Determining Credibility in the News: Do We Need to Read?

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Outline

Introduction
Methodology
Results
Conclusions
In 2016, the prevalence of political fact abuse – promulgated by the words of two polarizing presidential candidates and their passionate supporters – gave rise to a spreading of fake news with unprecedented impunity.

Fake news: Hillary Clinton is running a child sex ring out of a pizza shop.

Fake news: Democrats want to impose Islamic law in Florida.

Fake news: Thousands of people at a Donald Trump rally in Manhattan chanted, "We hate Muslims, we hate blacks, we want our great country back."

None of those stories – and there are so many more like them – is remotely true.
Fake News and the Modern Web

- **Motive**: Clickbait revenue streams and political campaign funding incentivizes low quality articles to attract readers
- **Means**: The democratization of online media allows anyone to setup a website and publish unadjudicated content
- **Opportunity**: Social media provides huge platforms for attracting clicks
Our Approach

“Structural Method”
Probabilistic inference using a domain (publisher) web link network

“Content Model”
Traditional supervised learning classifiers using textual features

“Bias Detection”
Class label denotes political ideology

“Credibility Assessment”
Class label denotes source reputation
Humans can pick up on nuanced but powerful signals of bias in terms of *semantics*, *sentiment* (*tone*) and *content*.
Figure 1: Content Model Pipeline
Oprah Stokes 2020 Rumors with Tweet: ‘Thanks for Your Vote’

September 29, 2017

Could the United States go from a reality TV president to a daytime TV president? If Oprah Winfrey’s recent Twitter activity is any indication, it’s at least a possibility.

The former queen of daytime television ignited rumors of a presidential bid after tweeting out a New York Post article that calls her the “Democrats’ best hope” to beat President Donald Trump in 2020.

“What’s your VOTE of confidence? Winfrey added, tagging the author of the piece:

Oprah Winfrey
@Oprah
@jpodhoretz Thanks for your VOTE of confidence! Democrats’ best hope for 2020: Oprah! New York Post
nypost.com/2017/09/27/dem…
8:49 PM - Sep 28, 2017

Democrats’ best hope for 2020: Oprah
On Sunday night’s “60 Minutes,” a panel of Michigan voters spent 20 minutes discussing their political differences on screen. It was a moving
When words are not enough...

Source: HillaryDaily.com

- New Book Reveals That Obama Pushed Hillary to Concede in 2016 Election
- 2016 Democratic Presidential Candidate Blasts Media for Being Against Trump “Right from the Beginning”
- Michelle Obama: If I Ran Against Trump I Would Have Beaten Him Easily!
- Kellyanne Conway Shuts Chelsea Clinton Down: “You Lost the Election”
- Former President Obama Spotted Partying in Caribbean with Billionaire
- Trump Admin Says Pakistan May Be Next Country He Includes in Ban
Figure 2: Structural Method Pipeline
### Structural Method: Graph Creation

<table>
<thead>
<tr>
<th>HTML Tag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>&lt;a&gt;</code></td>
<td>Mutually linked sites (text content)</td>
</tr>
<tr>
<td><code>&lt;link&gt;</code></td>
<td>Shared CSS (visual style)</td>
</tr>
<tr>
<td><code>&lt;script&gt;</code></td>
<td>Shared JavaScript files (user interaction)</td>
</tr>
<tr>
<td><code>&lt;img&gt;</code></td>
<td>Common images, logos, or icons (visual content)</td>
</tr>
</tbody>
</table>

**Table 1:** Link Types used in Graph Construction

- An undirected and unweighted graph was constructed using link structure from 19,786 domains (nodes) with 32,632 links (edges)
BP is an iterative semisupervised method based on:

- **Node potential:** \( \phi(x_i) \) "a priori belief of node \( i \)'s assignment"
- **Edge potential:** \( \psi(x_i, x_j) \)
  "probability node \( j \) in class \( x_j \) given node \( i \) in class \( x_i \)"

\[
\begin{array}{ccc}
\psi_{ij}(x_i, x_j) & x_i & x_j \\
& x_i & 1-\epsilon & \epsilon \\
& x_j & \epsilon & 1-\epsilon \\
\end{array}
\]

- **Nodes pass messages:** \( m_{ij}(x_j) \) "node \( i \)'s belief about node \( j \) belonging to class \( x_i \)"

\[
m_{ij}(x_j) \leftarrow \sum_{x_i \epsilon X} \phi(x_i) \psi_{ij}(x_i, x_j) \prod_{k \epsilon N(i)/j} m_{ki}(x_i)
\]

- **Compute Posterior:** \( b_i(x_i) \)

\[
b_i(x_i) b_i(x_i) = k \phi(x_i) \prod_{x_j \epsilon N(i)} m_{ji}(x_i)
\]
Experiments: The GDELT Database

Contains events extracted from online news sources and includes:

- two actors
- the action
- source url
- geographic information
- temporal information

We augment GDELT with text and links from news sources
Experiments: Media Bias Fact Check

Figure 3: Volunteer run fact checking site mediabiasfactcheck.com

- Rubric based ratings for domains for 4 categories:
  - Biased wording/headlines
  - Factual/Sourcing
  - Story Choices
  - Political Affiliation/Endorsement

- Labels are converted to binary labels for classification
Results

- Content problem used textual information from 124,300 articles from 242 domains
- Structural problem used link information from 19,786 domains (nodes) and 32,632 links (edges)

<table>
<thead>
<tr>
<th></th>
<th>Bias</th>
<th>Credibility</th>
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<tbody>
<tr>
<td>Model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td>0.926</td>
<td>0.358</td>
</tr>
<tr>
<td>Structure</td>
<td>0.931</td>
<td>0.889</td>
</tr>
</tbody>
</table>

**Table 2:** Test Set AUC for Bias and Credibility problems. While content is sufficient to detect bias, structure is required to detect fake news.
Conclusions

• We can discover and combat propaganda with structural analysis of the web, which leverages informative features ignored in linguistic models.

• Text based models are less effective for credibility because of changing topics of fake news.

• Future research should focus on:
  • Combining article link structure with traditional NLP textual features.
  • Current method is vulnerable to large connected components without any labels.
  • Extracting links from the text "according to AP"