A Lexicon Based Approach to Detect Extreme Sentiments

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    • Natural Language Processing.
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  – Current Research Project
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    • Artificial Intelligence.
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  – Current Research Project
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Outline

• Introduction
• Proposal
• Approach
• Experimental Setup
• Results
• Discussion
• Conclusion
• Future Work
Introduction

• Extreme sentiment analysis is to detect and classify extreme sentiment(s):
  
  – represent(s) the most negative and positive sentiments.

• An extreme sentiment is the worst or the best view, judgment, or appraisal formed in one’s mind about a particular matter or people.
Proposal

• An interesting unsupervised and language-independent approach for detecting people’s extreme sentiments on social platforms.

• Analyze two standard corpora:
  – SENTIWORDNET 3.0.
  – SenticNet 5.

• Extract extreme words having a high negative and positive polarity, reflecting people’s extreme sentiments.
Approach

• Design and develop a prototype system called Extreme Sentiment Analyzer (ESA) composed of two different components:
  – Extreme Sentiment Generator (ESG).
  – Extreme Sentiment Classifier (ESC).

• ESG is based on statistical methods.

• Apply it on SENTIWORDNET 3.0 and SenticNet 5 to generate a standard lexical resource known as ExtremeSentiLex.

• Embed ExtremeSentiLex in the ESC
  – run on the compilation of five different datasets, which are constituted of social network and media posts.
Extreme Sentiment Collection Process.
Approach

The approach based upon two steps:

1. Define Extreme Polarity.
2. Generating Extreme Sentiment Lexicon.
Approach:

1. Define Extreme Polarity

- Develop a python application “Extreme Sentiment Generator (ESG):
  - Calculate the average and standard deviation of terms from the original lexical resources,
  - Filter and save it into a new lexical resource.

- Define two conditions in ESG:

  \[
  \text{if } T_p > \text{Average} + \text{StandardDeviation} \text{ then }
  \text{The term is classified as Extreme Positive}
  \]

  \[
  \text{end if}
  \]

  \[
  \text{if } T_n < \text{Average} - \text{StandardDeviation} \text{ then }
  \text{The term is classified as Extreme Negative}
  \]

  \[
  \text{end if}
  \]
Approach:
1. Define Extreme Polarity

- **SENTIWORDNET 3.0**
  - Average for positive terms: 0.366
  - Standard Deviation for positive terms: 0.211
  - Extreme polarity for positive terms: 0.577
  - Average for negative terms: 0.412
  - Standard Deviation for negative terms: 0.230
  - Extreme polarity for negative terms: 0.642

- **For Example:**
  - SENTIWORDNET 3.0 terms generated by ESG:
  - ultrasonic 0.375 (non positive extreme)
  - selfless 0.875 (positive extreme)
  - thrash 0.125 (non negative extreme)
  - abduction 1 (negative extreme)
Approach: 1. Define Extreme Polarity

- **Senticnet 5**
  - Average for positive terms: 0.504.
  - Standard Deviation for positive terms: 0.362.
  - Extreme polarity for positive terms: 0.866.
  - Average for negative terms: -0.616.
  - Standard Deviation for negative terms: 0.306.
  - Extreme polarity for positive terms: -0.922.

- **Example:**
  - grace 0.79 (positive non extreme).
  - pioneer 0.97 (positive extreme).
  - anemic -0.918 (negative non extreme).
  - traffic -0.97 (negative extreme).
2. Generate Extreme Sentiments Lexicon

- Merge both files obtained from SENTIWORDNET 3.0 and SenticNet 5 terms stored in CSV files.
- Example:

<table>
<thead>
<tr>
<th>Term</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absolutely</td>
<td>+0.88</td>
</tr>
<tr>
<td>Accept</td>
<td>+0.93</td>
</tr>
<tr>
<td>Acknowledgeable</td>
<td>+0.95</td>
</tr>
<tr>
<td>Acne</td>
<td>-0.96</td>
</tr>
</tbody>
</table>
Experimental Setup

Performance testing of Extreme Sentiment Classifier
Experimental Setup

- Develop **Extreme Sentiment Classifier (ESC)** having **ExtremeSentiLex** embed in it.
- We perform the experiments five datasets:
  - TurnToIslam.
  - Ansar1.
  - RT-Polaritydata
  - T4SA.
  - Sentiment 140.
- We use **confusion matrix** to analyze the performance computing:
  - Recall.
  - Precision.
  - Accuracy.
  - F1-score.
# Results

<table>
<thead>
<tr>
<th></th>
<th>RT-polarity</th>
<th>Sentiment 140</th>
<th>T4SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recall EP</td>
<td>91%</td>
<td>95%</td>
<td>98%</td>
</tr>
<tr>
<td>Recall EN</td>
<td>21%</td>
<td>50%</td>
<td>45%</td>
</tr>
<tr>
<td>Precision EP</td>
<td>59%</td>
<td>65%</td>
<td>89%</td>
</tr>
<tr>
<td>Precision EN</td>
<td>65%</td>
<td>92%</td>
<td>86%</td>
</tr>
<tr>
<td>F1 score EP</td>
<td>72%</td>
<td>77%</td>
<td>93%</td>
</tr>
<tr>
<td>F1 score EN</td>
<td>32%</td>
<td>65%</td>
<td>59%</td>
</tr>
<tr>
<td>Accuracy</td>
<td>60%</td>
<td>72%</td>
<td>89%</td>
</tr>
</tbody>
</table>

Table: Indicators Of System Efficiency
Discussion

- The overall status of acquired results are quite satisfactory.
- In some evaluation measures, for certain datasets, we have more than 90%.
- The results of Sentiment 140 and T4SA are really prominent, where none of the values is less than 45%.
- RT-polarity, there appear some low values on negative terms, i.e., recall and F1 score for EN.
- The measure of accuracy for all data resources is equal to or greater than 60%:
  - indicating the overall performance of the approach is better.
- The calculation of recall, precision, f1 score and accuracy for Ansar1 and TurntoIslam is not performed:
  - Since these datasets are directly referred to as ‘Correction of common misconceptions about Islam’.
  - There is a possibility of radical participants may occasionally show their support for extremist fundamentalist militant groups.
Conclusion

• Presented an unsupervised and language-independent approach for people’s extreme sentiments detection on social media platforms.

• Our approach is based upon:
  – Defining extreme polarity for terms.
  – Generating extreme sentiments lexicon by relying upon two standard lexical resources:
    • SENTIWORDNET 3.0 and SenticNet 5.

• Experimented with five different social networks and media data.

• We provided a standard lexicon:
  – Useful other researchers to exploit it for sentiment analysis studies as well
  – Antiextremism authorities to identify people’s extreme sentiments
    • On social networks and can prevent violent extremism.
THANK YOU