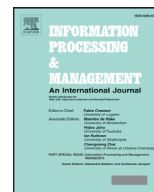


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In the mood for sharing contents: Emotions, personality and interaction styles in the diffusion of news

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ABSTRACT

In this paper, we analyze the influence of Twitter users in sharing news articles that may affect the readers' mood. We collected data of more than 2000 Twitter users who shared news articles from *Corriere.it*, a daily newspaper that provides mood metadata annotated by readers on a voluntary basis. We automatically annotated personality types and communication styles of Twitter users and analyzed the correlations between personality, communication style, Twitter metadata (such as followig and followers) and the type of mood associated to the articles they shared. We also run a feature selection task, to find the best predictors of positive and negative mood sharing, and a classification task. We automatically predicted positive and negative mood sharers with 61.7% F1-measure.

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1. Introduction and background

In online news and social media, people read and share links to news articles or other multimedia contents, that are related to their emotions, tastes and identity (Liu, 2007). The exposure to contents generated by others can give rise to different emotions like indignation, joy, anger or sadness (Cambria et al., 2012). Sometimes these contents may be shared or retweeted, indicating the users' will to participate in a diffuse conversation (Boyd et al., 2010) and share their emotions with others. Researchers (Bachrach et al., 2012; Kosinski et al., 2014) have discovered that such media consumption and sharing is affected by the personality type of the user. Different personality types are associated to different psychological dimensions (Golbeck et al., 2011b), such as linguistic functions, attentional focus, emotionality and social relationships.

In this paper, we address the question of how personality types and communication styles of Twitter users are related to the selection of contents they share in Twitter, affecting the diffusion of a positive or negative mood. We formalize this problem in 3 ways: as a correlation analysis, as a feature selection task and as a classification task. We aim at finding the relationships between personality, communicative style and mood sharing; the best predictors of mood and the performance in the classification of positive and negative mood sharers among Twitter users. We identify the data sources in *Corriere*¹, an Italian news platform that provides mood metadata annotated by the readers on a voluntary basis, and *Twitter*², that is widely used as an information diffusion platform. We annotate the data with personality and communication style labels, then we predict the average mood of the articles shared on Twitter by the users. The main contributions of this work to the research community are: (1) the

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development of an aligned corpus of Tweets and news articles, automatically annotated with personality types, communication styles and gold standard mood labels; (2) the analysis of the influence of Twitter users' metadata, personality and communication style in the diffusion of mood; and (3) the prediction of mood of a news article from personal data.

The paper is structured as follows: in [Section 2](#) we report some related works on information spread, mood, personality and emotions. Then we will describe the datasets and the annotations in [Sections 3](#) and [4](#). In [Section 5](#) we will report and discuss the results of the experiments, finally in [Section 6](#) we will draw some conclusions.

2. Related work

It is well known that mood has an impact on social media and spreads through social networks. [Bollen et al. \(2011\)](#) predicted mood states (tension, depression, anger, vigor, fatigue, and confusion) from tweets and compared the results to a record of popular events gathered from media, finding a significant correlation between them. Other works focussed on information spread, virality and retweeting of messages. This kind of research reached contradictory conclusions: while some researchers concluded that the most important features to predict retweeting is the level of influence of the source of the tweet and the retweeter ([Zaman et al., 2010](#)), others discovered that message virality is connected to the content of the message being shared, rather than to the influencers who share it ([Guerini et al., 2011](#); [Suh et al., 2010](#)).

Recent works that put together emotions and information spread, found that emotionally charged tweets tend to be retweeted more often and more quickly compared to neutral ones ([Stieglitz & Dang-Xuan, 2013](#)). Viral messages containing the six primary emotions (surprise, joy, sadness, anger, fear, and disgust) are very effective on recipients' emotional responses to viral marketing campaigns. However, emotional content can evoke different reactions based also on the gender of the audience. [Dobele et al. \(2007\)](#) discovered that male recipients were more likely to forward disgust-based and fear-based campaigns than their female counterparts. The effectiveness of mood as a feature has been proven for tasks like author profiling ([Argamon et al., 2009](#)) and cyberpedophilia ([Bogdanova et al., 2014](#)). Hill et al. provided formal evidence that positive and negative emotional states behave like infectious diseases spreading across social networks over long periods of time ([Hill et al., 2010](#)). As for the relationship between sentiment and personality, previous literature ([Celli & Zaga, 2013](#)) reports a little improvement in the classification of sentiment exploiting personality types.

Unlike previous works, this one does not make use of resources for sentiment analysis ([Cambria et al., 2012](#)), mood annotation ([Staiano & Guerini, 2014](#)), or mood assessment ([Shahid et al., 2012](#)). We exploit mood metadata annotated directly by news readers in *Corriere.it* on a voluntary basis, to analyze the role of the users in spreading moods in a social network like Twitter. In *corriere* there are 5 context-independent mood states: *amused*, *satisfied*, *disappointed*, *worried* and *indignated*. Each one of them can have a strength value between 0 and 100. To define personality types, we adopt the most popular personality model in psychology: the Big Five ([Costa & McCrae, 2008](#)), that defines 5 bipolar traits: *extroversion* (sociable vs shy); *emotional stability/neuroticism* (secure vs neurotic); *agreeableness* (friendly vs ugly); *conscientiousness* (organized vs careless) and *openness to experience* (insightful vs unimaginative). To define communication styles we adopt the classes provided by Analyzeweords, a tool for tweet analysis based on Linguistic Inquiry and Word Count (LIWC) ([Tausczik & Pennebaker, 2010](#)). Analyzeweords defines 11 communicative dimensions, namely: *upbeat* (positive words and large use of "we"), *worried* (use of anxious language and short questions), *angry* (large use of captions and hostile words), *depressed* (use of self-reference and negative words), *plugged-in* (use energy words and include many mentions in tweets), *personable* (use positive words and often refers to others), *distant* (use action words and do not refer to self much), *spacy* (use excited words and a lot of exclamation marks), *analytic* (use long words and complex conjunctions) *sensory* (use many feeling words and reference to self), *in the moment* (use mainly verbs at present and hashtags). In the next section we describe the collection and annotation of the dataset, in [Section 4](#) we will evaluate the automatic annotation of personality.

3. Data collection and annotation

Twitter is a very popular micro-blogging web service that allows users to post short text messages, called "tweets", up to 140 characters. Common practices in Twitter are the "mentions", to converse with other users, "retweets" - to share information ([Boyd et al., 2010](#)), and "hashtags" - to aggregate messages by topic. In recent years a lot of works have focussed on data mining from Twitter. For example, for sentiment analysis from emoticons ([Pak & Paroubek, 2010](#)), irony detection ([Reyes et al., 2013](#)), ranking algorithm for extracting topic keyphrases from tweets ([Zhao et al., 2011](#)) and of course personality recognition ([Celli & Rossi, 2012](#); [Quercia et al., 2011](#); [Golbeck et al., 2011a](#)). *Corriere* is one of the most popular Italian daily newspapers, and the online platform is structured as a social network, according to the definition in [Boyd and Ellison \(2007\)](#). In particular, the website of *corriere* provides (1) a semi-public profile for each registered user, (2) articulates a list of users connected by a relationship of interest and (3) allows to view their list of connections to other registered users.

3.1. Dataset for the experiments

We sampled about 2500 users from Twitter who shared at least two articles from *corriere.it*. We limited the number of tweets sampled from the APIs to 3000 per user. We computed the ratio between the number of articles shared and the number of tweets posted, cutting the tail in the fourth quartile (tweet-shared articles ratio above 0.32), in order to remove the accounts of *Corriere.it*, journalists of *Corriere* and bots that retweet *corriere* articles. To compute average mood class, first we subtracted the

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