Identifying Controversial Topics in Largescale Social Media Data

Master's Thesis

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31.03.2016

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Outline

Introduction











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Introduction

Controversies and the Web

Controversy

A state of prolonged public dispute or debate, usually concerning a matter of conflicting opinion or point of view^a

^ahttps://en.wikipedia.org/wiki/Controversy

Controversies on the web

- The web: a platform to express opinions or point of views
- A place to identify controversies.

Effects of Controversies

- Facilitates productive debates
- Provides balanced view about a topic
- Can lead to tension and conflict

Why detect controversies

- Avoid or detect tension and conflict
- Used by search engines in meeting users information need

Manual Controversy Detection Challenges

- The size of the web
- The diversity of the web
- The dynamic nature of the web
- The context and scope of controversy

Automatic Controversy Detection : Related Work

- Controversy Ranked Models [Vuong et al 2008]
 - Domain: Wikipedia
 - Objective: Detect if a page is controversial

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 - Objective: Ranking of how controversial a discussion is

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 - Domain: Twitter
 - Objective: Ranking of how controversial a discussion is
- Fine grained [Bykau et al 2015]
 - Domain: Wikipedia
 - Objective: What, Where, When, Who

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Objectives Research Questions

- How easily identifiable are controversies in a large domain?
- How early can these controversies be detected?
- How effective are the known controversial measures in detecting controversies?





Election 2016 How I see the US presidential election as a nerd. (imgur.com) submitted 10 days ago by bawbrosss ③ 4449 comments share

top 200 comments show 500

sorted by: best **v**

🔶 [-] Joal0503 3306 points 10 days ago

🔸 ted cruz as "The Penguin"

permalink



🔸 I was about to Photoshop that up, and I just decided to do a google search: http://i.imgur.com/2pDjZcL.jpg

permalink parent

[-] DMann420 1141 points 10 days ago

Well that's convenient.

permalink parent

🔶 [-] wnbaloll 526 points 10 days ago

🕨 Internet has done it again

permalink parent

- 🔶 [-] d_haven 420 points 10 days ago
- 🕈 Great job everyone! Let's go home.



Reddit Dataset





196.5M submissions & 1.7B July, 2006 to May, 2015 comments



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Reddit

Reddit Representation

- A page p = (s, c, t). Where
 - s is the page submission
 - c, the comments associated with the submission
 - t, the time the submission was created
- A page is controversial if it has at least one controversial comment
 - Using the the controversiality field of comments metadata
- Equal number of controversial and non-controversial pages
 - Balanced across subreddit and time

Reddit

Dataset Balancing

| Pages | Pages <i>n</i> ₁₁ . |
|-----------------|-----------------------------------|
| n ₁₁ | n ₁₁ |
| · · | |
| | |
| | • |
| • | • |
| n _{1j} | n _{1j} |
| • | |
| • | |
| • | • |
| n _{ii} | n _{ii} |
| | |
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| D | nii |
| | |

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Supervised Learning Problem

 Label data as controversial or not



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Supervised Learning Problem

- Label data as controversial or not
- Learn from examples from the past
 - Training set



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- Make predictions on recent data
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Approach Feature Engineering

Structural Features

• Linguistic Features

Sentiment Features

• Age Dependent Features

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Feature Engineering

Structural Features

- Features derived from the composition of the data
- Mainly from the metadata of the dataset
- Examples: number of comments, depth of comments, average timestamp of comments etc.
- Linguistic Features

Sentiment Features

• Age Dependent Features

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 - Describes the text content of the entire page.
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- Age Dependent Features
 - Takes advantage of the age of the page
 - Examples: comments per age etc

Experiments Overview

- Time Independent Experiments
 - Training Set: All comments of the page
 - Test Set: All comments of the page

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- Hybrid Experiments
 - Training Set: All comments of the page
 - **Test Set:** Only comments of the page at specified age of the page

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Evaluation Metrics

• Precision =
$$\frac{TP}{TP+FP}$$

• Recall = $\frac{TP}{TP+FN}$
• F-Score = $2 \cdot \frac{precision+recall}{precision\cdot recall}$

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Experiment Results

Table: Time Independent Experiment Test Data Result

| Metric | Value |
|-----------------------|-------|
| % Correctly Predicted | 75.4 |
| Precision | 0.84 |
| Recall | 0.63 |
| F-Score | 0.72 |

Objective

• How easily identifiable are controversies in a large domain?

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Experiment Results



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Experiment Results



Objective

• Effect of incomplete information in classification.

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Experiment Results

Table: Features Information Gain Ranking of highest ranked features in each Feature Family

| Features | Family | Info Gain | Rank |
|-----------------------|---------------|-----------|------|
| numOfComments | Structural | 0.422 | 1st |
| maximumNumOfComments- | Age Dependent | 0.399 | 2nd |
| InTimeSequences | | | |
| controversialMix | Sentiment | 0.371 | 4th |
| percentageOfQuestions | Linguistic | 0.325 | 9th |

Objective

• How effective are the known controversial measures in detecting controversial topics?

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Experiment Results

Table: Features Information Gain Ranking of lowest ranked features in each Feature Family

| Features | Family | Info Gain | Rank |
|------------------------|---------------|-----------|------|
| numOfGildes | Structural | 0.001 | 32nd |
| percentageOfSarcastics | Linguistic | 0.026 | 28th |
| commentsPerAge | Age Dependent | 0.063 | 27th |
| contradictionScore | Sentiment | 0.216 | 18th |

Objective

• How effective are the known controversy detection measures

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• A balanced social media dataset that can be used for research.

Image: A matrix

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- A balanced social media dataset that can be used for research.
- Knowledge about how early controversies can be detected.
 - ▶ Controversy can be detected within 0.3 days (7 hours 12 minutes)

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- A balanced social media dataset that can be used for research.
- Knowledge about how early controversies can be detected.
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 - Lower percentage of page correctly classified for the first two days

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- A balanced social media dataset that can be used for research.
- Knowledge about how early controversies can be detected.
 - Controversy can be detected within 0.3 days (7 hours 12 minutes)
- Effect of incomplete information in classification.
 - Lower percentage of page correctly classified for the first two days
- Performance of known controversy detection measures.
 - Sentiment Features: a good measure of controversy
 - Age Dependent Features: a good measure for data with incomplete information



- Effective way of topic extraction
- Feature Engineering: Development of more features

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Thank You