# Wisdom in Adversity: a Twitter Study of the Japanese Tsunami

Paolo Casani*, Hayate Iso**, Shoko Wakamiya**, Eiji Aramaki**
*Department of Information Studies, University College London, UK. paolo.casani.14@ucl.ac.uk
** Nara Institute of Science and Technology, Japan. {iso.hayate.id3, wakamiya, aramaki}@is.naist.jp

***Abstract* – Sophisticated data science techniques have recently been applied to social networks data to study social phenomena and people. Recognizing that social psychology research has witnessed a renewed interest in the notion of wisdom, with an emphasis to its contextual dimensions, this study looks at the expression of wisdom in twitter messages. Specifically, it examines the relation between wisdom in adversity and cultural influences using Twitter data from the tragic Japanese *tsunami* of 2011. The study employs natural language processing and data science to detect the expression of wisdom. Two categories for wisdom in adversity are used: recognition of uncertainty and change, and cognitive empathy. Data processing is applied to 1,000 annotated tweets and extended to 43,436 tweets. The results show that it is viable to study wisdom in context using social networking sites data. This short paper discusses some of the findings.**

## I. Introduction

The explosion in the use of social networking has, like never before, empowered people to freely express their thoughts and beliefs. Social media platforms have enabled users to participate in social networking, to generate and share online content. This content, what people write and post online, represents an expression of who they are [1]. Social psychology, with the application of computational and statistical tools, has taken advantage of the availability of social media data to study people at large scale [2], [3], [4]. This has been the case, for example, for the detection and prediction of personality [5], [6], [7].

There has been, however, little research on social media data about other important aspects of human nature such as wisdom. This in spite of the fact that there has recently been a renewed and growing interest by psychological scientists about what wisdom is and how it can be cultivated [8], [9]. Wisdom is deemed to be an important human character for creating a cohesive and harmonious society, in so far as it promotes understanding of diverse points of view and conveys compassion for other people. Recent research has emphasized the importance of contextual factors, such as the situational and cultural background, in the forging of wisdom [10], [9]. Given these findings, social media appears to be a fertile ground where to untangle the intricacies of the phenomena of wisdom in context.

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This raises the following broad questions: how can social media data be used to study wisdom? What can it reveal about the expression of wisdom? Can social media promote and increase social and personal wisdom?

While touching upon these general questions, this study targets specific contextual aspects of wisdom by taking as a case study a situation of adversity in a particular cultural space: the response to the 2011 *tsunami* in Japan. A situation of immediate crisis such as that of the tsunami is taken to reveal essential aspects for the expression of wisdom.

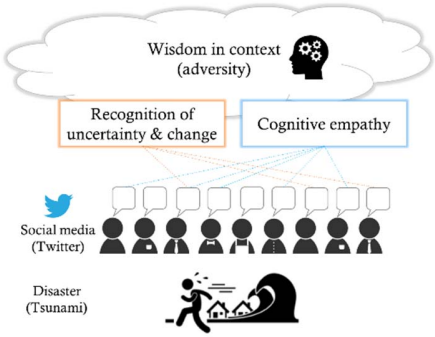


Fig. 1: Theoretical framework for wisdom in context

The study focuses on two congruent factors that are deemed to characterize wisdom in adversity: the *recognition of uncertainty and change*, and the *capacity for cognitive empathy*. While the first is a trait of wise thinking [11], the second is a promoting factor for wisdom [12]. Taken together, these two factors are used as measures for wisdom in context where the Japanese cultural space also allows to infer aspects of the social construction of wisdom (see Fig. 1).

## II. Background

Research in the last ten years has demonstrated that the merging of complex computing algorithm and statistical techniques applied to big data from social media allows for predicting and determining the psychological makeup of people [5], [13]. The recent scandal about the unqualified use of Facebook users' data by Cambridge Analytica has showed this to be a very controversial field of research [14]. Ethical debates have echoed the headlines about whether such techniques were used to influence social media users and alter the democratic process of elections. Debates about the ethics and moral implications of the use of social networking footprints and

people online expression have taken central stage and come to the forefront of the public and scientific arenas [15].

Wisdom have long been seen as the glue of society, and very relevant theme in the contemporary world. It is a faculty of the mind that appears to escape the appeals of artificial intelligence to replace human cognitive faculties in so far as it is generally related to lived human experience and the ability to cope with life situations arising. Although there are rational elements to wise thinking, such as the ability to take multiple points of view, or to mitigate conflict [8], it is only weakly related to intelligence [16], [9]. Conversely, wisdom includes fine-tuned human emotional responses such as empathy, and the capacity for compassion [17]. In contrast with the idea that wisdom is a stable discreet characteristic of our minds, notion that is rooted in ancient Greek philosophy, recent anti-essentialist views of wisdom concede for its situational and cultural variability [10]. It follows that that there is a role for the promoting and the teaching of wisdom [18] for the betterment of society. There is a case to be made, therefore, in examining whether social networking and social media can promote wise thinking and wisdom qualities.

## III. Approach

This study examines the expression of wisdom in Twitter in the context of adversity with the Japanese *tsunami* of 2011. On the 11th of March an earthquake of the magnitude of 9.0 struck out of the coast of Japan triggering a powerful tsunami with waves up to 45 meters in height that hit the North -Eastern costal area and particularly the city of Sendai. It was a horrific human tragedy with more than 15,000 casualties, over 2,500 people still missing, and hundreds of thousands dislocated from their homes. Twitter played a vital role in helping to mobilize and aid people affected by the tsunami. The collaborative element was so prevalent that the Japanese web platform for the provision of help to the people who were affected by the tsunami is called wisdom [19]. Situation of crisis and tragedy makes us human and become more collaborative [20]. People are, therefore, more prone not only to directly manifest generosity by deed, but also to give encouragement or advice to other people in need so to alleviate their current plight. The study of social media data can shine a light on what motivates people, and the expression of wisdom.

The contextual dimension of wisdom points to the importance of triggering situations with the interplay of the socio-cultural background. In this respect, research on wisdom has corroborated folk believes about the importance of negative and stressful life experiences as catalysts for wisdom [21], [12]. This goes along with the old English saying that "a smooth sea has never made for a skilled sailor" [22]. Psychology research have established that following experience of adversity individuals restore psychical order by re-evaluating long hold beliefs and creating new meanings [22]. This reinforces the idea that a degree of negative experiences promoted personal growth making the individual wiser.

In contrast to the West, Japanese people are less prone to relate wisdom with analytical features like 'knowledge'. Instead, they conceptualize wise with 'discreet' characteristics which require a 'direct' understanding, emotional involvement and the integration of multiple aspects of human nature, such as affect and intuition. Research on the cross-cultural components of wisdom have also showed that Japan, as a collectivist society, promoted a less self-centered vision of the individual [10]. These considerations provide a further interpretative key.

*Theoretical framework.*

This research explores to what extent a social media platform like Twitter can be used to detect aspects of the expression of wisdom in context. There are two modes to such expression: the narration about the self, and the advice given to other people. A narration about the self is usually in the form of an anecdote or an opinion that ultimately is intended to convey a message of wisdom. Advice is a form of instruction or written help. This study addresses both in the discussion of the results.

Our framework employs two categories which are derived from theoretical models of wisdom. It includes on the one hand a wisdom trait that is prevalently cognitive, and on the other a trait that has an emotional component. These are explained more in detail below

1) *Recognition of uncertainty and change* is the sensitivity to the possibility of change in social relations and events [8]. It conveys a personal acceptance that many things can happen as the situation unfolds. In this, it reflects the notion of accepting not-to-know in the face of uncertainty. Wisdom, thus, derives from the initial acceptance and subsequent mastery of such uncertainty in life [22].
2) *Cognitive empathy* is considered one of the key components for the capacity for wisdom. To put it simply, to have empathy for someone is put yourself in his or her shoes. It marks a prosocial and compassionate orientation toward the welfare of others. In wisdom questionnaires used in research, the level of empathy is one of the core characters of wisdom [23].

Empathy is deemed to be a very important aspect of the expression of wisdom in the context of social media. Unlike *sympathy*, which indicates a direct concern for people with whom we feel a bond, empathy is not bias towards a particular group. This quality is what makes empathy the foundation of compassion and selfless moral conduct. The field of psychology differentiates between *affective empathy*, as the feeling of mirroring other people's emotions, and *cognitive empathy*, as the ability to reflect and identity yourself with the position of others [24].

In the contemporary industrialized and networked world, we are witnessing a rise in self-centeredness [25], [26]. It is still unclear whether social media promotes social altruistic values such as wisdom and compassion. The capacity for empathy, nonetheless, is the key triggering element to be able forge personal connections with other people. A lack of empathy, some researchers argue, makes us see the other as an object, and in this sense, it is at the core of evil deeds [27].

## IV. METHODOLOGY

The study implemented a standard NLP methodology and methods, with annotation, and training of the data.

### A. Datasets

*Tsunami data* - The dataset comprises of 103,570,975 tweets covering a period of 3 months, between 12/03/2011 to 11/06/2011, after the March 11th 2011 Japanese *tsunami*. They were collected using the Twitter Streaming API. The keyword "*tsunami*" ("津波" in Japanese) was used as identifier to further filter the raw dataset and resulted in 164,647 tweets. Since most of data consisted of announcements, reports, and general statements about the *tsunami*, it was further filtered by "@reply", so that it would target people's opinions and thoughts. This resulted in 43,436.

### B. Annotation

The two categories from the theoretical framework were applied to the data. For each category, two values were evaluated in the annotation as presence (+) or absence (-). For example, we determined that the first tweet in Table 1 presents neither the recognition of uncertainty (uncertainty-) nor change and cognitive empathy (empathy-). On the other hand, the forth tweets presents both the recognition of uncertainty (uncertainty+) and change and cognitive empathy (empathy+).

Table. 1: Sample tweets, translated into English, for the two selected categories.[1] + and – stand for presence / absence.

| Tweets | Categories |
|---|---|
| *My house was saved just because it was scattered inside, but it seems the old houses are destroyed halfway. On the coastal areas of the prefecture more houses are rolling up by the tsunami, the damage is heavy.* | *(uncertainty-) (empathy-)* |
| *The tsunami came. I saw a ship rolling on the road. A tearful word when a refugee's grandad came home "What we can do is to make this town better again". I will definitely bring that back! My eyes got hotter.* | *(uncertainty-) (empathy+)* |
| *I understand it. I cannot escape it. I could hardly escape, but most people died. I thought that it was not scary to think that I was stupid when I was relaxing in front of the tsunami. My eyes were drowsy in death.* | *(uncertainty+) (empathy-)* |
| *I was scared of the tsunami, really. Everything was sinking... Yes! Breakwater! They said it on TV. I'm crossing over!! I want a great person in the company to manage this sense of crisis. Calm down over there!* | *(uncertainty+) (empathy+)* |

Twitter messages contains noisy and ungrammatical expressions which can bias the annotation process. To overcome this problem, we employed a translation-based annotation scheme [28] with the assumption that the translation process objectively resolves the ambiguity of raw sentences. First, we translated the Japanese tweets into English using Google translate. The Google Neural Machine Translation (GNMT) provides Japanese to English automatic translation using deep neural networks which achieves significant improvements over a phrase-based machine translation (PBMT) [29]. To assess the quality of the machine translation, we conducted a preliminary study where a Japanese speaker with English as a second language checked the accuracy of the translation using randomly sampled tweets. The quality of the GNMT's translation has high BLEU score [30] and therefore good accuracy, and because neural machines translation systems translate to a simpler version of the sentences they also improve the annotation productivity. The annotator, who is one of the authors, added labels to the translated English tweets. For the annotation process, 1,000 tweets were randomly selected from a pool of 43,436.

### C. Classification

In order to scale up the tweet analysis, we developed the automatic wisdom classifier for tweet. We used the bag-of-words approach for feature representation and support vector machines (SVM) [31] with gaussian kernel for the classification model. The regularization parameter $C$ was determined from {0.1, 1., 10.} using 5-fold cross validation. The average accuracies on the cross validation resulted in 77 % for cognitive empathy and 74 % for recognition of uncertainty and change.

## V. RESULTS AND DISCUSSION

The graphs in Figs. 2-3 show the distribution of tweets over a timeline for the *tsunami* and the two wisdom categories. Fig. 2 outlines the relation of the data with occurring earthquakes. Our findings confirm the proposition that in a situation of adversity people are prone to '*voice'* and express in elements of wisdom. While previous studies in social psychology have attempted to validate this idea in a controlled environment, such as by using questionnaires in a laboratory, the analysis of social media data extends the investigation into a real-life scenario.

Two elements are indicative and support the expression of wisdom in adversity, as it can be seen in Fig. 2. Firstly, there is a degree of uniformity in the graph between the two selected categories: they go hand in hand over the time axis. It can be argued that in responding to the ongoing discussion taking place on Twitter about the *tsunami*, people react with cognitive empathy by expressing a bond and understanding towards other people's plight. In parallel, they seem to reflect about the limitations of human existence, in this way taking a long-term and detached perspective on their lives. The data shows that in a situation of wisdom in adversity such as that of the Japanese *tsunami* there is a manifestation of these two traits of wisdom.

Secondly, another factor that supports the above claim is that, staring with a peak right after the *tsunami* of 11 March, Fig. 2 shows a gradual decrease in the expression of the two wisdom categories. In our analysis, it reaches a stable point 40 day after the event when it is normalized. As the social impact of the situation of adversity decreases, there is a contraction in the expression of wisdom.

The data also shows a relation between the display of wisdom in the two categories, and the occurring of significant seismic events in Japan during the same time frame. This relation is captured in Fig. 3. Specifically, the display of wisdom in tweets took place on the day or next day following a large earthquake (magnitude 4 or higher on the Richter

[1] We use *uncertainty* as shorthand for recognition of uncertainty and change.

magnitude scale) or frequent earthquakes even if it was smaller (magnitude 1 to 3) as highlighted in the rectangles of Fig. 3.

*Discussion and interpretation*

The results confirm the viability of studying, with the use of social media data, complex human faculties that combine cognitive as well as emotional traits, as it is the case with wisdom in context. The manual annotation of these categories allows to extend social media data analysis to abstract concepts. In this way, the investigation of human faculties doesn't necessarily need to fall directly within established models of personality, such as the big five model, which are mostly based on keywords analysis.

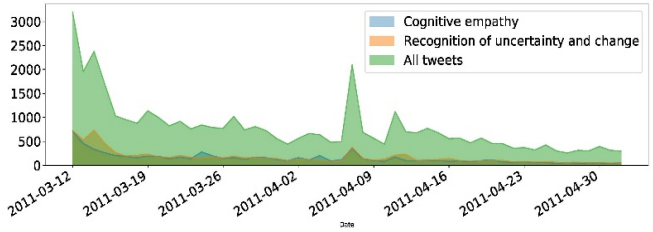


Fig. 2: Timeline of tweets from day 1 to day 40 after the tsunami for the selected categories

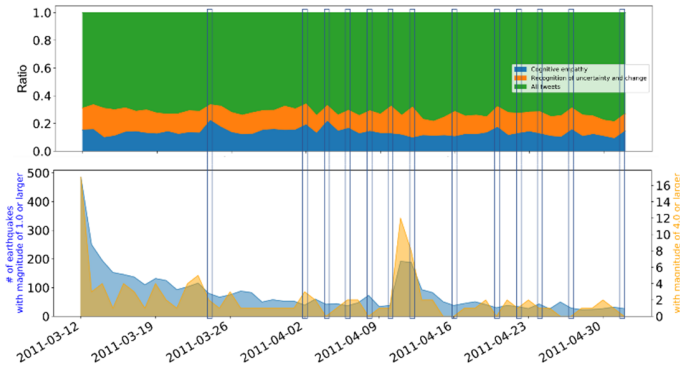


Fig. 3: Comparison of our tweets data (upper graph) with earthquake levels (lower graph). The abbreviations on the left of the lower graph are the major seismic events. The x-axis of the upper graph shows the stacked variable and the one of the lower graph shows the frequency of earthquakes with respective seismic magnitude (magnitude 4 or higher on the Richter scale)

The findings in our data are also significant because social media allows to extend the study of wisdom in context beyond the narrow grouping of people we are related to, and we thus feel sympathy for. The tweets that express the two categories are not just a direct communication and response with people we already know and have a bond with. But they also extend to reach out to the larger community of twitter. The study of wisdom in context with social media data allows to better understand how much wisdom traits, such as the two categories that we uphold, are indicators of the expression of wisdom and caring for all humankind.

There are other external factors that condition not only the debate that takes place on Twitter but the intensity of the reaction that we have to them. The events of the Japanese tsunami have of course been widely reported in the news. This in so far as the tragedy of the people affected was newsworthy, and a constant source of interest by audiences. A central element of many discussions taking place on Twitter was the release of new images and videos that were emerging of the tsunami: horrific videos showing cars, houses, and entirely villages swept away the advancing tsunami waves. Such visual inputs undouble have very more powerful emotional affect than textual forms such as in the headlines of a news story.

## VI. Conclusion

This study has explored the expression of wisdom in social networking sites taking as a case study a situation of adversity, the 2011 Japanese *tsunami*, in the cultural context of Japan. In contrast with long established practices of self-reporting questionnaires, it has traced the expression of wisdom in social media data looking at one aspect of wise thinking and at empathy. The findings have showed that complex human faculties such as wisdom in context can be studied using social networking sites data. This yields an improvement over tradition methods within psychology that study wisdom within the laboratory and in relation to circumscribed groups people that are known. Future work should address how cultural and social factors influence the expression of wisdom in twitter messages, and whether similar studies can determine general human predispositions to wisdom in situations of adversity.

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