

Use case introduction: Twitter analysis towards indirect support for Kumamoto Earthquake

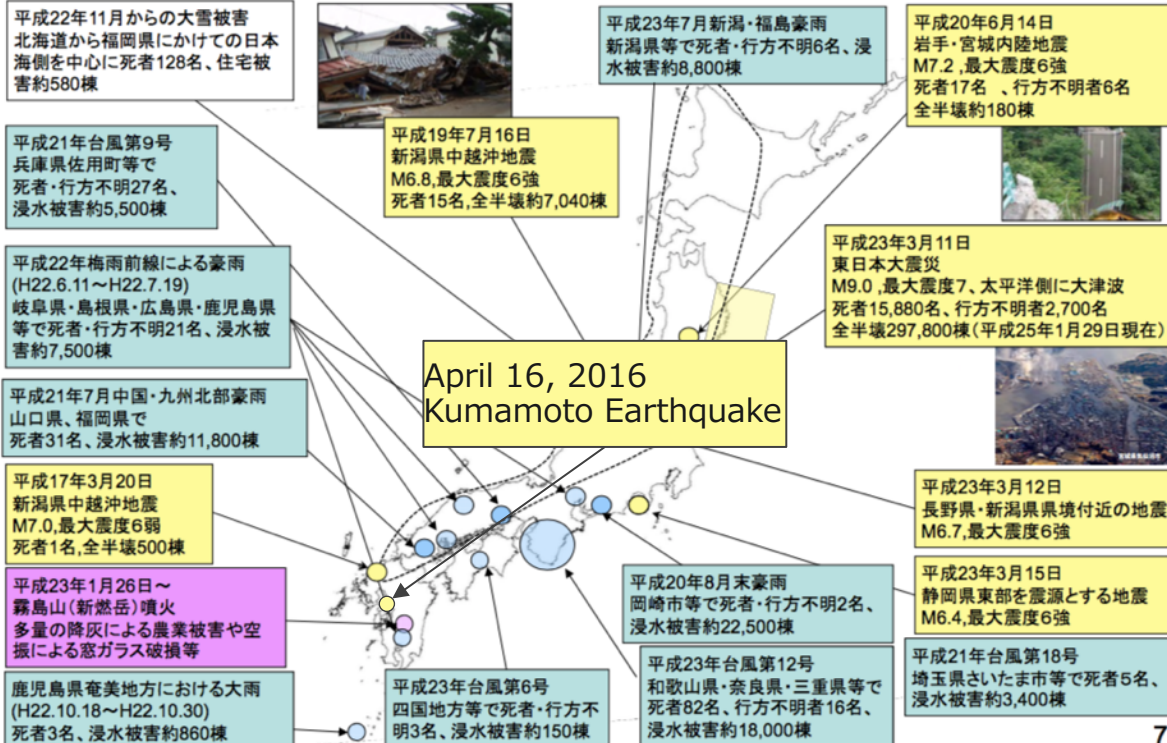
Masayasu MURAOKA
Knowledge Infrastructure
IBM Research AI

Contents

- Information volunteer
- Analysis results
 - [Text] Missing item identification
 - [Image] Damaged state understanding
 - [Personality] Identification of users needed mental clinic
- Wrap up

Japan is a department of natural disasters!

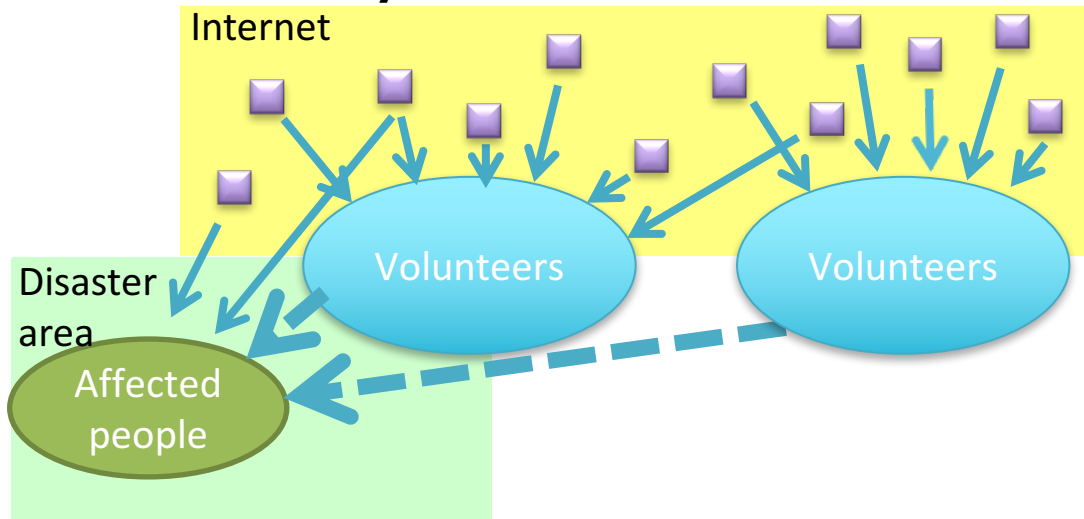
近年発生した主な災害



Cabinet Secretariat, "1st National resilience discussion" ("ナショナル・レジリエンス (防災・減災) 懇談会 (第1回)"), 2013. <https://www.cas.go.jp/jp/seisaku/resilience/dai1/siryou6-1.pdf>

Classical support of information

Affected people and volunteers used to collect information from the Internet **by themselves**



However, it requires **IT skills** to collect useful information
Moreover, volunteers must be **tough physically and mentally** and may **suffer from disconnection** from the Internet

Cited with partial modifications: D. Sato and A. Murakami, "Construction of 'Information Environment' to Support Disaster Support Activities and Text Mining of SNS" ("災害支援活動を支援する『情報環境』の構築とSNSからのテキストマイニング")

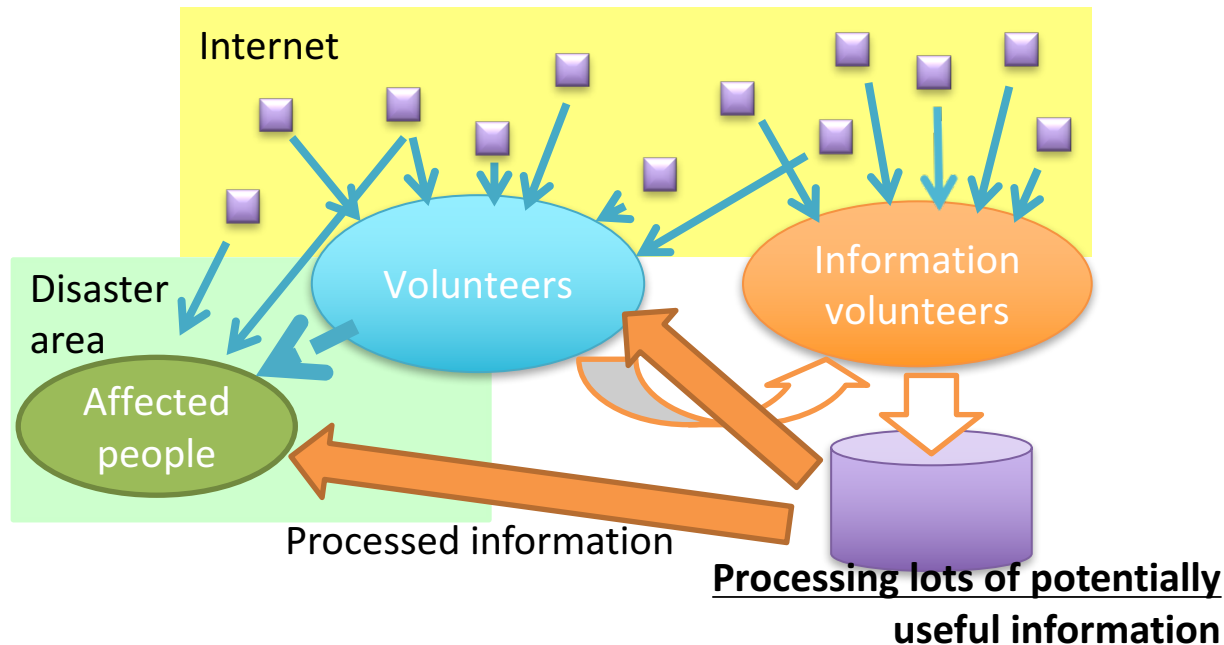
Remote support of information

- Take over to collect and organize information necessary for support activities or affected people
 - No requirements of mental and physical toughness
 - Be able to help whenever they want
- Utilize remote resources
 - Better Internet connection
 - Someone who cannot go to a disaster area can help
- “Volunteer without going to a disaster area”
 - 『被災地に行かないボランティア』



We can support from remote!

Since we can support volunteers, it's referred to as **"indirect support"**



Cited with partial modifications: D. Sato and A. Murakami, "Construction of 'Information Environment' to Support Disaster Support Activities and Text Mining of SNS" ("災害支援活動を支援する『情報環境』の構築とSNSからのテキストマイニング")

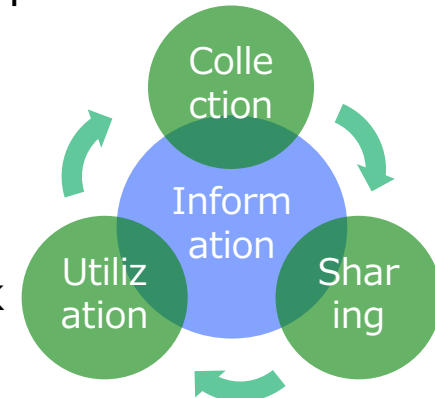
IT DART (情報支援レスキュー隊)

■ Information Technology Disaster Assistance and Response Team

- Support by information for volunteer groups
- Collect, Utilize, and Share “information” with IT
- Take prompt actions for a disaster response in a disaster acute phase

■ Activities

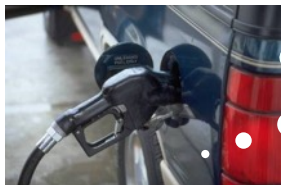
- Support in a heavy rain, earthquake, and flood
- Establish a special group on Facebook



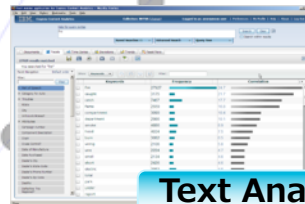
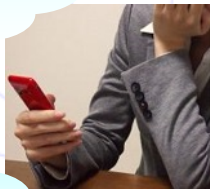
<http://itdart.org/>

Social media analysis

Extract useful information by analyzing social data



**i cannot get
gasoline!**



Text Analysis



**i want water
but cannot buy!**

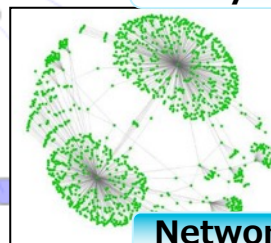


**Spatio-temporal
Analysis**



**Train doesn't
work...**

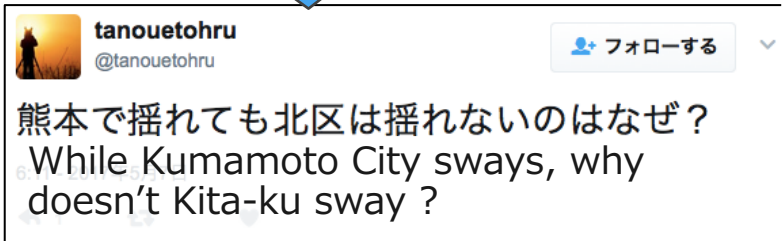
**Post to SNS
(Twitter etc.)**



Network Analysis

Twitter data (Tweet)

Up to 140 words
per tweet



<https://twitter.com/tanouetohru/status/861206789227921408>

- Twitter Inc. kindly provided with us **45M tweets** for the analysis
 - Duration: 2016/4/1~7/31
 - Condition:
 1. Tweets tweeted in “Kumamoto” or “Ōita”
 2. Tweets tweeted by users in “Kumamoto” or “Ōita”

Image and location



Tweet location


<https://twitter.com/tanouetohru/statuses/721830413438574592>

Objective: Twitter mining for useful information


[Text]
Missing item
identification

[Image]
Damaged state
understanding


[Personality]
Identification of
users needed
mental clinic

 あたた丸・信仰希望愛いつまでも残るもの
@atatamaru

益城町立小学校 広安小学校
避難所。
ここでも水は不足しています。

 すず(仮住まい)
@suzu638383

ガソリンスタンドは富合のエネオス(うなぎの徳永となり)は営業中、先の宇佐美は売り切れの表示、宇土シティの前も営業中。宇土と製鉄の横から宇土市内への道は通行止め。川尻から松橋に移動中です #熊本地震 #ガソリンスタンド

 グリーンモールハウジング
@green_m_housing

★震災の影響で荒尾市のコンビニでおにぎりやパン等食材が売り切れです。飲料水も売り切れ。早く、落ち着いて眠れる日々が戻って来ることを祈ります。

2:52 · 2016年4月16日 場所: 熊本 荒尾市

<https://twitter.com/atatamaru/status/721850038062723072>
<https://twitter.com/suzu638383/statuses/721505076313923584>
https://twitter.com/green_m_housing/statuses/721275056517558272

 まるまるん
@24aftereden

益城町の島田地区も壊滅です。まだ救援物資も何も来ていません。
#熊本地震 #益城町




 まみ
@mamig_11_06

益城のおばあちゃんち
ひどすぎた😭
とりあえずみんな無事で良かった



<https://twitter.com/24aftereden/status/720913234216128512>
https://twitter.com/mamig_11_06/status/720955570883141632

 rilakumadorin

家のすぐ横火事だし
道われてるし
電信柱倒れてるし
水道管破裂して水浸し
余震やばいし
家に入れないから
みんな外にいるけど
火事の火の明るさしかない

<https://twitter.com/rilakumadorin/statuses/720599387710164992>

IBM Watson Explorer*: A tool for text mining

Analyzing unstructured data, computing the correlations between the data, and finding implicit insights

Metadata[structured]

[username] @sample

[tweeted date]

16/04/17 15:39

[tweeted location]

Mashiki, Kumamoto

Text[unstructured]

Missing water at
Hiroyasu elementary
school

• **Metadata extraction**

• **Tokenization,**
• **Keyword extraction,**
• **Dependency parsing, etc.**

[username] @sample

[tweeted date]

16/04/17 15:39

[tweeted location]

Mashiki, Kumamoto

[Pattern] miss-water

[Location] Hiroyasu

elementary school

Dependency

Tokenization

Missing

VBG

water

NOUN

at

IN

Hiroyasu

PROPN

elementary


PROPN

school

PROPN

Pattern list for “missing” items


Appear with a certain context (i.e. pattern)



あたた丸・信仰希望愛いつまでも残るもの
@atatamaru

益城町立小学校 広安小学校
避難所。
ここでも水は不足しています。

フォローする




グリーンモールハウジング
@green_m_housing

★震災の影響で荒尾市のコンビニでおにぎりやパン等食材が売り切れです。飲料水も売り切れ。早く、落ち着いて眠れる日々が戻って来ることを祈ります。

2:52 - 2016年4月16日 場所: 熊本 荒尾市

フォローする

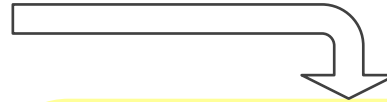


Ma
@mana_exiga15

菊池市 ドラッグストア コスモス。水は売り切れ。パン、おにぎり売り切れ。おむつ、電池等他のものはありました。コンビニのパン売り切れ。お弁当は少し残あり。#熊本 #スーパー #コンビニ

22:44 - 2016年4月14日

フォローする



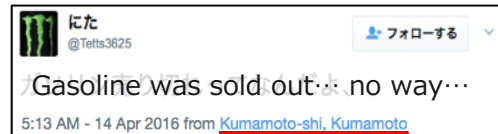
Pattern list

- X is/are <missing(不足する)>
- X is/are <not enough(足りない)>
- X is/are <unavailable(入手不可)>
- X is <sold out(売り切れ)>
- <can/could not buy(買えない)> X
- X is <ran out(在庫切れ)>

...

<https://twitter.com/atatamaru/status/721850038062723072>
https://twitter.com/mana_exiga15/statuses/720850361196478464
https://twitter.com/mana_exiga15/statuses/720850361196478464

Results of “missing” items



Lots of drinks

Classified by tweet location

<input type="checkbox"/>	missing item	frequency
<input checked="" type="checkbox"/>	水 water	764
<input type="checkbox"/>	内 inside	633
<input type="checkbox"/>	物資 goods	504
<input type="checkbox"/>	食料 foods	308
<input checked="" type="checkbox"/>	飲み水 drinking water	239
<input type="checkbox"/>	支援物資 relief supplies	211
<input type="checkbox"/>	支援 support	178
<input type="checkbox"/>	救援物資 relief goods	166
<input checked="" type="checkbox"/>	ミルク milk	120
<input checked="" type="checkbox"/>	飲み物 drink	119
<input type="checkbox"/>	人数 number of people	102
<input type="checkbox"/>	今 now	96
<input type="checkbox"/>	え uh	86
<input checked="" type="checkbox"/>	避難所 shelter	64

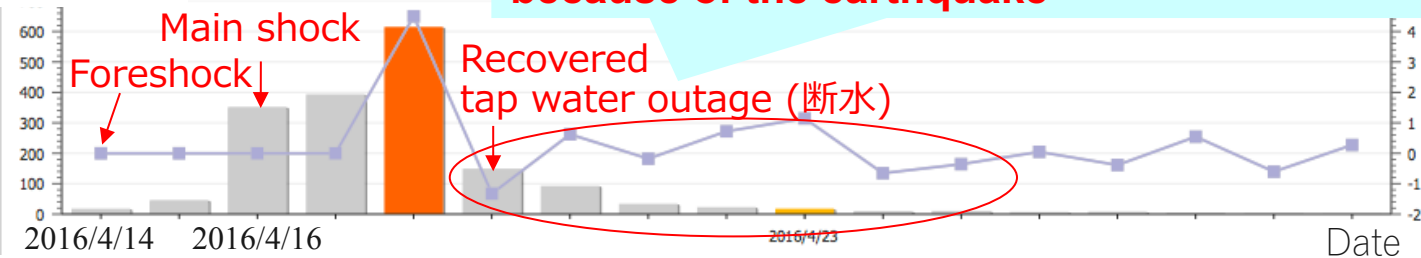
location	missing item	frequency
Ōita city, Ōita	水 water	3
Higashi-ku, Kumamoto	水 water	2
Higashi-ku, Kumamoto	ガソリン gasoline	2
Koshi city, Kumamoto	水 water	2
Ōita city, Ōita	パン bread	1
Ōita city, Ōita	食料 food	1
Ōita city, Ōita	麺 noodle	1
Ōita city, Ōita	コンビニ convenience store	1
Higashi-ku, Kumamoto	カップラーメン cup noodle	1
Miyazaki, Kyushu	水 water	1
Miyazaki, Kyushu	ガソリン gasoline	1

Time transition of "missing water" tweets

Kumamoto Earthquake

Even after the tap water outage, water shortage continued since the **tap water** has been **muddy because of the earthquake**

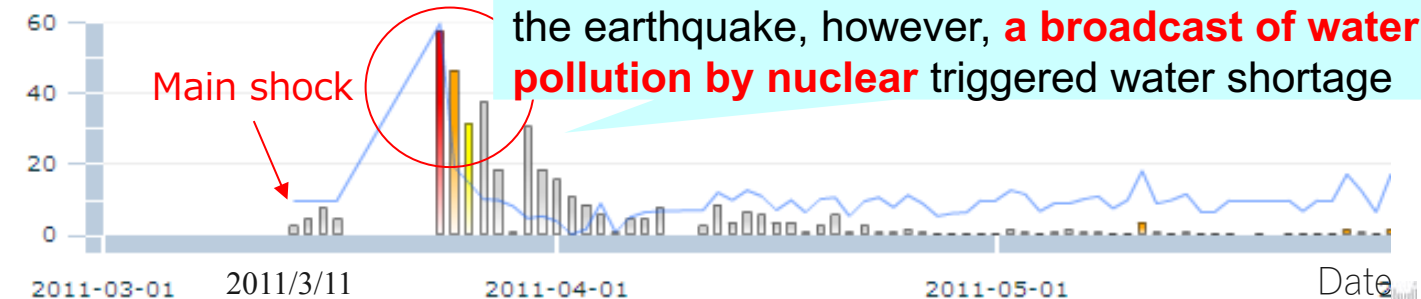
Tweets



Great East Japan Earthquake (東日本大震災)

Water shortage did not occur immediately after the earthquake, however, **a broadcast of water pollution by nuclear** triggered water shortage

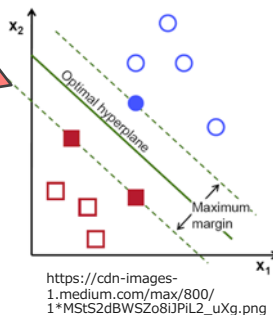
Tweets



A disaster-image classifier

Treated disaster images as positive instances and other irrelevant images as negatives

Disaster images



Other images

著作権の観点から
削除

- IT DART kindly provided disaster images with us
- Irrelevant images were extracted randomly from Twitter
- All images were converted into feature vectors by CNN (Residual Network [He+,2016])

Images classified as disaster

Identified around **70K tweets** out of ~650K tweets tweeted within a week after the Kumamoto Earthquake

In house



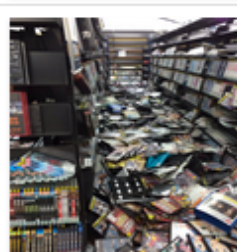
Clackling



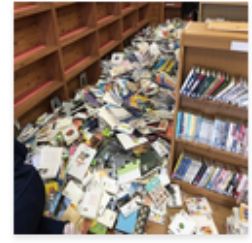
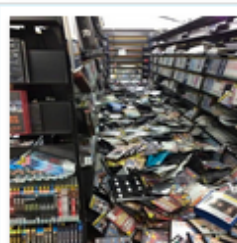
Houses



In store



Others



Classified tweets based on shelters

<input type="checkbox"/>	値	頻度	
<input checked="" type="checkbox"/>	熊本北高校	Kumamoto Kita HS	17
<input type="checkbox"/>	西原中学校	Nishihara JS	9
<input type="checkbox"/>	アクアドーム	Aqua Dome	8
<input type="checkbox"/>	熊本市立白山小学校	Shiroyama ES	7
<input type="checkbox"/>	熊本市立西原中学校	Nishihara JS	7
<input type="checkbox"/>	文徳高校の体育館	Gym at Buntoku HS	6
<input type="checkbox"/>	熊本市東区役所	Higashi Ward Office	6
<input type="checkbox"/>	熊本県立北高等学校	Kumamoto Kita HS	6
<input type="checkbox"/>	千原台高校	Chiharadai HS	5
<input type="checkbox"/>	熊本県立東稜高校	Tōryō HS	5
<input type="checkbox"/>	国際交流会館	International Center	5
<input type="checkbox"/>	熊本学園大学	Kumamoto Gakuen Univ.	5
<input type="checkbox"/>	龍田小学校	Tatsuda ES	5
<input type="checkbox"/>	熊本市立桜木中学校	Sakuragi JS	5



https://twitter.com/hideki_honda001/status/720649547911790592



https://twitter.com/tommy_asahi/status/721863195644669952

Useful information can be found in the text

Soup run at Nishihara JS



ken
@ken04095288

フォローする

避難所となった西原中学校には、16日午前
に宮崎県都城市の陸自第43普通科連隊が先
行して陸路で入り、給水活動に取り組んだ
西原村教育委員会の南利孝文係長は「自衛隊
が来てくれたおかげで、ようやく避難所とし
て機能できるようになった」と語っ



<https://twitter.com/ken04095288/status/721895358968631296>

This user
evacuated to
Tōryō HS

瑞花
@1210Ruka

フォローする

家族全員なんとか無事です
家にはヒビが入り棚ほぼ全部倒れてお風呂場
はタイルが剥がれトイレはガラスが割れて自
分の部屋見たら本棚ばった一ん倒れてまし
た現在東陵高校で避難中です皆無事であり
ますように



<https://twitter.com/1210Ruka/status/720638451461148672>

Call for attention
to sneak thieves

ともぞ〜@4/19、20神戸!
@tomozoh_glay

フォローする

8時頃に発信された情報です。
熊本市立白山小学校付近に、現れたカップル
を装った2人組が、被災者の家を物色する、
40から50代の2人組。
現在は北区の方にいる模様です。#もっと伝
えたい熊本地震



https://twitter.com/tomozoh_glay/statuses/721899414218911744

Earthquake causes mental illness

We found users who are affected by the **Earthquake** mentioned **mental illness**. It's essential to find out those users and provide an appropriate treatment.

It's really unwilling to resume taking an incense-taste **Chinese herbal medicine** and **anxiolytic**. If only **the Earthquake** didn't happen...

(お線香の味がする**漢方薬**と、**抗不安薬**を再開することになるなんて、本当に不本意。**地震**さえなければ...)

Table 4 from T. Aoki et. al. "Possibility of Mental Care via SNS Analysis for Disaster Affected People", ("震災被災者のソーシャルメディア分析を通じたメンタルケアの可能性")

Expensive to manually find out those users



Identify from tweets!

IBM Watson™ Personality Insights

- A tool to predict the personality of an author from the text
 - **“Personality affects linguistic production”** [Mairesse+,2007]
 - Focus on the feature such as frequent use of ‘I’, polite form (です・ます調), and particle (助詞)
- Represent a characteristics by BigFive

Predicted personality of Yu Darvish (@faridyu)

ダルビッシュ有(Yu Darvish) @faridyu · 5月13日
 返信先: @KFYEXgpyyHIZ8r0さん
 まず整形外科でMRIなり撮らないとなにもわからないです。
 1 1

ダルビッシュ有(Yu Darvish) @faridyu · 5月13日
 返信先: @KFYEXgpyyHIZ8r0さん
 ギャロのサヨナラホームランで4連勝！！
 28 94 1,015

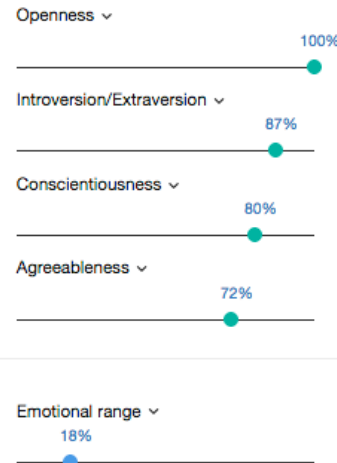
ダルビッシュ有(Yu Darvish) @faridyu · 5月12日
 返信先: @pjpjhiroさん
 特に決まってはいませんでした(^^;
 2 3

ダルビッシュ有(Yu Darvish) @faridyu · 5月12日
 返信先: @ToMLBJ23さん
 魚も特に好きではないですね。
 基本的に噛むのに力があるものはあまり好まないです(^^;
 1 1

ダルビッシュ有(Yu Darvish) @faridyu · 5月12日
 返信先: @ToMLBJ23さん
 いや多分いませんでした(笑)
 1 7



Personality *% = percentile



<https://personality-insights-livedemo.mybluemix.net/>

<https://twitter.com/faridyu?lang=ja>



Personalities of people affected by the disaster

- BigFive **didn't change** before, during, and after the earthquake
- However, sub-profile **changed** through the earthquake
- Personality Insights **can potentially find out mentally ill users**

BigFive profile	Before the Earthquake	During the Earthquake	After the Earthquake
Sub-profile			
Emotional Range	0.521	0.538	0.512
Sensitivity to stress	0.568	0.695	0.583
Openness	0.506	0.487	0.495
Adventurousness	0.489	0.363	0.467
Intellect	0.495	0.39	0.481
Conscientiousness	0.539	0.518	0.535
Cautiousness	0.513	0.702	0.532



T Nasukawa, "Understanding Personality and Leverage in Action – Mechanism and Possibility of Personality Insights",
 "性格を把握してアクションに生かす - Personality Insightsの仕組みと可能性 -"

Tweets from newly found mentally ill users

Even though I'm normally **worried** about tomorrow and **concerned** if I could sleep today, I was struck with **fear** by the last **earthquake** and so I **can't sleep** any more

(ただでさえ明日が**不安**で今日眠れるか**心配**してたのに、さっきの**地震**で**恐怖**襲ってきて、絶対に**寝れない**)

The **earthquake** just now **really got me scared** –
Until when will **this aftershock** continue?

(今の**地震**本当に**怖かった**—**余震**ていつまで続くの)

Recently **aftershocks** somewhat come to often occur again, right? **Earthquakes** at night is my **trauma**

(なんかまた最近**余震**増えてない？もう夜中の**地震**すごい**トラウマ**なんだけど)

Table 8 from T. Aoki et. al., "Possibility of Mental Care via SNS Analysis for Disaster Affected People", "震災被災者のソーシャルメディア分析を通じたメンタルケアの可能性"

Wrap Up

[Text] Missing item identification

- Identified missing items and analyzed when and where the item is missing
- Volunteers can supply effectively the items with the appropriate time and location

[Image] Damaged state understanding

- Collected disaster images to grasp the states of the disaster areas
- Enable monitoring based on shelters

[Personality] Identification of users needed mental clinic

- Identified users who potentially have a mental illness
- Be able to save the cost to find mental ill patients manually

- Tweets used in this presentation are referred to on May 19, 2017.
- IBM® Watson Explorer Advanced Edition Analytical Components V11.0 is a trademark of International Business Machines Corporation in USA and the other countries.

End of the File