,4]	100	0.656	0.42	**0.594**
2	[1,2,3,4,5]	100	0.602	0.570	0.586
3	[1,2,3,4,5,6,7]	100	0.595	0.539	0.566
3	[1,2,3,4]	50	0.519	0.435	0.474
3	[6,7]	100	0.59	0.555	0.572

Comparison with the Official Results

Team	F1
IHS-RD	63.12
Lsislif	62.22
NLANGPL	61.49
Our Model	**59.59**

Team	F1
wnlp	57.63
UMDuluthC	50.36
UMDuluthT	50.36
CU-BDDA	36.01

Future Work

1) **Add more features to the input:** frequency name lists, word clustering, name lists extracted from external resources

2) **Input Overlapping:** weighted word embedding with respect to the word in the middle

3) **Used pre-trained word embedding:** GloVe and Google word2vec