

Memotion Analysis : Automatic processing of Internet Memes

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Memotion Analysis:

- Automatic processing of internet memes for leveraging meme emotions.

Specific intend for detection of offensive memes :To avoid malicious users upload something abusive to torment or disturb people.

Need for Meme Emotion Analysis:

- 1 Detection of offensive Meme requires both visual cue and language understanding making them complex to model.
- 2 No finegrained approach currently existing to distinguish a meme is offensive or humorous.
- 3 Future exploration on finding differences between Textual and Non-Textual memes on the notion of prominence in sentiment analysis.

Memotion Analysis on Multimodal Social media text:

A meme is an idea, behavior, or style that spreads from person to person within a culture often with the aim of conveying a particular phenomenon, theme, or meaning represented by the meme.

Challenges in processing Internet Memes:

- A meme is uniquely multimodal because a meme consists of both textual representation and visual representation.
- Emotion Semantic Image Retrieval(ESIR) with affective gap making the low-level image features extrapolate the high-level semantics.
- Replication and mutation of memes.
- Challenges on OCR compound as the number of potential fonts, languages, lexicons and other special characters increases.

Automatic Processing of Internet Memes:

- Detection of offensive content on online social media is an ongoing struggle due to voluminous data collected from various sites like Twitter, Facebook, Flickr.
- Prevalance of hate speech in social media gives a great societal responsibility for many social media companies to plan well ahead for mitigation and prevention.
- Detection of offensive meme is more complex than detecting offensive text as it involves more of language understanding and cognitive psychology.

Example Memes



Figure 1: A sarcastic and humorous meme on a feminist men. Here, the text is enough to get humor punchline.



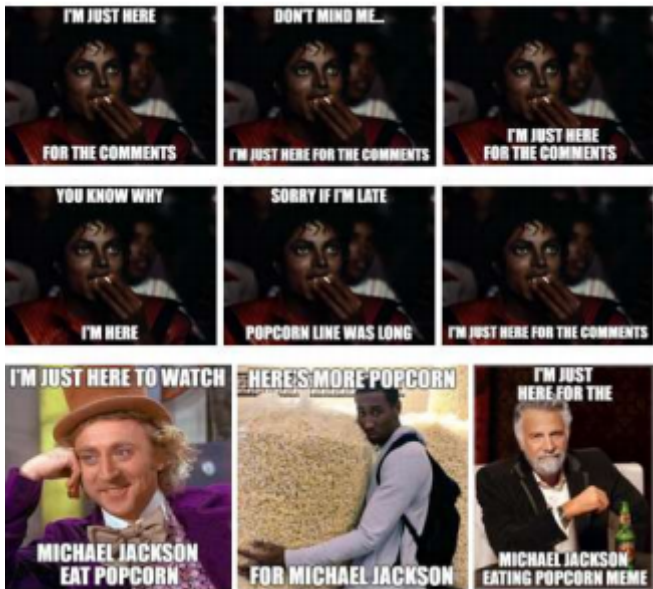
Figure 2: A sarcastic meme on unavailability of Deep Learning based OCR materials on Internet. The extreme shortage of tutorials is conveyed by the man in the meme through the imagery of trying to read a small piece of paper.

When you're at an airport security check and they pull out an Uno reverse card



Figure 3: An offensive meme on woman dressed in Hijab. It is difficult to label this as offensive until one makes the correlation between the biased opinion towards a particular religion and role reversal for the act of frisking.

Meme Replication and Mutation



Mememes typically induce humor and strive to be relatable. Some mememes are directly humorous whereas others go for sarcastic dig at daily life events. Three subtasks varied by the degree of exploration are as follows:

- 1 **Task A - Sentiment Classification:** Given an Internet meme, the first task is to classify it as positive or negative meme. We presume that a meme is not neutral.
- 2 **Task B- Humor Classification:** Given an Internet meme, the system has to identify the type of humor expressed. The categories are sarcastic, humorous, and offensive meme. If a meme does not fall under any of these categories, then it is marked as a other meme.
- 3 **Task C- Scales of Semantic Classes:** The third task is to quantify the extent to which a particular effect is being expressed(refer Table 1).

Table 1: Semantic classes for the Memotion Analysis













	sarcastic	humorous	offensive
<i>not</i> (0)			
<i>slightly</i> (1)			
<i>mildly</i> (2)			
<i>very</i> (3)			

Image-based memes as sentiment predictors[1]

Method Used

- Finding correlation between Implied semantic meaning and Textual content (discussions).
- Image based descriptor: Visual predictors like colour, depth and shapes.

Results

- Discrepancy in Word level(WL) and phrase level analysis(PL):
Term: "pixie dust"

WL: "dust" (NEG)

- PL:** Good luck (Meaning-POS)
- Words with incorrect spelling regarded as NEUTRAL.

Dataset Used

Facebook: Public posts and discussion
10 discussion forums
997 unique comments
103 memes
27,260 words.
Random discussions pages containing meme

Advantages

- Uncovering challenges like: Image at initial conversation shows higher correlation score than text.
- More importance to image than text in textual memes.

Shortcomings and Future Work

- Misspelled words have NEUTRAL sentiment.
- Contradicting word-level and phrase level analysis.
- Sentiment dictionaries required addition of colloquial words.

Memetic Engineering to Classify Twitter Lingo[2]

Method Used

- Opinion mining on text meme.
- ML Approach: Multinomial Naïve Bayes Classifier(MNB) or K-Nearest Neighbours(KNN).
- NLP: Text preprocessing using NLTK.

Results

F-Score

- KNN**:
Positive:70.14%
Negative:66.32%
Neutral:66.32%
- MNB**:
Positive:62.29%
Negative:66.32%
Neutral:66.32%
- KNN and MNB proves accurate compared to SVM and Logistic Regression.

Datasets

- 1.Benchmark Dataset:CSV file 1524 tweets labelled :
POS(1)
NEG(-1)
NEUTRAL(0)
- 2.Dynamic Dataset using Twitter API: Tweets gathered for a keyword given by the user.

Advantages

- Efficient sentiment evaluator which can be easily integrated to enterprise applications.
- Small scale focused application easier to understand.
- KNN applicable on small dataset.

Shortcomings and Future Work

- Not multilingual compactible.
- OCR Accuracy not taken into account.
- Visual descriptors not given much attention.

Meme Opinion Categorization by Using Optical Character Recognition (OCR) and Naïve Bayes Algorithm[3]

Method Used

- Opinion Extraction from memes.
- Image Processing and NLP methods to classify meme as positive or negative.
- Tesseract OCR is used to extract text from meme.

Results

- Accuracy of OCR Tesseract is 75%.
- Naïve Bayes algorithm shows fairly good accuracy of 75%.
- Vmap tendency is calculated to find P_{\max} of all categories of documents tested.

Datasets

- Memes collection: Viral memes towards Indonesian Government.
- Total number of memes: 100.
- Train test split: Training Dataset :70 memes. Test Dataset: 30 memes.

Advantages

- Simple approach
- Vmap to find the P_{\max} in order to correctly classify testing memes.

Shortcomings and Future Work

- OCR less accurate: Inability to recognise italics.
- KNN,Neural network can be employed.
- n-gram for enhanced pre-processing.

Rosetta: Large Scale System for Text Detection and Recognition in Images[4]

Method Used

- Rosetta Facebook's scalable OCR system.
- Two stage process: Finding textual region and CNN to recognise text.
- Recognised text stored in TAO for faster search.

Results

- Error rate of 37% still recoverable by changing single character.
- Finetuning with manually annotated corpus increased accuracy by 48.06%
- Random jitter introduced for data augmentation.

Datasets

- COCO-Text: 63,000 images.
- 145,000 text instances.
- Train, Test split: 400k im-ages(training) and 50k images for testing.
- Human rated dataset is also used.

Advantages

- Robust and accurate OCR capable of processing millions of images per day.
- Faster search from TAO for recognised text.
- Adaptive character based recognition.

Shortcomings and Future Work

- Resolution of image increases inference time.
- Case sensitive labelling affected performance.

An image-text consistency driven multimodal sentiment analysis approach for social media[5]

Method

Used

- Visual feature detection using Local Binary Pattern.
- Textual Feature extraction: Continuous bag-of-words or skip-gram.
- Image-text similarity found.

Results

- **F-score:**
- Positive category: 0.87
- Negative category: 0.89
- Adaptive merging of textual features with State-of-art SentiBank for improved accuracy.

Datasets

- Visual Sentiment Ontology:
- Total number of images: 603.
- Topics: 16.
- Train test split: random shuffling.
- Training Dataset : 400 images.
- Test Dataset: 157 images.

Advantages

- Superior performance in Flickr benchmark dataset.
- Use of Adjective-Noun-Pair (ANP): Converting neutral noun into Strong sentiment word.

Shortcomings and Future Work

- SVM modelling unrelated and related data sensitive to outliers.
- ANP difficult due to its abstract nature and high variability.

- The existing approaches have used meme discussion text correlation and 5-pre trained CNN model for extracting top 10 tags from image individually. [1][5].
- Rosetta method of Extraction and pre-processing for additional data set creation can be done for multilingual memotion analysis[4]
- KNN or Naïve Bayes classifier can be used for maximising F-score.[3][2].



- Pre-trained CNN to work on either image or OCR extracted text based on the image-text correlation.
- Increasing working dataset size by using Rosetta Facebook's OCR system to make the system more generic by handling multiple languages.
- KNN approach or Naïve Bayes classifier for opinion extraction to categorise as positive or negative.
- Using ResNet for faster computation.

- 8000 Human Annotated Internet Memes.

Input File: **data.csv** consists of entries:

- Image_name
- Image_URL
- OCR_extracted_text
- Corrected_text
- Humour
- Sarcasm
- Offense
- Motivation
- Overall_sentiment
- Basis_of_classification(text or image)

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THANK YOU