Modern Technologies for Disaster Management

Resilience to Disasters & Conflicts Global Support Branch

Paula Padrino Vilela

01 November 2021, Geneva

Agenda

1. UNEP's work in Modern Technologies for Disaster Management
    - AI for Disaster Management
    - IoT for Disaster Management
    - Robotics for Disaster Management
    - Drones for Disaster Management
2. Efforts to promote collaboration on this topic
    - LinkedIn Expert group: AI and AI and other New Generation Technologies for Disaster Management
    - Introduction to AI for Disaster Management Focus Group

Introduction to the Resilience to Disasters and Conflicts Global Support Branch

Key Activities

Resilience to Disasters & Conflicts Global Support Branch

Post-crisis Environmental Assessments

Post-crisis Environmental Recovery

Disaster Risk Reduction

Policy and Analyses (Security)

Key Achievements

- Responded to **more than 200 emergencies** (including the UNEP/OCHA Joint Environment Unit)
- Operated in **more than 30 countries**, including in Afghanistan since 2003
- Raised **more than 250 million USD** for assessment, clean-up and capacity building
- Our assessment reports have led to:
  - Establishment of new **Environmental Protection Agency in Afghanistan;**
  - Establishment of new **solid and liquid waste facilities**, worth more than 250 million USD in the Gaza Strip, a new **400 million USD desalinization plant planned**;
  - Establishment of a new **clean-up agency** and **1-billion-dollar fund in Nigeria;**
  - New **environmental legislations** in Afghanistan, Iraq, Liberia.

Modern Technologies for Disaster Management

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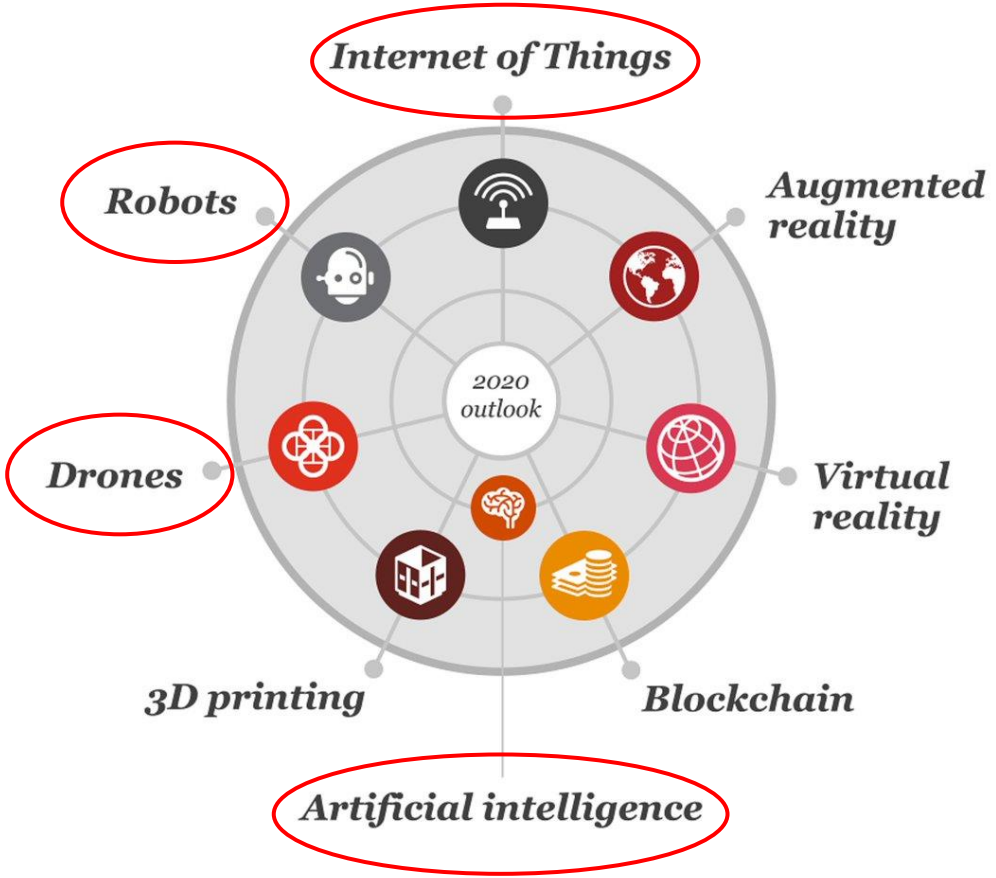
Focus work

Fourth Industrial Revoultion Technologies

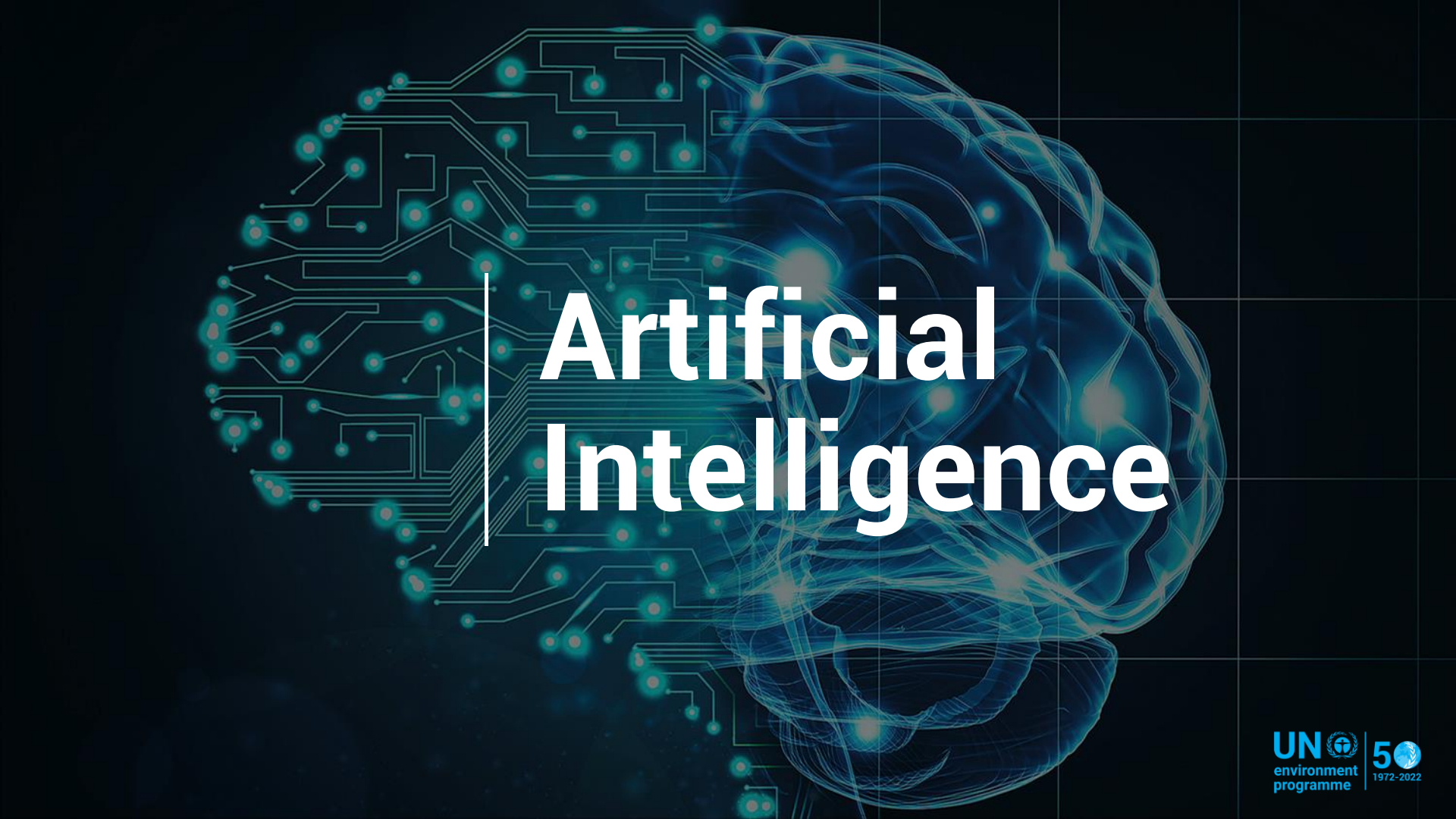


#TechMegatrend

Report on “Modern Technologies for Disaster Management”

Objectives:

- To illustrate the potential of 4IR technologies and their current application in disaster risk reduction and response
- Show how existing 4IR technologies have been implemented in successful case studies
- To present the key institutions, private companies and organizations involved in 4IR technologies & disaster management
- To promote the use of 4IR technologies for environmental emergency prevention and response in the future.


Artificial
Intelligence
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Artificial Intelligence

- Applications of AI in Disaster Management

  - **Mitigation**
    - Susceptibility Mapping
    - Forecasting vulnerabilities
    - NLP for disease outbreaks

  - **Preparedness**
    - Early warning systems
    - Evacuation mapping
    - Training systems

  - **Response**
    - Disaster mapping
    - AI chatbots
    - Crisis response through social media

  - **Recovery**
    - Damage assessment
    - Resource allocation

Internet of Things (IoT)

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Internet of Things

- Applications of IoT in Disaster Management
- IoT-based early warning systems
  - Information dissemination
  - Combating Covid-19 and contagious illnesses
  - Logistics and cold-chain monitoring

Controlant Rokid


Robotics

Robotics

- Applications of Robotics in Disaster Management: Mitigation, Preparedness, Response, Recovery: search and rescue, rubble removal, extinguishing forest fires
- Application of drones during pandemics
  - Detecting correct use of facemasks, monitoring crowd density, and giving public service announcements.
  - Disinfect large areas including public spaces, points of care, workplaces, and schools.
  - Disinfect objects or people's hands.
  - Measuring body temperatures and oxygen levels.
  - Provide telepresence between COVID-19 patients and their doctors and families
  - Deliver goods like medicines and COVID-19 test samples and keep track of the inventory.
  - Deliver food or other products to quarantined citizens.

Drones

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Drones

- **Applications of Drones in Disaster Management**
  - Mapping
  - HealthCare
  - Search and Rescue
  - Surveillance
  - Oil Spills
  - Delivery
  - Situational Awareness

ROBOTICS & PERCEPTION GROUP

We Robotics
THE POWER OF LOCAL

災害ドローン救援隊
DRONE BIRD

MICROMEK

Garuda Aerospace (P) Ltd

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Annexes

A – Artificial Intelligence

CrowdAI

TENEVIA
A new vision of environmental monitoring

Google

TRACTABLE

UNESCO

B – Robotics

ASIMOV ROBOTICS

HYDRONALIX

COSTAR

DOK-ING

Center for Robot-Assisted Search and Rescue

C – Drones

DroneDeploy

draganFLY
INNOVATIONS INC

NOKIA
Nokia Saving Lives
Technology for your safety

IAEA
International Atomic Energy Agency

D – Internet of Things

DRYAD

estimote

MyShake™

kinsa

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Conclusion

- Disasters are responsible for countless injuries, mortalities, displacements, damages to property and infrastructure, and disturbances to nature and natural resources.
- In order to minimize the risks and consequences of disasters action needs to be taken.
- The advantages and challenges vary among each of the technologies.
- Our research shows that the 4IR technologies mentioned above have a great potential to contribute to the reduction of treats to health and livelihoods from environmental causes and consequences of disasters.
- In order to address the challenges, it is important to have a holistic approach and foster partnerships.

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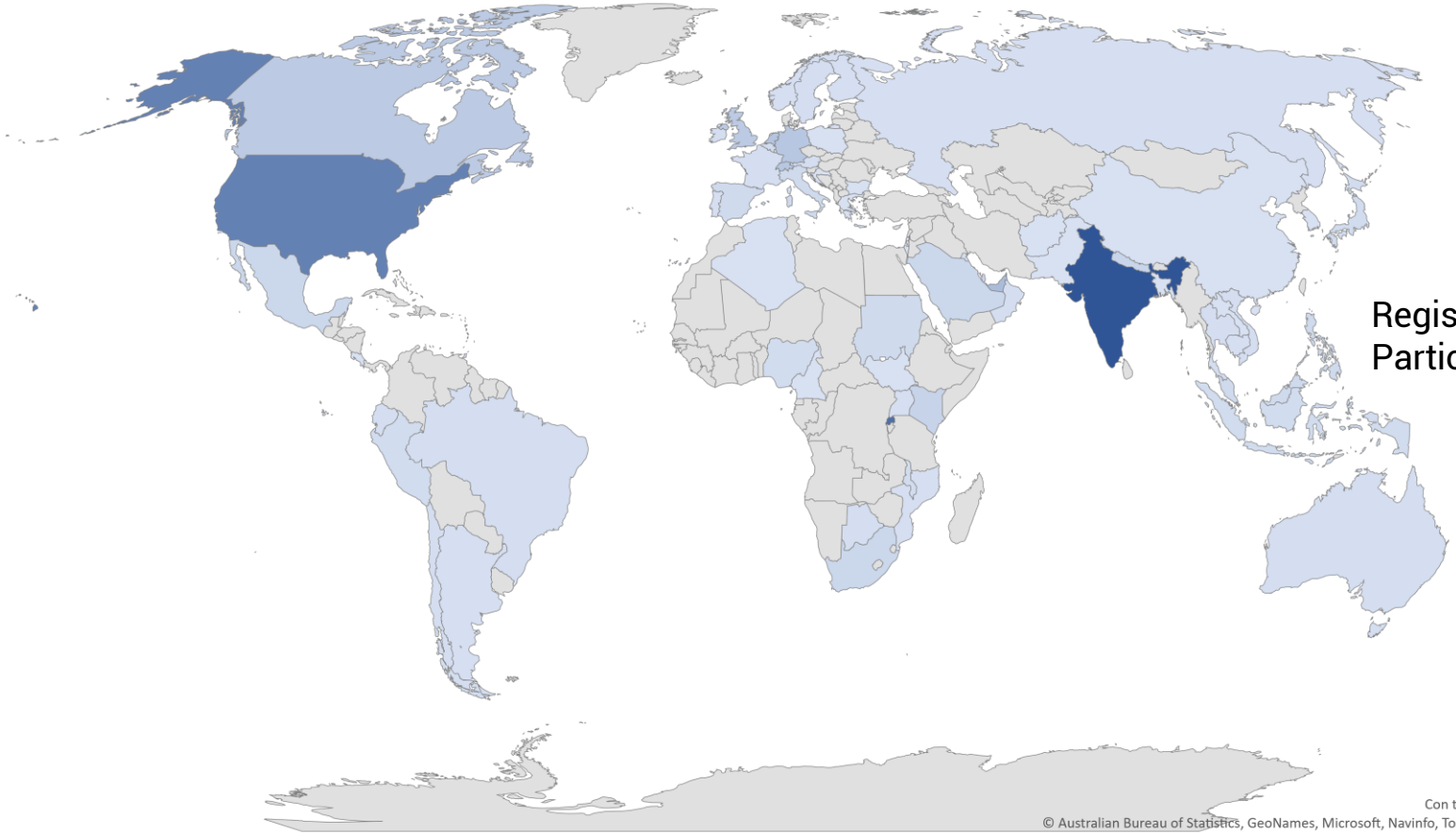
Webinar Series on Modern Technologies for Disaster Management

Registrants: 2072
Participants: 728

Webinar Series on Modern Technologies for Disaster Management



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Webinar Series on Modern Technologies for Disaster Management

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AI for Natural Disaster Management

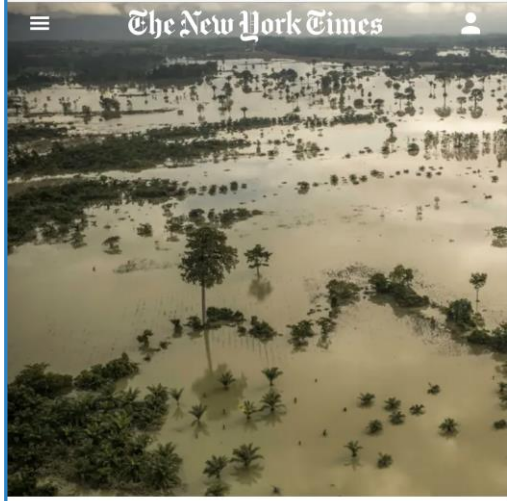
ITU Focus Group

Paula PADRINO VILELA

Focal Point of UNEP at FG-AI4NDM

The challenge.

- **Natural disasters** can result in injury, mortality, displacements, damage to property (including cultural heritage) and infrastructure, and disturbance to nature and natural resources.
- The situation is exacerbated in **certain regions** (**SIDS** and **LDCs**) and for certain **populations** (e.g., women and children); and is expected to **worsen** due to population growth, rapid urban development, and growing frequency/intensity of some events.



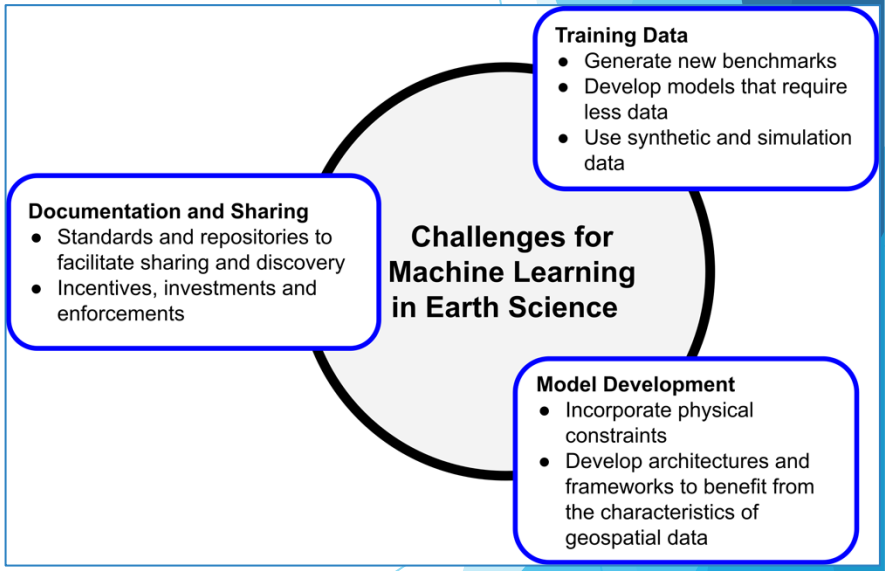
A view of the vast flooding in Guatemala after Hurricanes Eta and Iota struck one after the other last month.

2 Hurricanes Devastated Central America. Will the Ruin Spur a Migration Wave?

(4 Dec 2020, NYT)

The questions.

- Through tapping the **potential of AI**, can we improve our **understanding** of natural hazards, our ability to **detect** events in real-time, our ability to **forecast** events, and our ability to effectively **communicate** an impending disaster?
- What are the **best practices** when using AI?
- What are the **limitations** of using AI?



(Maskey et al., 2021)

To find answers, bring together experts.

- **ITU/WMO/UNEP Focus Group on AI for Natural Disaster Management** (**FG-AI4NDM**) converges the ICT expertise of ITU with natural disaster expertise from the WMO and UNEP.
- Creates an atmosphere that is conducive to international, multi-stakeholder, and interdisciplinary collaboration.

Management & operations

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Monique Kuglitsch
Fraunhofer HHI, Germany

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Elena Xoplaki
University of Giessen, Germany

Juerg Luterbacher
WMO

Muralee Thummarukudy
UNEP

Preeti Banzal
Government of India, India

Yan Chuan Wang
China Telecom, China

ITU/TSB

Mythili Menon, Advisor
Hiba Tahawi, Secretariat

Operations

Ivanka Pelivan (*Fraunhofer HHI, Germany*)
Jackie Ma (*Fraunhofer HHI, Germany*)

Goals

- Explore the potential (and identify the pitfalls) when using AI-based algorithms to support:
  - **data** (collection, monitoring, and handling),
  - **modeling** (reconstructions and forecasts), and
  - effective **communication**.

(Landslide in 2005, Luzern, Switzerland; swissinfo.ch)

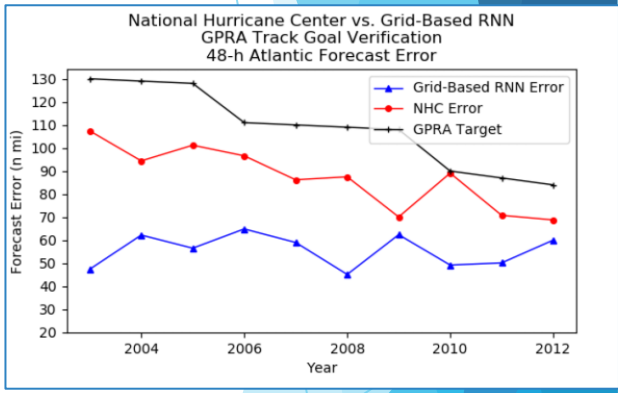
AI for data (collecting, monitoring, and handling)

- Some questions to explore are:
  - how can AI be used to **enhance** data quantity and quality?
  - how can AI be used to support **detectio**n of features in **real time**; for instance, earthquake signal detection in seismic data?
  - how can AI be used to leverage **synergies** from different data sources more effectively?

(ESA/NASA-A, Gerst)

AI for modeling (reconstructing and forecasting)

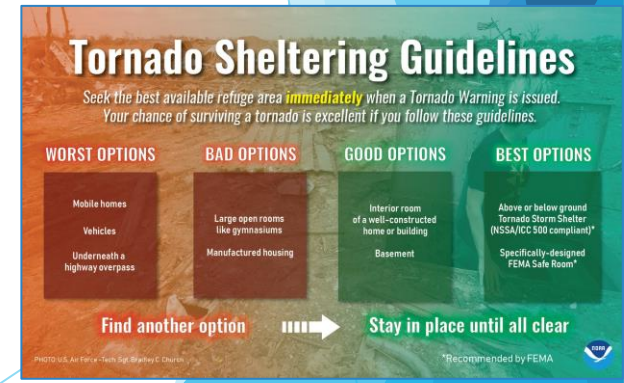
- Some questions to explore are :
  - what is the current **gold standard** method to create reconstructions or forecasts? How can AI-based algorithms bring these methods to the **next level**?
  - what **requirements** should data meet when **training and testing** an AI-based algorithm?
  - what should be considered when **evaluating** an AI-based algorithm?



(Alemany et al., 2019)

AI for effective communications

- Some questions to explore are :
  - once an event has been forecast or has been triggered, how can AI assist with the **immediate response**?
  - how do we ensure that communication methods are **reliable and trusted** by the population? Are they accompanied by a clear set of **protocols** to ensure that individuals know how to respond?



Key deliverables

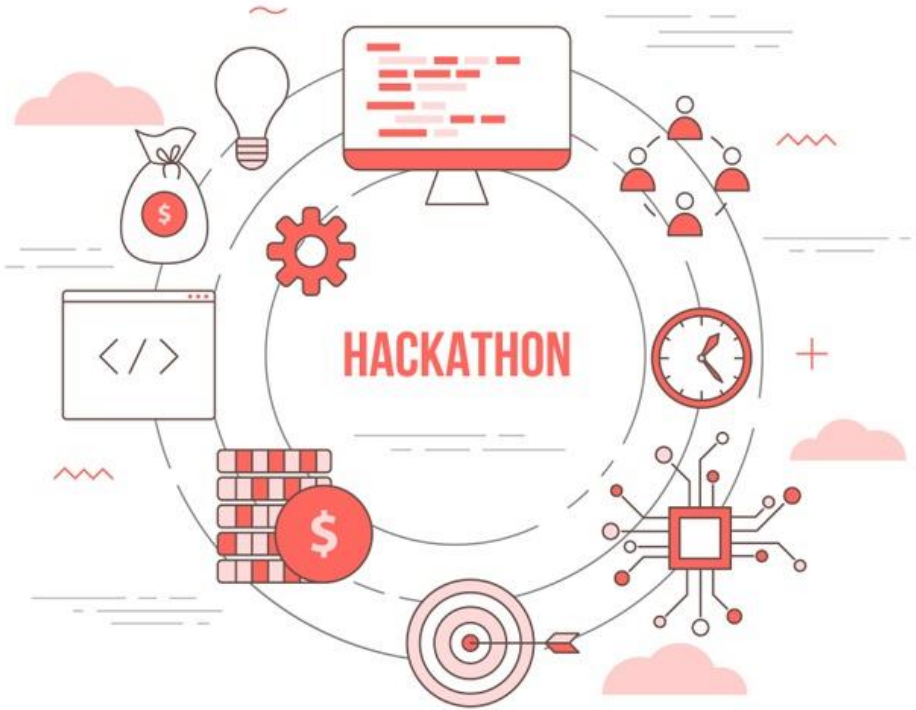
- **Roadmap** of AI activities in these areas of natural disaster management.
- **Workshops** that bring together experts and stakeholders, highlight ground-breaking activities in this topic, and encourage participation in FG-AI4NDM.
- Non-normative **technical reports** that summarize the findings of our analyses, based on input from selected **use cases**.
- **Educational materials** to make the content of the technical reports accessible to all stakeholders.

Participation

- Visit our website (https://itu.int/go/fgai4ndm)
- Peruse our onboarding document for guidance on how to:
  - Create a free **ITU user account**
  - Join our low-volume **mailing list**
  - Register for **workshops/meetings**
  - Use our **remote participation platform** (MyMeetings)
  - Access our **collaboration site**
  - Submit **written contributions** (e.g., use case proposals)

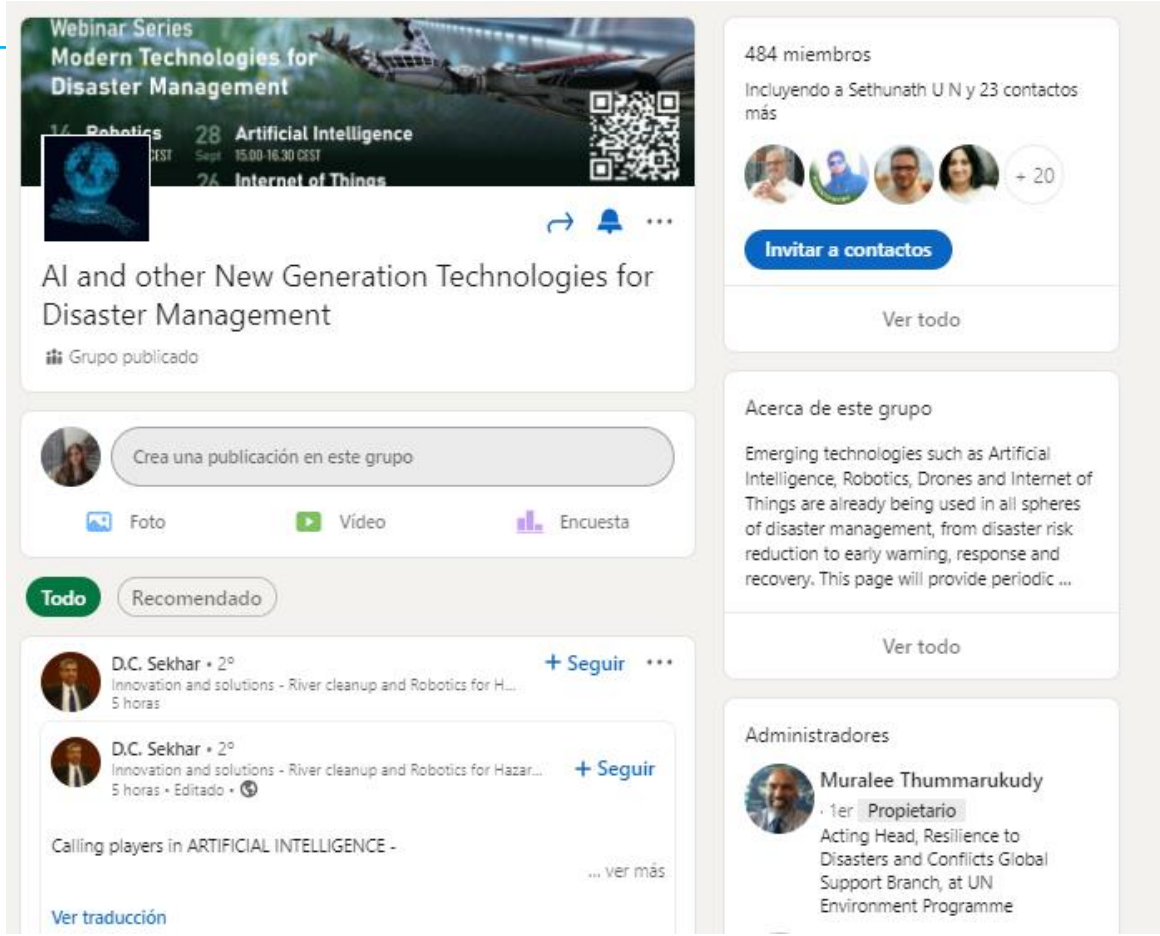
Soon to come:

Global hackathon on AI for Natural Disaster Management 2022



LinkedIn Group: AI and other New Generation Technologies for Disaster Management

- Creation: August 2021
- Members: 483
- More than 50 posts related to AI, Robotics, IoT and Drones for disaster management.
- Link to join: https://www.linkedin.com/groups/13996266/



Thank you for listening

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