

We Feel: Taking the emotional pulse of the world

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Abstract

Social media has become a major channel of communication, used to disseminate information, opinions, announcements, and behaviour. This results in a wealth of data that researchers are trying to harvest for a number of purposes, including public health issues -- e.g., (Leaman et al., 2010; Paul and Dredze, 2011; Bian et al, 2012; Sadilek et al, 2012; De Choudhury et al., 2013). Similarly, we are investigating whether that data can be mined to help further research in mental health.

Our aim is to monitor social media to take the pulse of the world, to ultimately better understand the prevalence of mental health problems. To this end, we built *We Feel* which constantly monitors Twitter, looking for English tweets with emotional content (wefeel.csiro.au).

Summary

We Feel (wefeel.csiro.au) is an online tool that passively analyses a ‘massive pipe’ of Tweets, using language processing to look at the English words people use and mapping them to a hierarchy or ‘wheel of emotions’. These are based on Parrott’s (2001) list of basic emotions and include love, joy, anger, sadness. Each of these emotions is then segmented further to more specific secondary emotions. For example, the primary emotion of sadness includes suffering, disappointment, neglect and sympathy.

A screen shot of *We Feel* is shown in Figure 1. This screen shot was taken for Australia, for the week of November 27th, the date of the death of cricketer Phillip Hughes. The “wheel of emotions” is displayed on the left, and a map of the world on the right. In the centre is the visualisation of the emotions of the tweets captured, colour-coded by emotions. Note here the peak in sadness. The tool also provides an indication of the posts’ gender (when identifiable). The interface enables the exploration of these emotional tweets: by selecting a specific area of the world, an emotion or gender, the visualisation focuses on the posts from that region/emotion/gender. By automatically processing the tweets by emotions and presenting the aggregate results visually, the tool enables researchers to examine the emotional state of the world (or a country) at any time, including during or after specific events, without having to examine individual tweets.

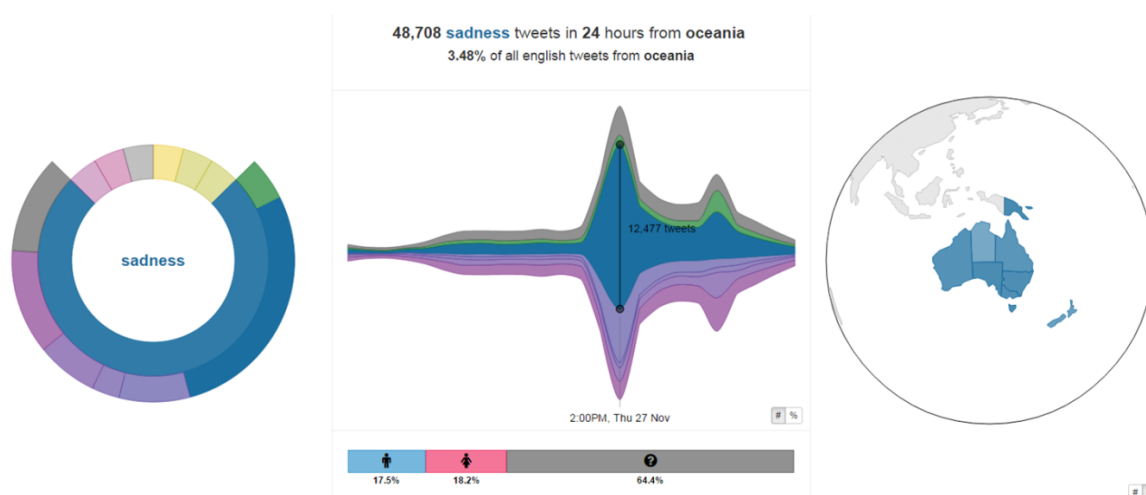


Figure 1: A screen shot of *We Feel* – taken the week of November 27th, 2014, the date of the death of cricketer Phillip Hughes. In the figure, the Australia region is selected. Note the peak of sadness.

The tool obtains its data from Twitter, through a purpose-built module developed by the CSIRO. It captures up to 45,000 tweets per minute. To identify the emotions, CSIRO first curated a vocabulary of emotion terms (such as “angry”, “sad”) using existing resources, e.g., [ANEW](#) and [LIWC](#)¹. It then employed a crowdsourcing task (using [Crowdfunder](#)) to further identify the emotion terms (those that could be inserted into the sentence “I feel ...”) and organise them against Parrott's (2001) hierarchy of emotions.

The emotions are colour-coded using a dataset of affective norms provided by the Center for Reading Research at Ghent University. These norms plot almost 14,000 words (not just emotions) against three dimensions: valence (the pleasantness of the stimulus), arousal (the intensity of emotion provoked by the stimulus), and dominance (the degree of control exerted by the stimulus). Most of the emotion terms in our vocabulary had an entry in the norms dataset. We manually found synonyms for the 100-or-so emotion terms that did not have an entry. In *We Feel*, we only use valence and arousal. When possible, *WeFeel* identifies the gender of the post's author, by comparing the Twitter user name against large lists of known male and female names obtained from the BabyNameMap project. When the user's Twitter name did not appear in these lists, the gender was marked as unknown. Locations of tweets were determined by the local time zone selected by the user in their registration profile.

We Feel has a publically accessible, user-friendly web-interface that researchers and the general public can access via the internet (wefeel.csiro.au).² It allows one to explore each of the emotions and its sub-emotions within 5 minute periods, on a time scale which extends back days or several weeks. *We Feel* includes a “Table Builder”, a data export available for research purposes. It provides the same data as available on the website in a tabular format which can be used for further analysis. This enables comparisons with other available data and further analysis.

Using this data export, we have started to validate the signal obtained through the tool and found interesting associations between rates of anxiety and suicide and some of the key emotions such as sad, rage and envy (Larsen et al., 2015). We need to examine these further. We also examined the feasibility of characterising responses to known significant events (e.g., the date the Australian Federal budget was read, and when the death of actor Robin Williams was announced) and were able to observe an effect.

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References

- Bian, H., Topaloglu, U. & Yu, F. 2012. Towards large-scale Twitter mining for drug-related adverse events. In Yang, C. C., Chen, H., Wactlar, H., Combi, C. & Tang, X. (program chairs). In Proceedings of the 2012 International Workshop on Smart Health and Wellbeing (SHB '12). New York, NY, USA: ACM.
- De Choudhury, M., Gamon, M., Counts, S. and Horvitz, Eric. 2013. Predicting Depression via Social Media. In Proceedings of the International AAAI Conference On Weblogs and Social Media (ICWSM), 128 - 137. Boston, Ma.
- Leaman, R., Wojtulewicz, L., Sullivan, R., Skariah, A., Yang, J. and Gonzalez, G. (2010). Towards Internet-age Pharmacovigilance: Extracting Adverse Drug Reactions From User Posts To Health-Related Social Networks. In Proceedings of the Workshop On Biomedical Natural Language Processing, 117—125, Uppsala, Sweden.
- Larsen, M., Boonstra, T., Batterham, P., O'Dea, B., Paris, C. and Christensen, H. 2015. We Feel: Mapping emotions on Twitter. *IEEE Journal of Biomedical and Health Informatics (JBHI)*. ISSN: 2168-2194; DOI: 10.1109/JBHI.2015.2403839.
- Paul, M. and Dredze, M. 2011. You Are What You Tweet: Analyzing Twitter for Public Health. In Proceedings of the International AAAI Conference On Weblogs and Social Media (ICWSM), 265—272, Barcelona, Spain.
- Parrott, W. 2001. *Emotions in Social Psychology*, Psychology Press, Philadelphia.
- Sadilek, A., Kautz, H. A., & Silenzio, V. 2012. Predicting Disease Transmission from Geo-Tagged Micro-Blog Data. Proceedings of the Twenty-Sixth AAAI Conference on Artificial Intelligence.

¹ <http://csea.php.ufl.edu/media/anevmessage.html> and <http://www.liwc.net>

² The site and the system are provided by CSIRO. We will try to keep it publicly accessible for as long as possible.