Data Revolution for Sustainable Development Goals and Humanitarian Action

Jong Gun Lee

Data Scientist and Research Lead
Pulse Lab Jakarta – UN Global Pulse
United Nations Global Pulse

A flagship innovation initiative of the United Nations Secretary-General on the data revolution

Vision
Big Data harnessed responsibly as a public good

Mission
Accelerate discovery and adoption of big data innovation for sustainable development and humanitarian action
What people say
Social media (content focus)
Online advertisement
Complaint system
Radio

What people do
Social media (location focus)
Mobile data
Utility usage data
Postal data
Transportation data
Searching keywords
On-/ offline retail data
Remote sensing
Remotely Sensed Satellite Imagery for Rapid Poverty Assessment
Various New Sources of Data for Commodity Price Dynamics

**Social Media**

\[ p_{i+1} = \frac{\alpha P_i + \beta \text{MoT}_{i-1}}{\alpha + \beta} \]

\[ p_{\text{tweets}} = \frac{\sum_{j=1}^{T_i} w_j T_j}{\sum_j w_j^2} \]

\[ w_{i+1} = \begin{cases} 1 - \frac{|p_{i+1} - P_i|}{\delta} & \text{if } |p_{i+1} - P_i| \leq \delta \\ 0 & \text{otherwise} \end{cases} \]

\[ P_i = \frac{\sum_{j=1}^{T_i} P_j}{k} \text{ where no tweets over } n \text{ days} \]

**Google Search**

\[ P_i = \alpha + \beta_1 \text{MoT}_{i-2} + \beta_2 \text{MoT}_{i-4} + \beta_3 \text{GT}_{i-1} + \beta_4 \text{GT}_{i-1} + \beta_5 \text{GT}_{i-3} \]

**Crowdsourcing**
Mobility Insights from Mobile Data for Disease Outbreak Prediction
Airtime Purchase Records (Top-up) for Food Consumption Statistics
Anonymized, Aggregated Microfinance Data for Financial Inclusion by Gender

5 GENDER EQUALITY

2010

2011

2012

2013

2014

2015

2016

Gender

Gender

Gender

Gender

Gender

Gender

Gender

Male

Female

Male

Female

Male

Female

Male

Female

Male

Female

Male

Female

Male

Female

Male

Female

Male

Female

Saving

<5

5-50

50-100

100-1000

1000-10000

>10000

Saving

<5

5-50

50-100

100-1000

1000-10000

>10000

Saving

<5

5-50

50-100

100-1000

1000-10000

>10000

Saving

<5

5-50

50-100

100-1000

1000-10000

>10000

Percentage

Percentage

Percentage

Percentage

Percentage

Percentage

Percentage

Percentage

0% 25% 50% 75% 100%
Water (Energy) Consumption Data for Clean Water (Energy) Accessibility
**International Postal Flows for Economic Growth Tracking**

<table>
<thead>
<tr>
<th>Type of event reported</th>
<th>International tracking ID #</th>
<th>Corresponding domestic tracking ID #</th>
<th>Country of origin</th>
<th>Country of destination</th>
<th>Date and time</th>
<th>Item was posted by customer ‘CY1224’</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EMA+CP012374226IN:::21200015891152+ES+1410241030+75-243</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+(66) 66 666 666:<a href="mailto:MIGUEL@UN.ORG">MIGUEL@UN.ORG</a>: MR.LUENGO:28100+1+3+A+LP+R+0.055:0.051:0.00358+127.43:INR+DDU+0:EUR:BIC NUMBER:IBAN NUMBER+301+MONS::43:CALLE CANALETAS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>28100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Postcode of sender**

- **Gross and net weight of item**

- **Amount paid for postage and currency**

- **Place of sender**

**Item was posted at office ‘75-243’**

- **Date and time**

**1.1.2014**
Public Transportation (Usage) Data for Better Infrastructure Planning
Community Radio Mining for Timely Information from Rural Areas
Social Media Usage Pattern for Human Development Index
Social Media Location Mining for Inter-city Commuting Statistics
Public and Private Sector Data for Cyclone Management in Pacific

1. FIJI ISLAND
Social Media Data
- Start: Monday, 1 Feb 2016 00:00 AM
- End: Monday, 29 Feb 2016 23:59 PM
- Duration: 28 days
- Twitter: 532 Tweets
- Facebook: 750 Conversations
- Instagram: 135 Images

---

1. FIJI
2. VANUATU
3. MICRONESIA, FEDERATED STATES OF
4. KIRIBATI
5. MARSHALL ISLANDS
Public and Private Sector Data for Haze Crisis in SEA

Leaflet | Tiles © Esri — Source: Esri, DeLorme, NAVTEQ, USGS, Intermap, iPC, NRCAN, Esri Japan, ME
Citizens’ Active and Passive Voices for Enhanced Decision Making
How data science and analytics can contribute to sustainable development

**BIG DATA & THE SDGs**

<table>
<thead>
<tr>
<th>SDG</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NO POVERTY</td>
</tr>
<tr>
<td>2</td>
<td>ZERO HUNGER</td>
</tr>
<tr>
<td>3</td>
<td>GOOD HEALTH AND WELL-BEING</td>
</tr>
<tr>
<td>4</td>
<td>QUALITY EDUCATION</td>
</tr>
<tr>
<td>5</td>
<td>GENDER EQUALITY</td>
</tr>
<tr>
<td>6</td>
<td>CLEAN WATER AND SANITATION</td>
</tr>
<tr>
<td>7</td>
<td>AFFORDABLE AND CLEAN ENERGY</td>
</tr>
<tr>
<td>8</td>
<td>DECENT WORK AND ECONOMIC GROWTH</td>
</tr>
<tr>
<td>9</td>
<td>INDUSTRY, INNOVATION AND INFRASTRUCTURE</td>
</tr>
<tr>
<td>10</td>
<td>REDUCED INEQUALITY</td>
</tr>
<tr>
<td>11</td>
<td>SUSTAINABLE CITIES AND COMMUNITIES</td>
</tr>
<tr>
<td>12</td>
<td>LIFE BELOW WATER</td>
</tr>
<tr>
<td>13</td>
<td>LIFE ON LAND</td>
</tr>
<tr>
<td>14</td>
<td>PEACE, JUSTICE AND STRONG INSTITUTIONS</td>
</tr>
<tr>
<td>15</td>
<td>PARTNERSHIPS FOR THE GOALS</td>
</tr>
</tbody>
</table>

- **NO POVERTY**: Spending patterns on mobile phone services can provide proxy indicators of income levels.
- **ZERO HUNGER**: Crowdsourcing or tracking of food prices listed online can help monitor food security in near real-time.
- **GOOD HEALTH AND WELL-BEING**: Mapping the movement of mobile phone users can help predict the spread of infectious diseases.
- **QUALITY EDUCATION**: Citizen reporting can reveal reasons for student drop-out rates.
- **GENDER EQUALITY**: Analysis of financial transactions can reveal the spending patterns and different impacts of economic shocks on men and women.
- **CLEAN WATER AND SANITATION**: Sensors connected to water pumps can track access to clean water.
- **AFFORDABLE AND CLEAN ENERGY**: Smart metering allows utility companies to increase or restrict the flow of electricity, gas or water to reduce waste and ensure adequate supply at peak periods.
- **DECENT WORK AND ECONOMIC GROWTH**: Patterns in global postal traffic can provide indicators such as economic growth, remittances, trade and GDP.
- **INDUSTRY, INNOVATION AND INFRASTRUCTURE**: Data from GPS devices can be used for traffic control and to improve public transport.
- **REDUCED INEQUALITY**: Speech-to-text analytics on local radio content can reveal discrimination concerns and support policy response.
- **SUSTAINABLE CITIES AND COMMUNITIES**: Satellite remote sensing can track encroachment on public land or spaces such as parks and forests.
- **LIFE BELOW WATER**: Maritime vessel tracking data can reveal illegal, unregulated and unreported fishing activities.
- **LIFE ON LAND**: Social media monitoring can support disaster management with real-time information on victim location, effects and strength of forest fires or haze.
- **PEACE, JUSTICE AND STRONG INSTITUTIONS**: Sentiment analysis of social media can reveal public opinion on effective governance, public service delivery or human rights.
- **PARTNERSHIPS FOR THE GOALS**: Partnerships to enable the combining of statistics, mobile and internet data can provide a better and real-time understanding of today’s hyper-connected world.
## Value for sustainable development

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>New insights</td>
<td>New sources provide data historically unavailable, yielding new insights</td>
</tr>
<tr>
<td>Cost of data collection</td>
<td>Digital systems can be significantly less resource intensive than traditional statistics</td>
</tr>
<tr>
<td>Risk of data collection</td>
<td>Allows remote analysis, allowing data to be tracked in risky or unstable locations</td>
</tr>
<tr>
<td>Speed of response</td>
<td>Response can significantly improve on lag in traditional statistics</td>
</tr>
<tr>
<td>Adaptive execution</td>
<td>Continuous real-time feedback allows strategy to evolve with changing realities on the ground</td>
</tr>
</tbody>
</table>
“THE DATA REVOLUTION IS GIVING THE WORLD POWERFUL TOOLS THAT CAN HELP USHER IN A MORE SUSTAINABLE FUTURE.”

- BAN KI-MOON, UN SECRETARY-GENERAL

jonggun.lee@un.or.id

@unglobalpulse
@pulselabjakarta
@pulselabkampala
### The Information Gap

<table>
<thead>
<tr>
<th>Topic</th>
<th>1 Year</th>
<th>2 Years</th>
<th>3 Years</th>
<th>4 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunger and Poverty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender Aginity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AIDS and Malaria</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Household-level data is challenging to collect on a real-time basis, making development progress difficult to track. (Source: Millennium Development Goals Report, 2011)
Whether using our phones, shopping online or posting on social media, the activities that we undertake everyday generate an ocean of digital data. Once anonymised to protect privacy, this 'big data' can reveal insights on changes in human well-being, as well as real-time feedback on the efficacy of public policy, development programmes and humanitarian action.
Global Pulse is a United Nations innovation initiative that explores how new, digital data sources and real-time analytics technologies can provide a better understanding of changes in human well-being and emerging vulnerabilities. However, legitimate concerns about privacy and data protection present challenges to harnessing Big Data sets for public benefit.
OUR PRIVACY & DATA PROTECTION PRINCIPLES

We access, analyze, store, transmit or otherwise use only data that has been obtained by lawful and fair means, including, where appropriate, with the knowledge or consent of the data subject.

We do not access data containing personal information on any individual, without the knowledge or proper consent of the data subject.

We never access the content of private communications, without the knowledge or proper consent of the data subject.

We never attempt to re-identify anonymised data, without the knowledge or proper consent of the data subject.

We will only access, analyse, store, transmit or otherwise use data in accordance with the purposes for which the data has been properly and lawfully obtained.

We ensure reasonable and appropriate technical and organisational safeguards are in place to prevent unauthorised disclosure or breach of data.

We design, carry out, report and document our activities with accuracy and transparency.

We employ even stricter standards of care while conducting research among vulnerable populations and persons at risk, children and young people, and any other sensitive data.

We perform due diligence when selecting data or service provider partners and ensure their activities comply with the United Nations’ global mandate.

We ensure that our research partners are acting in compliance with relevant law, privacy and data protection standards.