Folksonomication
Predicting Tags for Movies from Plot Synopses using Emotion Flow Encoded Neural Networks

Sudipta Kar*, Suraj Maharjan, Thamar Solorio
Department of Computer Science
University of Houston
FOLKSONOMY

Social Classification

Social Tagging

Social Indexing

Collaborative Tagging

Thomas Vander Wal (2005)
TAGS FOR MOVIES

- comedy
- prank
- romantic
- flashback
- entertaining
- fantasy
- murder
- cult
- violence
- horror
FOLKSONOMICATION ...

- Create tags from synopsis
- What is in the movie? How would I feel watching?
- Emotion flow encoded neural network
- Learns ~18% more tags than feature based system
OH REALLY

TELL ME ABOUT DATA
**MPST**: A corpus of movie plot synopses with tags. (Kar et al., 2018)
MODEL ARCHITECTURE

Textual Representation

Flow of Emotions

Feedforward Module
TEXTUAL FEATURES USING CNNs

Maxpool

1024 Kernels. Length 2 to 5

Synopses to sequence of word vectors

Left Padding with 0

Sequence Length 1,500

Vocabulary Size 5,000

Random and Fasttext
I am getting emotional !!!
“Stories have shapes which can be drawn on graph paper.”

Harry Potter and the Deathly Hallows
by J.K. Rowling

* Illustration of Kurt Vonnegut: Kathryn Rathke

* The emotional arcs of stories are dominated by six basic shapes (AJ Reagan et al., 2016)
EMOTIONS IN MOVIE

Tracking flow of emotions in the synopses

Joy
winner, love, bridesmaid, kiss, shopping

Trust
wonderful, perfect, real, mother, inspired, defended

Sadness
homeless, lie, debt, upset

Anger
Stolen, hot, horrible, insulting

Fear
nervous, avoid, homeless, war, danger

Disgust
sick, horrible, lie, thrift, furious, homeless

* Crowdsourcing a word-emotion association lexicon. (Mohammad et al., 2013)
CAPTURING FLOW OF EMOTIONS

Anger, Fear, Joy, Anticipation, Trust, Surprise, Sadness, Disgust, Positive, Negative

Synopsis into \( N \) Segments

Bidirectional LSTM: 16 Units

\( \% \) of Words of Different Emotions

Equal Sized Segments (word)

\( N = 20 \)

Vector Dim. 20 x 10
FEEDFORWARD MODULE

Top N (3, 5) tags selected based on their probability values in the output layer

Softmax

40% Dropout

Class Weight

\[ CW_t = \frac{|I|}{(|T| \times M_t)} \]

Textual Features

Emotion Features
TRAINING

**LOSS**
KL Divergence

**OPTIMIZER**
RMSProp

**LEARNING RATE**
1e^{-4}

**VALIDATION**
20% of Train Data

**BATCH SIZE**
32

**CHECKPOINT**
Micro F1
EVALUATION

Predict 3, 5, 10 tags

METRICS
- Tags Learned
- Micro F1
- Tag Recall

BASELINES
- Majority
- Random
- FEATURES (MPST)
## RESULTS (TOP 5 TAGS)

<table>
<thead>
<tr>
<th></th>
<th>Tags Learned</th>
<th>Micro F1</th>
<th>Tag Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline: Most Frequent</td>
<td>5</td>
<td>28.4</td>
<td>14.08</td>
</tr>
<tr>
<td>Baseline: Random</td>
<td>71</td>
<td>6.4</td>
<td>15.04</td>
</tr>
<tr>
<td>Baseline: Features</td>
<td>52</td>
<td>37.3</td>
<td>16.77</td>
</tr>
<tr>
<td>CNN</td>
<td>26</td>
<td>36.7</td>
<td>12.62</td>
</tr>
<tr>
<td>CNN with Class weights</td>
<td>55</td>
<td>35.7</td>
<td>14.94</td>
</tr>
<tr>
<td>CNN + Flow of Emotions</td>
<td>65</td>
<td>36.7</td>
<td>14.11</td>
</tr>
</tbody>
</table>
LETS TRY SOME MOVIES

- Matrix: thought-provoking, action, sci-fi, suspenseful, mystery
- Beyond: action, good versus evil, suspenseful, humor, thought-provoking
- Luther: Christian film, murder, intrigue, melodrama, romantic
- American Pie: adult comedy, cute, feel-good, prank, entertaining

* True Positive, False Positive
INCOMPLETENESS IS HURTING!!!

christian film, murder, intrigue, melodrama, romantic

murder, romantic, violence

Storyline

Biography of Martin Luther, the 16th-century priest who led the Christian Reformation and opened up new possibilities in exploration of faith. The film begins with his vow to become a monk, and continues through his struggles to reconcile his desire for sanctification with his increasing abhorrence of the corruption and hypocrisy pervading the Church's hierarchy. He is ultimately charged with heresy and must confront the ruling cardinals and princes, urging them to make the Scriptures available to the common believer and lead the Church toward faith through justice and righteousness. Written by scgary66

* https://www.christianfilmdatabase.com/review/luther-2
HOW EMOTION FLOW IS HELPING?

- absurd
- dark
- realism
- cruelty
- autobiographical
- thought-provoking
- claustrophobic
- philosophical

![Graphs showing emotion flow in Arthur and Messiah of Evil](chart.png)
LEARNING OR COPYING?

~3K test movies :: 14,830 predicted tags :: 11.8% in plot

~11K training movies :: 9,022 ground truth tags :: 12.7% in plot

is_tag && in_synopses:
- horror
- violence
- historical

is_tag && not in_synopses:
- thought-provoking
- feel-good
- suspenseful

Having tags in synopses != crime. They have value.
Model is learning !!!
DIFFERENT BOTTLES, SAME WINE

SCRIPT = DETAIL

PLOT SYNOPSIS = SUMMARY

STORY = SAME

80 Scripts (Scriptbase)

<table>
<thead>
<tr>
<th></th>
<th>Tags Learned</th>
<th>Micro F1</th>
<th>Tag Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scripts</td>
<td>55</td>
<td>35.7</td>
<td>14.94</td>
</tr>
<tr>
<td>Synopses</td>
<td>65</td>
<td>36.7</td>
<td>14.11</td>
</tr>
</tbody>
</table>

* Movie script summarization as graph-based scene extraction. (Gorinsky et al., 2015)
FUTURE WORK

- Improve Model Performance
- Better Evaluation Approach (Ranking?)
- Human Evaluation of Model Predictions
- How Experiences are Created in Stories?
THANK YOU

Live Demo:

Try the online demo!

Source is available

ritual.uh.edu/folksonomication-2018

Acknowledgement
THANK YOU

Live Demo:

Try the online demo!

Source is available

ritual.uh.edu/folksonomication-2018

Acknowledgement