Accelerating progress towards the SDGs

Track 3:

The Eye in the Sky: Space, AI & Satellite

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As the UN specialized agency for information and communication technologies, ***ITU is well placed to guide*** *AI innovation towards the achievement of the UN Sustainable Development Goals.*

We are ***providing a neutral platform*** *for international dialogue aimed at building a common understanding of the capabilities of emerging AI technologies.*

- Houlin Zhao, Secretary General of ITU

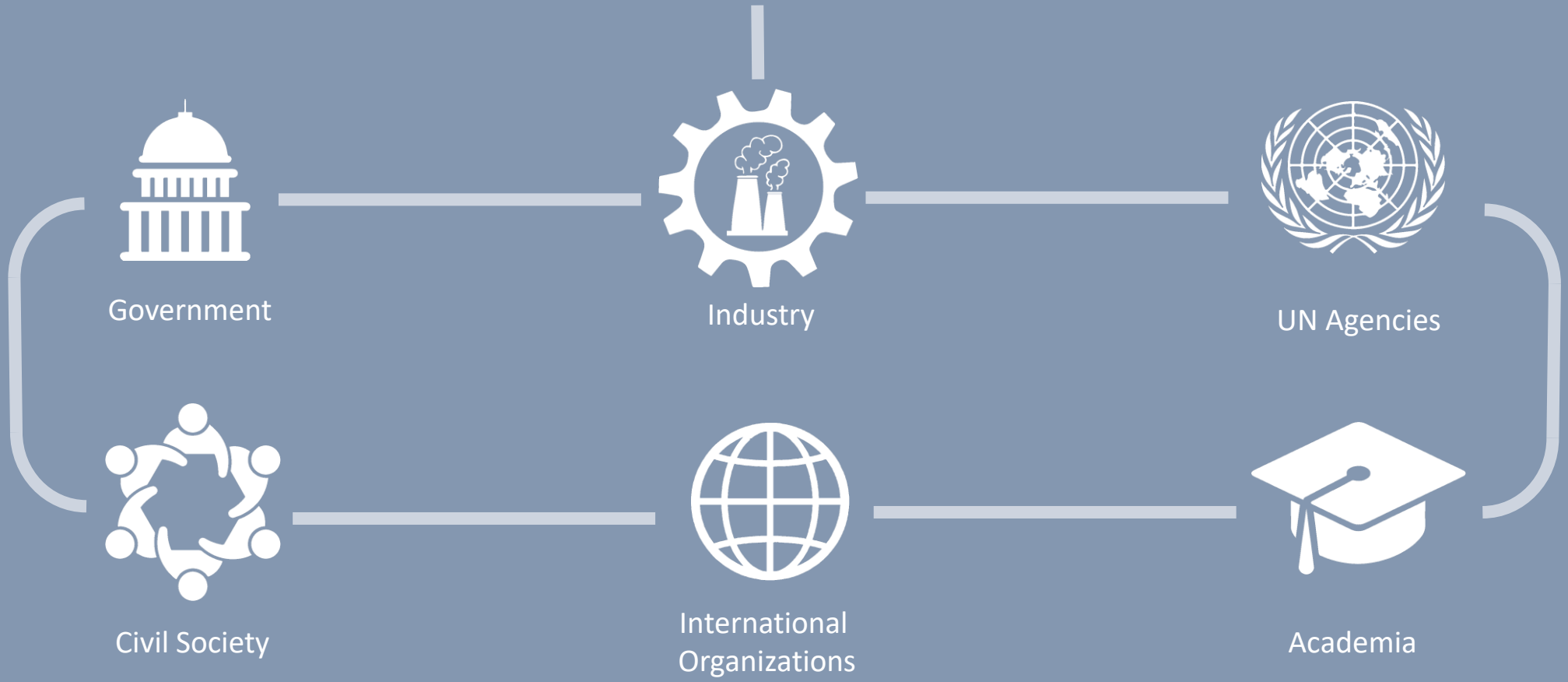
GOAL

Formulate strategies to ensure **trusted**, **safe** and **inclusive development** of AI technologies and **equitable access** to their benefits

- 2017 summit = first ever inclusive global dialogue on beneficial AI
- 2018 summit = focused on impactful AI solutions able to yield long-term benefits and help achieve the SDG.

MULTI-STAKEHOLDER

AI for Good
Global Summit



Partnership

XPRIZE Foundation

Association for Computing Machinery (ACM) and

sister United Nations agencies including UNESCO, UNICEF, UNCTAD, UNIDO, Global Pulse, UNICRI, UNODA, UNIDIR, UNODC, WFP, IFAD, UNAIDS, WIPO, ILO, UNITAR, UNOPS, OHCHR, UN University, WHO, UNEP, ICAO, UNDP, The World Bank, UN DESA, CTBTO, UNISDR, UNOG, UNOOSA, UNFPA, UNECE, UNDPA, and UNHCR.

3 steps approach

Teams proposed **impactful AI strategies** able to be enacted in the near term, guided by an expert audience of mentors representing government, industry, academia and civil society.

Strategies were **evaluated by the mentors** according to their feasibility and scalability, potential to address truly global challenges, degree of supporting advocacy, and applicability to market failures beyond the scope of government and industry.

The exercise connected AI innovators with public and private-sector decision-makers, **building collaboration** to take promising strategies forward.

“The world is too complicated for humans to comprehend, but, with AI, perhaps we can.”

“Satellite imagery is a much vaster source of data than we have ever had access to.”

“The question is *are we good?* and NOT *are the technologies good?* “

AI for Good Global Summit REPORT

Track 3:
The Eye in the Sky:
Space, AI & Satellite

Team Lead: Stuart Russell (Berkeley)

Members:

Lars Bromley, Einar Bjørgo (UNOSAT)

Miguel Luengo-Oroz, Marguerite Nyhan (UN Global Pulse)

Andrew Zolli (Planet)

James Crawford (Orbital Insight)

Track 3 : Objectives

How satellite imagery together with AI and machine learning can help meet the SDGs ?

a. Identify challenges

to large-scale automated analyses of satellite imagery libraries that inform models and knowledge systems on sustainable development

b. Create partnerships

among the artificial intelligence community, satellite imagery providers, research labs, analysts, sustainable development implementers in Member States and the United Nations system, and others

c. Discuss AI methods

for rapid and accurate analysis of satellite imagery that can feed into decision-making processes at national levels

d. Satellite imagery to inform national decision-making

for sustainable development : measure multiple indicators repeatedly over time and across large areas

e. Seek to create a framework for ‘challenges’

whereby specific satellite imagery analytical tasks are posed to the machine learning community to solve

Much needs to be done to better quantify relative concepts like poverty and wealth from mapping analytical outputs

Satellite imagery, along with aerial imagery, and AI can be used for detecting and measuring thinning of upper-story trees, loss of understory trees and other vegetation, changes in overall water levels, and the growth of new trees in areas being restored.

AI can be used to **assess and understand agricultural production** to avert famine, maximize market returns for smallholders, and develop tailored insurance policies to mitigate the impacts of crop failures

Track 3:
The Eye in the Sky: Space, AI & Satellite

7 Key Takeaways

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Key Takeaways from the Track 3: Satellite (1/3)

1. Since 2017, it is possible to **image the entire Earth's surface** to conduct **ultra large-scale analysis** of continents in **near real time**
   However, there is a trade-off between the availability of high-res data (which is available every few days) and low-res data (potentially every day), with high-res data obviously more costly and expensive to obtain.

2. Global satellite monitoring might even prove the equivalent of **global 'closed-circuit TV (CCTV)'**, and can be used to hold Governments and other parties **accountable for their actions**
   – e.g. mapping burning villages in conflict areas, or potentially mapping carbon dioxide emissions for future conformance/compliance with the Paris climate accords or other agreements.

3. We are moving from historical analysis to **real-time information** (e.g. retreat of the ice caps) and we shall increasingly move to **predictive modelling**.
   Using AI means we can also economize on human analysis time and save the human analyst time for the tasks really needed.

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Key Takeaways from the Track 3: Satellite (2/3)

4. We are moving from data asymmetries/poverty to **information asymmetries** with a potential impact on whole markets
   – e.g. foreknowledge of steel production depending on furnace heat, or size of potential oil reserves in a new discovery.

5. The purposes we think imagery (and the associated data) may be used for are **not always how they get used** – we think they may be used to achieve the SDGs, when in fact it may make exploitation even more efficient. Privacy also needs to be secured.
   There are a number of major users of satellite data not even at the development table or talking with the development community (military on truck movements, Wall Street for crop yields and taking positions on the futures market).

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Key Takeaways from the Track 3: Satellite (3/3)

6. For deforestation, a **road going into an area is the best predictor** of the development of agriculture (electrification and a potential increase in local incomes) within five years, as well as predictor of deforestation.
   This means that while satellite imagery could help with the monitoring of certain SDGs (e.g. for tracking climate change), it could also help humankind become even better at finding and exploiting the Earth's natural resources (including fish reserves). **There may literally be nowhere to hide from the eye(s) in the sky!**

7. Regional learning in predictive models – algorithms trained in Africa may not always work in India – there are **dangers in generalizing**, while models can only be as good as the data they are trained with – the quality of the data can determine the quality of the model.

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For more information

ITU NEWS – AI for Good 2018

https://news.itu.int/ai-and-satellite-imagery-proposed-global-service-platform-to-scale-ai-for-good-projects/

AI for Good Track 3, interviews

https://youtu.be/FsSfB8aKTuI Stuart Russel, team leader

https://www.youtube.com/watch?v=9HUbZ-WZgrA Einar Bjørgo, Manager, UNOSAT

1st AI for Good Global Summit 2017

https://www.itu.int/en/ITU-T/AI/Pages/201706-default.aspx

2nd AI for Good Global Summit 2018

https://www.itu.int/en/ITU-T/AI/2018/Pages/default.aspx

3rd AI for Good Global Summit 2019

https://aiforgood.itu.int/ and https://aiforgood.itu.int/reports/

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Annexes

Poverty

SDG 1 : “End poverty in all its forms everywhere”

- **Mapping** relative poverty for input into relevant models and activities
- While most **developed countries** have rich data collection schemes for tracking wealth much of the world does not
- Some **interesting developments** have occurred mapping poverty from satellite imagery and other inputs using AI

➔However, **much needs to be done** to better quantify relative concepts like poverty and wealth from such analytical outputs

Deforestation and reforestation

SDG 15 “Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.”

- Critical problem because forests can provide about **33% of the solution** to climate change and are critical for **species diversity**.
- Clear cutting and forest degradation are **important threat**
- **Today**, we cannot effectively measure the extent of the threat

➔**Satellite imagery, along with aerial imagery, and AI** can be used for detecting and measuring thinning of upper-story trees, loss of understory trees and other vegetation, changes in overall water levels, and the growth of new trees in areas being restored.

Agriculture

SDG 2 “End hunger, achieve food security and improved nutrition and promote sustainable agriculture.”

- **>2billion people** depend on smallholder farms for their livelihoods
- Disruptions to local agricultural production can have **major adverse impacts** on health and livelihoods
- The vagaries of the weather **is one risk factor**, and a growing number of unusual weather events make agriculture **even riskier**

➔AI can be used to **assess and understand agricultural production** to avert famine, maximize market returns for smallholders, and develop tailored insurance policies to mitigate the impacts of crop failures