
Exploring Emotions in Online Movie Reviews for Online Browsing

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Abstract

A restaurant review is a reflection of the reviewer's experience and attitude towards the restaurant. The same applies to a review of a new phone or a review on any other online merchandize. Films, however, are created with the intended purpose to evoke an emotional response in the viewer. This emotional response does not necessarily correspond with the viewer's attitude towards the film. Thus, the question we try to address is, would the emotions expressed in a film's online reviews also reflect the emotions elicited during the film? In this work, we take a first step in the investigation of this question, by studying the role of emotions in movie reviews as expressed in a large dataset of millions of online reviews for over 9000 movies, that appeared in IMDb from 1972 to 2015. Our results show that we can extract emotions elicited by the film from its reviews, and create an emotional signature of a film, and of a genre. This is a first step towards an *Emotion-based Film Browser* UI system that will enable users to browse films according to the emotions they evoke.

Author Keywords

Emotions; Emotional signature; Movie reviews.

ACM Classification Keywords

I.2.1 [AI]: Artificial Intelligence]: Applications and Expert Systems.

Introduction

The importance of emotions in films have been long recognized, as well as the demonstrated ability of movies to elicit emotions such as amusement, anger, and more. Effect elicitation, triggered by emotions, was found to be a powerful reason for box office success, and filmmakers use a variety of methods to elicit emotions in their audiences, such as narration, screen-architecture, images, colors, lighting, music, camera angles and characters [2, 8]. Smiths [7] further describes an interplay of emotions between a film and its audience, in the following manner: A film is an invitation to feel in a particular way; however, while the audience can recognize how a film is cueing them to feel, they may either accept it, or reject the invitation by not feeling those emotions. A recent study found that movie goers experience a dynamic set of emotions that is spontaneously evoked when they recall the movie [1].

Given this specific role of emotions in the film industry, and their eliciting effect on film viewers, it is intriguing to see whether this effect further influences the film's reviews. Would the emotions expressed in a film's online reviews also reflect the emotions elicited during the film? Reviews are perceived as the online word-of mouth, and consist of both a numeric rating, and text, in which the reviewer expresses her opinion. Opinions in this form exist for products, services, and films. Film reviews have been researched for their sentiment [9], helpfulness [6, 4, 10], and their predictive power on box office income [5, 3]. Here, we are interested in assessing the role of emotions in film reviews. Which is more dominant, the opinion on the movie, or the emotions the movie elicited in the reviewer? To that end, we study a large dataset of 1.5 million reviews for over 9000 films, obtained from the IMDb movie database site, and try to identify the following. Do emotions expressed in reviews reflect an attitude towards a movie, and hence are predic-

tive of its rating, or else, can we identify an emotional footprint, or emotional signature of a film from its reviews, and even so, of a genre?

Our surprising results are that the reviews reflect also the emotions elicited in a film, and that they create a distinctive emotional signature for it. Moreover, genres also show a clear emotional signature, and genres that are similar in spirit, such as Family and Romance, or Sci (Science Fiction) and Action, show close emotional signatures. Interestingly, the most unique genre, as far as the emotional footprint, is Horror, which is furthest from all other genres in its emotional footprint. Our results show that online movie opinions in the form of reviews, on the IMDb site, express emotions towards the movie, as well as emotions elicited by the movie. This is, to the best of our knowledge, a first step into this area of understanding the emotional footprints of reviews in general, and the movie domain in particular.

This is a first step towards a novel UI system that enables users to browse films according to the emotions they evoke in people.

Data and Methodology

We collected the full review information for 9,666 films released by Hollywood between 1972 and July 2016 to a total of 1,576,656 reviews. We consider only movies released between 2003 and 2014, to account for review volume and validity of temporal information, and after cleaning the data we are left with 717,498 reviews. Each review was then annotated using the NRC lexicon for Plutchik eight emotions, as well as positive and negative sentiment. We then create an emotional vector for each review, termed *emotional signature*, consisting of the eight emotions of the Plutchik's wheel. The vector contains for each emotion the number of times it was expressed in the review, normalized according to the number of total words in the document. We de-

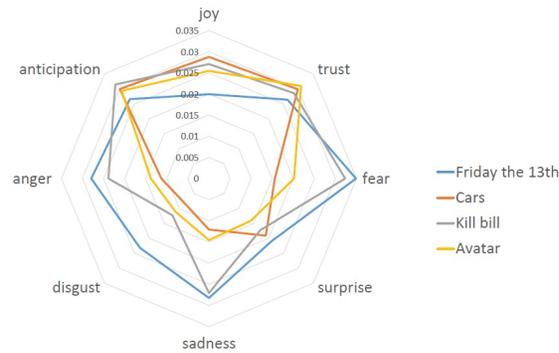


Figure 1: Emotional signature of four selected movies

fine it is $e_n = \frac{e_n^C}{M^C}$, where $e_n, n \in 1..8$ accounts for the eight emotions in the Plutchik wheel, e_n^C is the total number of emotion e_n words in C , and M^C is the total number of words in C , where $C \in \{Review, Film, Genre\}$.

Results

Emotional signature of a movie

We first see whether we can produce a unique emotional signature for a single movie that would be composed of the emotions reported on the movie in its reviews.

Figure 1 shows an example of the emotional signature of four selected movies on a Radar graph organized according to Plutchik’s wheel of emotion (we refer to this kind of graph as a *Plutchik Radar* since this is a Radar chart, however the order of emotions are in sync with Plutchik’s Wheel of emotions). Differences in movies’ emotional signatures can be easily seen. For example, we see that Cars, a family animation movie, is relatively high on Joy and Trust, and low on Anger, Disgust and Sadness. On the other hand, Friday the 13th, a well-known horror film, is high on Sadness, Disgust, Anger and Fear, and low on Joy, Trust and Anticipation. We

can also see that some emotions, such as trust and anticipation, do not distinguish well between these four movies.

Emotional signature of movie genres

In order to see whether emotions in reviews reflect the content of the movie, we compare the emotional signature of different genres. Our assumption is that distinct emotional signatures in different genres imply emotional reflection of reviews that stem from the contents of the movie. We summarize all emotional words from all reviews and all movies belonging to a single genre in each of the 8 Plutchik categories. As the majority of the movies have several genre tags, and these tags were ordered alphabetically rather than by importance, we include a movie in all the genres it was tagged with. Figure 2 shows the Plutchik Radar of four representative genres.

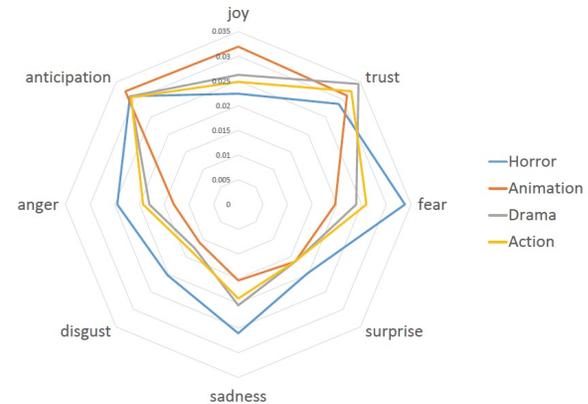


Figure 2: Emotional signature of four selected genres

Joy	Trust	Fear	Surprise	Sadness	Disgust	Anger	Anticip
67.7	31.8	84.9	42.7	69.5	108.4	87.8	31.2

Table 1: Differences (Δ value) between emotions across genres

In order to see the range of values for each emotion across the different genres, we calculated the percentage difference between the maximum and minimum values, V , for each emotion $e_n, n \in 1..8$. As can be seen in Table 1, Disgust, Anger, Joy and Fear show a high percentage difference, while Trust, Surprise, and Anticipation show a low difference.

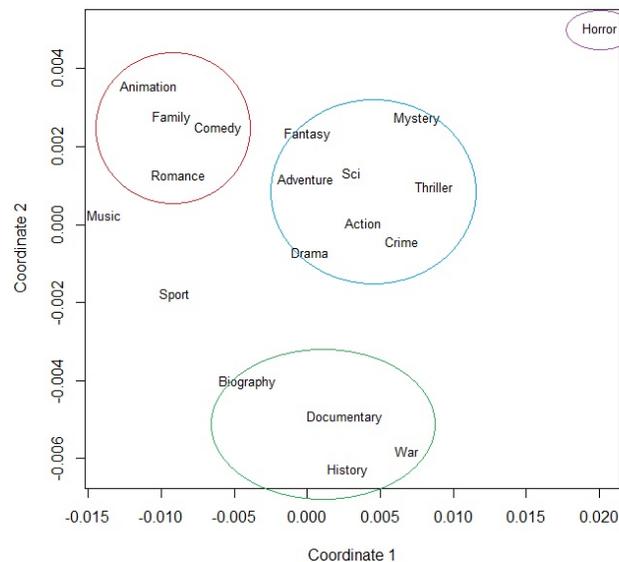


Figure 3: Metric MDS on movie's genres

To further understand the grouping and clustering of genres, we conducted a multi-dimensional scaling (MDS) analysis with the Euclidean distance of the eight emotions as the distance metric between genres. Results of the MDS analysis are presented in Figure 3. It is interesting to note that the relationship between genres (which we remind, stems only from the eight emotion values for each genre), is fairly close to what we perceive from our knowledge about the genres. We further validated the results with

an unsupervised clustering of the genres using K-means, $K \in 2, 3, 5, 10, 15$ (IMDb provided 21 genre labels). When $K = 15$, we get three pairs of genres: Romance and Family; Sci and Action; Thriller and Mystery. When we continue the grouping process, decreasing the number of clusters (K), we see that Adventure and Fantasy join the Sci cluster, while Crime joins the Thriller cluster. Interestingly, the Horror genre remains in a cluster of its own.

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