Summary Notes: Discussion on data science and ethics within the Humanitarian Sector

1400 BST July 3rd 2018

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Agenda (planned): 1) Participant introductions; 2) Introduction to the inception of the group; 3) What type of data science practices are organizations working on & in what phase; 4) Which datasets are being used in what models; 5) Current concerns of data science applications; 6) Longer term planning for this group; 7) AoB & close the meeting; **Agenda (actual):** 1) Participant introductions; 2) Introduction to the inception of the group and listing of expectations; 3) What type of data science practices are organizations working on; 4) What type of initiatives related to ethics and data science are organizations working on; 5) Current concerns of data science applications; 6) Planning for continuing discussing; 7) Summary of action points.	**ACTION 1 (A1): Define better the agenda for the next meeting** (please provide comments, topics and feedback to agenda)
Overview: This first meeting was a promising discussion that clarified some of the different parties' activities and expectations, as well as exploring broadly the many pressing issues at the juncture of data science, ethics and humanitarianism. The enthusiasm and breadth of the discussion underscored the importance of bridging between data collectors, data scientists and ethicists, just as the complexity and variety of issues and actors highlighted the need for a defined scope for future meetings. Participants suggested the need to develop a common typology of tools and applications, peer-review processes, and methods of data science, perhaps based on requirements defined by both ethicists and data scientists.	**ACTION 2 (A2): Define problem space for group** (we received a list of topics, during and after the meeting. If you could select or add your top 3 priorities and share before our next meeting, discussion will be more focused).
Introduction to the inception of the group and listing of expectations: A key expectation voiced in the meeting was a suggestion to keep a strong, practical data science perspective that provides a forum for data scientists in the sector who ordinarily work in isolation from each other to be in communication with one another and with ethicists and operational experts. A second key theme were the differences and analogies between humanitarian data science and non-humanitarian data science work (e.g. what data scientists do differently because of working in the field of humanitarian action). The final theme in expectation was to reconcile perspectives, terminology and expectations from data scientists, ethicists and operational experts in defining a practical output for this group.	**ACTION 3 (A3): Compile information on data science practices and share with group** included for your feedback / input Also relates to **(A2)**

What type of data science practices are organizations working on: The organizations included in this meeting are presently involved in data science practices that tend to center on better flagging and categorizing crisis situations (or preparedness situations), better understanding risk and vulnerabilities, mapping vulnerable populations, and aiming for predictive capabilities in crisis scenarios. These activities involve analysis of social networks and cellular data, or else data generated from population monitoring initiatives. Satellite and drone imagery are also being investigated as a source of real time information, which together with the aforementioned social, cellular, and monitoring data is being experimented with via new algorithms and modelling techniques. See page **6** for a summary list of what organizations are currently working on, data used, and concerns with current practices, as discussed during the meeting or submitted during follow up discussions.	**ACTION 4 (A4): Define possible ways for peer review** related to methods, algorithms, results, to support data scientists. Discussion in next meeting on how to pursue this idea and put it in practice.
What type of ethics for data science are organizations involved in: In this first meeting we discussed ethics with perspectives shared by participants, but did not collect systematic information on ethics work. If useful, we could add similar description as to that of data science practices. Participants are welcome to submit input. It may be useful to use this group to gather data scientists and plan a sequence of presentations on different ethics work streams, to receive recommendations of how to increase awareness among humanitarian data science experts. **What type of operations that relate to data science are organizations involved in:** Organizations mentioned work related to data collection and data sharing; as well as tests to implement models in operational contexts.	Also relates to **(A2)** If useful, we can add list of ethics work after the data science practices (distribution with notes from next meeting)

Moving Forward

- Next Meeting, August 7th 3pm BST. **Proposed Agenda** (please share feedback/comments/topics):
  - MAIN TOPIC: Definition of operational problem space (see feedback received, copied below; could you select your top 3 priorities and let us know before the next meeting; it will help to move the discussion)
  - Definition of requirements – perspectives of data scientists
  - Contributions, ongoing initiatives that can provide input to this group, ongoing initiatives that can receive input from this group
  - Identify some examples from ongoing model work that would be interesting to discuss with other data scientists and ethicists

List of concerns: Current concerns related to data science applications by the mixed discipline group (input and ideas received from participants):

PLEASE SELECT 3 and send (if possible) before the next meeting. Please also share topics that need to be added, should they be on your top 3 priorities and not included below. Would be great to have your view on prioritization, from 1 (highest priority) to 3. Input from colleagues can be used during the discussion on operational problem space. Feedback to be sent to Robert Trigwell (rtrigwell@iom.int**)**

- Degree of **data literacy** of people using the models and results – can sometimes be open to interpretation for various reasons
- Need for **peer review and exchange**: Ideally, before findings of an analysis are publicly communicated or before an algorithm is fully employed for decision-making etc., endorsement of at least one other data scientist. At present many models and research are presented as 'scientific evidence' but with no peer-review as in scientific publication or even a system of validating models. Potentially maintaining quarterly **communications**. Not a full-fledged journal but a collection of **short articles updating the peer group** on what is being worked on. These could be easily adapted from (or simply reproductions of) internal short documentations. Annual **workshops.**
- Need for basic **quality control** and **transparency**: **Codes** to be disclosed (to the extent possible) among data scientists; **Training data** to be disclosed among data scientist; **Testing routines** for algorithms to be developed and their **results** to be disclosed among data scientists
- Capacity building and **education:** The three groups of 1) **ethical** experts 2) **data** science experts and 3) **operational** experts need a **platform** to teach each other the **basics of their respective work** in order to find a **common language** and understanding of respective concerns and requirements. Once these three have found a common language they could jointly produce an **education** product describing **risks** and **benefits** of the data science techniques currently used
- Need to clarify **accountability**: Who is accountable for the **decisions** made based on a **complex** data **analysis**?
- It can be difficult to **validate** different models, based on their data source (e.g. disaster risk models can have more historical data compared to conflict models)
- Hard to **communicate** that these models don't provide '**predictions'** but rather a risk profile – everyone is looking for the crystal ball
- Models are **used** by non-technical experts who don't understand the limitation or the limits of application of the model
- Some models developed may not be **effective** at field level, and therefore need a "**ground truthing**" element to them
- How can we ensure that **Humanitarian information activities** are intended to fulfil the **principle** of humanity - I.e. maintain dignity and alleviate suffering
- Tech practices may not provide all the answers, there can be a techno-exceptionalism, that may lead to an **over-reliance on models**
- No clear line of **reporting** -- neither for **risks** we are afraid of nor for things that actually went wrong
- How can we prevent **accidental harm through data science activities**. Currently we have no minimum standards for HIA, either through negligence or intent.

- A lot of the discussions about the ethics of models, AI, data science practices etc, but lack of specification to the humanitarian sector - I.e. how this is **specific to the humanitarian sector**. How do we better tie in humanitarian **principles** with the work in comparison to other sectors (I.e. this is what defines us as humanitarians – we have to abide to the Geneva convention)
- The current discussions on this topic can sometimes be too **siloed**, all discussions need to include a broader spectrum of stakeholders involved in discussions (e.g. data modellers, field practioners, ethical advocates, lawyers, donors). **When** to involve all.
- There is a need to overcome the **confidentiality** of barriers, and the risk of what we are doing.
- Data science practices and the proliferation of data itself may enhance the ability to **re-identify anonymized data**. There is a need to identify key/sensitive **variables** in order to **detect record-level exposure risk**
- Outputs are interpreted without bearing the necessary **caveats** and uncertainties in mind

- **Anonymity** in datasets - monitoring for application of data standards in publicly available data
- Sensitivity of projects and **impact of models** on humanitarian situations
- Algorithmic **bias** - processes around peer review and external (end-user) review
- Building data science **applications into existing** reporting and analytical processes
- Technology often advances **faster** than the **capability of humanitarian organizations** to integrate them into practice with the appropriate **competencies** and **governance**
- Trends in the sector lean towards a mixture of internal and external expertise; hybrid **partnerships** raise questions about the **re-use of data/algorithms by third-party/private sector actors**
- Organizations that engage in humanitarian data collection, research, and use of AI and ML technologies **work across jurisdictions** and contexts and are subsequently subject to a wide range of legal regimes
- The range of **risks to the affected are not fully understood**; there are a lack of sector wide **mitigation** strategies for **known risks**, such as inherent **bias** and the potential for **dual use**
- There is a lack of an agreed **ethical framework** governing and use of these technologies in practice
- The sector's **competitive funding environment** drives risk taking and makes data a competitive asset/advantage

Annex 1: Contact List

Participants in last meeting

Name	Organization	Email
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Expanded contact list (not in last meeting, also receiving these notes. If you're considering to suggest other colleagues to participate in these discussions, please check whether they already are in the list below)

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Annex 2: Quick summary of who is doing what

What type of data sciences practices are organizations working on & in what phase (some information provided by colleagues during and after the meeting, if you would like to add information we can keep updating this section until it has a good description of different initiatives; it can be useful to connect with other data scientists working on similar issues; related to action point on selection of some pieces of work for discussion between data scientists, maybe in September)

IOM DTM: ***Work streams:*** **1. Outlier and anomaly detection** for quality assurance and semi-automated verification processes in country and global databases (Initial algorithmic development completed, second phase of piloting, user interface in development); **2. Wave models for visualization** of information collected in flow monitoring points (algorithmic development completed, testing completed, implemented for 9 countries, good confidence in scalability); **3. 3D modelling based on UAV imagery** for site planning (algorithmic development completed, testing completed, currently implemented for 1 country, good confidence in scalability, limitations in use in conflict areas); **4. Location ranking** based on departures, returns, incidents and components stability (Initial algorithmic development completed, principal component analysis, testing expanded to 1 additional country, implemented in 2 countries, requires adaptation for scalability, requires input from follow up phase in country); **5. Risk index** related to GBV risk factors (seems to present too many limitations for scalability and use); **6. Prediction of IDP figures in upcoming rounds of DTM** for quality control and preparedness (algorithmic development completed, random walk simulation, testing completed, implemented for 1 country, piloted for 2 countries, good confidence in scalability, requires adjustments in workflows for operational use in preparedness, requires components of quality control); **7. Prediction of returnee figures in upcoming rounds of DTM** to trigger changes in data collection related to development/transition/solutions (under development). ***Datasets used:*** DTM Mobility Tracking data***;*** DTM Flow Monitoring data***;*** WorldPop data***;*** ACLED data***;*** FewsNet food security and livelihoods data; IOM internal surveys; INFORM and IASC's EWEAR and data inside such reports; HDX geographical data (JSON, shapefiles) + DTM Reference Geodatabase ***Models used:*** Bayesian inference and Naïve Bayesian; Regressive models; Econometric methods; Graphical models / network models; Time series auto-regressive models (from AR to ARIMA); Stochastic processes (Random Walks, Markovian processes, Geometric Brownian, etc.); Supervised and unsupervised machine learning.

Centre for Humanitarian Data: ***Work streams:*** **1. Predictive** analytics projects: Pilot building on the WB FAM model to evaluate the **amount of humanitarian financing for IPC phase predictions**. In early stages, first phase to be complete at the end of July. **2.** Ongoing **data cleaning** and tool

development for HDX; **3.** Working on the **retrieval of data** from a variety of sources such as Excel file downloads and JSON APIs, the processing of data including cleaning and standardisation, quality control of data particularly determining how up to date it is and library development to accelerate these tasks and push towards greater automation. ***Datasets used:*** Food security and IPC analysis; Population; Settlement Files; Administrative Boundaries; ACLED data; Health indicator; Global Food Prices; Water prices; 3W data matrix; Beneficiary data; CBPF data; CERF data; IDP Information; NDVI

IDMC: Work streams: 1. **GIS analyses** Using satellite imagery analysis to obtain information on housing destruction where we don't have other sources of information http://www.internal-displacement.org/innovation . DONE **2. GIS analyses** Working with Google+WFP+UNOSAT to automate this analysis (pattern recognition and Machine Learning). ONGOING; **3. Risk model** Developed a **global disaster displacement risk model** which takes into account three layers of raster data : exposure, hazard, vulnerability. The model can estimate the number of people expected to be displaced by a given event http://www.internal-displacement.org/publications/global-disaster-displacement-risk-a-baseline-for-future-work . DONE, some enhancements planned; **4.** Developing a **conflict displacement risk model** using the full library of WB indicators as features and IDMC data as observation to estimate the risk of conflict induced displacement. The analysis makes use of clustering and statistical correlations to predict the risk class. IN PROGRESS; **5. text mining, NLP and ML** Developed a **global displacement monitoring platform** http://www.internal-displacement.org/monitoring-tools/monitoring-platform where we show the input of: IDETECT https://uniteideas.spigit.com/main/Page/PCIDETECT which automatically extracts displacement facts from thousands of sources every day + A compilation of hazard monitoring systems (GDACS, PDC and others) + ACLED events; **6. Social media** Ongoing collaboration with Facebook to **estimate scale and duration of displacement** from users' location data and safety checks; **7.** Using **tweets to identify new floods** in partnership with https://www.globalfloodmonitor.org/). ***Datasets used:*** GIS analyses - Satellite images come from a wide range of providers; Training datasets for the ML algorithm come from UNOSAT and other partners; Risk model: Disaster risk model (same as UNISDR GAR model) The global-level exposure model was developed by UNEP-GRID and CIMNE in collaboration with the World Agency for Planetary Monitoring and Earthquake Risk Reduction (WAPMERR), the European Commission's Joint Research Centre (EU-JRC), Kokusai Kogyo and Beijing Normal University. The hazard models for cyclones and earthquakes were developed by the International Centre for Numerical Methods in Engineering (CIMNE) and INGENIAR Ltda with inputs from the Global Earthquake Model (GEM). Those for floods were developed by the International Centre on Environmental Monitoring (CIMA) and UN Environment's global resource information database (UNEP-GRID); and those for tsunamis and volcanoes by Geoscience Australia with the Norwegian Geotechnical Institute (NGI) and the Global Volcano Model Network (GVM) respectively. Vulnerability was modelled by CIMNE with INGENIAR Ltda for Latin America and the Caribbean, and by Geoscience Australia for the Asia-Pacific region. In other regions, the Hazus software developed by the US Federal Emergency Management Agency (FEMA) was used. Agricultural drought risk assessments were undertaken by the Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD) and the Famine Early Warning Systems Network (FEWS NET); Conflict risk model: WDI indicators from the World Bank database + Displacement data from IDMC; Monitoring platform: Input URLs from GDELT + Hazards from GDACS + Events from ACLED; Social media: FB data (data sharing agreement, not publicly available) + Tweets

Leiden University: ***Work streams:*** ***1.*** Prediction (anomaly monitoring) - (Prototyping phase); **2.** Event classification - (Developing an open source microservice); **3.** Text processing/classification - (Developing an open source microservice); **4.** Social network analysis - (Prototyping phase) ***Datasets used:*** Prediction (anomaly monitoring) - Unstructured data: Twitter. Semi-Structured: ACLED, IATI. Structured: indexes (E.g: INFORM, Food prices, global peace index, market prices); Event classification - Unstructured data: Twitter. Semi-Structured: ACLED, IATI. Structured: indexes (E.g: INFORM, Food prices, global peace index, market prices); Text processing/classification - Unstructured data: Facebook messenger, twitter, web scraping; Social network analysis - Semi-structured data: Twitter relationships, Structured data: Creditcard transaction data, call detail record.

FlowMinder: ***Work streams:*** Workflow involves data cleaning and pre-processing, exploratory analysis, statistical and mathematical modelling, training and developing machine-learning models. ***Datasets used:*** Mobile Phone Data (call detail record (CDR) and 'top up' data); Satellite data; Nationally representative secondary survey data, e.g. Demographic & Health Surveys (DHS); Primary survey data (face to face and telephone modes)