AI for GOOD GLOBAL SUMMIT

#AIforGood

Artificial Intelligence can help solve humanity's greatest challenges

Hosted at ITU in Geneva, Switzerland
7-9 June 2017

REPORT

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FOREWORD

The AI for Good Global Summit in June 2017 discussed how Artificial Intelligence (AI) could follow a development course able to assist the achievement of the United Nations' Sustainable Development Goals.

Co-organized by ITU and the XPRIZE Foundation, the event convened 500 representatives of government, industry, academic and research institutes, United Nations agencies and civil society to explore the potential of AI to accelerate progress in fields such as health, education, energy and the protection of our environment.

ITU and XPRIZE share a firm belief that AI will help to solve some of the most pressing challenges to our planet and its people. We believe in AI's promise of a better life for all. We also believe that this will only be achieved if government, industry and civil society work together to develop the positive aspects of the technology and manage related risks.

FOREWORD

The AI for Good Global Summit brought together leading minds in AI and humanitarian action, establishing an historic milestone as the first event to launch inclusive global dialogue on the potential of AI to benefit humanity.

The event hosted discussions aimed at building a common understanding of the applications and capabilities of emerging AI technologies. Thousands of people worldwide followed the discussions via webcasts offered by event partners ACM, IEEE, IFIP, CSTA and Digital Africa.

This report summarizes these discussions and proposes actions and strategies to ensure the continued collaboration necessary to ensure that we take full advantage of emerging AI technologies.

Sincerely,

Houlin Zhao
Secretary-General, ITU

Marcus Shingles
CEO, XPRIZE Foundation

01.

BACKGROUND

The "AI for Good Global Summit" took place at ITU in Geneva, Switzerland, on 7-9 June 2017, organized by ITU and the XPRIZE Foundation, in partnership with twenty UN agencies. Artificial Intelligence (AI) will be central to the achievement of the Sustainable Development Goals (SDGs) and could help solve humanity's grand challenges by capitalizing on the unprecedented quantities of data now generated on sentient behavior, human health, commerce, communications, migration and more.

SUSTAINABLE DEVELOPMENT GOALS (SDGs)

The meeting aimed to accelerate and advance the development and democratization of Artificial Intelligence (AI) solutions that can address specific global challenges related to poverty, hunger, health, equality (including gender equality), education, the environment and others.

AI has great potential to advance the sustainable development goals and help to solve our greatest challenges.

Opening Address by António Guterres, Secretary-General of the United Nations

Thank you for coming together to discuss a challenge of growing global importance. As someone with a background in engineering, I am deeply interested in the remarkable phenomenon of Artificial Intelligence. And, as Secretary-General of the UN, I am strongly committed to promoting global cooperation on this emerging issue. AI is advancing dramatically. It is already transforming our world, socially, economically and politically. We face a new frontier, with advances moving at warp speed. Artificial Intelligence can help analyze enormous volumes of data, which in turn can improve predictions, prevent crimes and help governments better serve people. But there are also serious challenges, and ethical issues at stake. There are real concerns about cybersecurity, human rights and privacy, not to mention the obvious and significant impact on the labor markets. The implications for development are enormous. Developing countries can gain from the benefits of AI, but they also face the highest risk of being left behind. This Summit can help ensure that AI charts a course that benefits humanity and bolsters our shared values. The UN stands ready to be a universal platform for discussion. Together, let us make sure we use Artificial Intelligence to enhance human dignity and serve the global good, thank you.

PARTICIPATION AND MEDIA COVERAGE

The AI for Good Summit attracted over

500

participants and

5000

webcast connections from all corners of the globe.

Click play for a full HD recording of the webcast

A MULTI-STAKEHOLDER APPROACH...

AI experts have said themselves that we cannot leave AI to just the experts – a multi-stakeholder approach is needed.

Government | Industry | UN Agencies | Civil Society | International Organizations | Academia

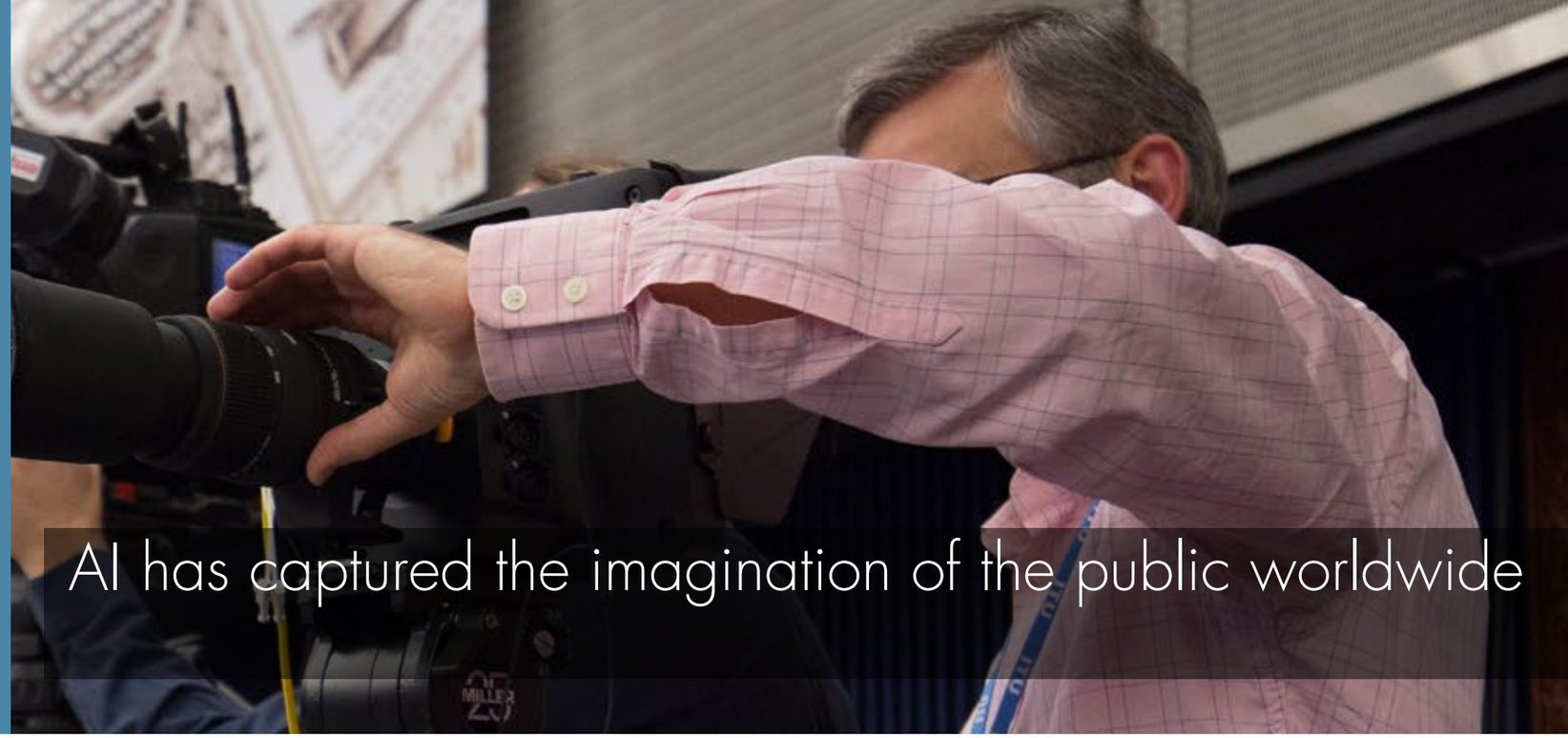
The Summit hosted over 500 participants onsite, including many leading researchers and authorities on AI. One-third of participants and speakers were women.

> **"It was great to see so many women attending the AI for Good Summit but we still need many more, including from the techno-political field."**
>
> *Anja Kaspersen, ICRC*

As such, this Summit brought together a unique mixture of many disciplines, with some of the top AI researchers (Stanford, UC Berkeley, Cambridge, etc.), top AI industry executives (Microsoft, Google, Facebook, etc.), and heads of UN agencies (WHO, UNODA, UNESCO). Delegates appreciated the ample networking opportunities that having such diverse participants brought.

The global
multi-lingual coverage
reached over

100 million people



media coverage

AI has captured the imagination of the public worldwide. The Summit was attended by over 45 journalists from a wide range of mainstream and technical international media such as the BBC, Reuters, Euronews and Wired. The global, multi-lingual coverage reached over 100 million people and the tone was overwhelmingly positive.

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ats · SWI swissinfo.ch

THE EVENT ALSO GENERATED
RECORD-BREAKING SOCIAL MEDIA COVERAGE WITH THE FACEBOOK LIVE SEGMENT GOING VIRAL AND BEING VIEWED BY OVER 3 MILLION PEOPLE.

AI for Good Summit
goes viral with over
3.1 million views
on Facebook.

watch
the video

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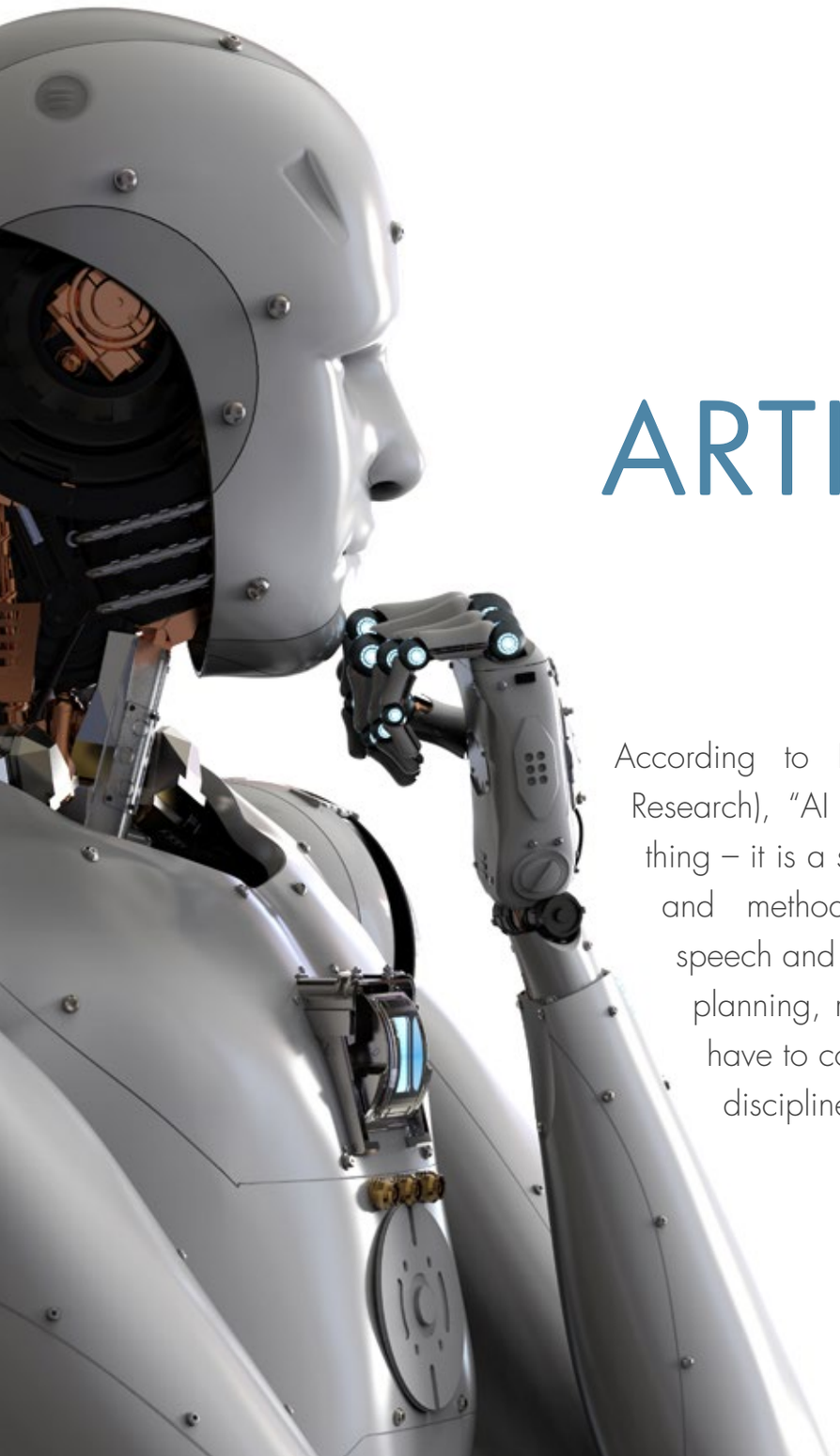


02.

WHAT EXACTLY IS ARTIFICIAL INTELLIGENCE (AI)?

According to Eric Horvitz (Microsoft Research), "AI is not really any single thing – it is a set of rich sub-disciplines and methods, vision, perception, speech and dialogue, decisions and planning, robotics and so on. We have to consider all these different disciplines and methods in seeking true solutions in delivering value to human beings and organizations". Chaesub Lee, Director of ITU's Standardization Bureau, observed "AI is quite old, and is made up of many individual parts, including protocols and common elements such as data. We have a situation of vertical development in AI and horizontal common elements". At the Summit, AI was viewed as a set of associated technologies and techniques that can be used to complement traditional approaches, human intelligence and analytics and/or other techniques.

While AI is not "general magic," Peter Diamandis (XPRIZE Foundation) claimed that "AI is probably the most important technology we have ever created." Marcus Shingles (XPRIZE Foundation) suggested (we are now putting in place core tools to put in place systems to deal with hunger and other problems). Prof. Gary Marcus (NYU) sounded a note of caution about AI's potential, observing, "we are not nearly as close to strong Artificial Intelligence as many believe." Prof. Gary Marcus also argued that there has been little real progress in "true AI" (from Eliza to Alexa and Siri), where, according to him, progress has flatlined. In his estimation, machines can currently perform tasks taking a human being approximately one second of thought.

Current AI developments work using an approach called deep learning — Prof. Yoshua Bengio (University of Montreal) described deep learning as a way of enabling computers to figure out good representations by considering how knowledge or information can be represented — representation has been central to AI from the beginning, but computers are now learning and discovering by practice using data how to represent information.

However AI is defined, participants offered a range of perspectives on rates of progress in digitization. According to Marcus Shingles (XPRIZE), digitization is creating rapid and exponential advances in progress, data traffic and data storage. However, Prof. Yoshua Bengio (University of Montreal) suggested we are "…very, very far from 'human-level' AI… we have a lot of research due before we get there. Pretty much all of the major breakthroughs and amazing applications we have today of AI and machine learning are based on supervised learning."

In fact, progress in AI can proceed in stepwise increments (e.g. Google Translate's significant improvement in November 2016, according to Prof. Jürgen Schmidhuber, Swiss AI Lab, IDSIA; Prof. of AI, USI & SUPSI, Switzerland; President of NNAISENSE). Prof. Joseph Konstan (University of Minnesota) pointed out that word processing systems are not many million times more efficient today than they were thirty years ago, but they are more useable and accessible than they ever have been. Perceived rates of progress therefore clearly depend on which aspects of AI are under discussion.

03.

DEVELOPING WORLD & PRIORITIZATION

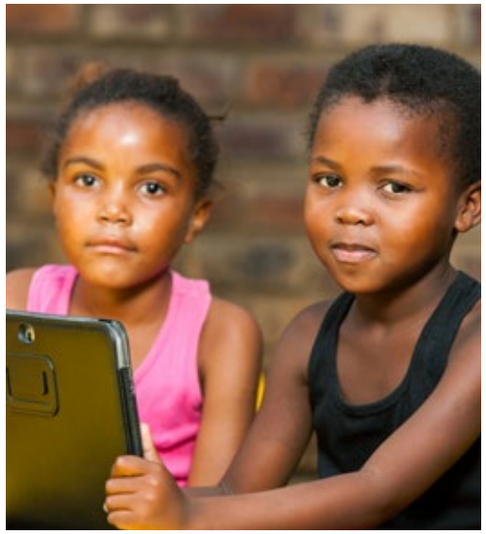
Developing countries may have the most to gain from AI, but unless we are vigilant, they may also have the most to lose. In order to reap the benefits of AI, vast amounts of data are needed, which are only available through mass digitization – an area where developing countries lag far behind. There can be no mass digitization without universal and affordable access to broadband, which is central to ITU's mission. We need to avoid a deepening of the digital divide, so the benefits of AI can be distributed equitably.

It is vital that the needs of a diverse range of people, including the most vulnerable, guide the design and development of AI systems. Those who are furthest behind in terms of social and economic development, are at the centre of the SDGs and need to be at the centre of design and application of technologies such as AI.

There was extensive discussion of the problem of significant (and exacerbated) inequality around AI. According to Salil Shetty (Amnesty International), inequality is at the highest level in 50 years in OECD countries, up seven-fold from 25 years ago, while income inequality is nine times higher. There was broad consensus that AI will create growing

inequalities between developed and developing countries, between those who own and/or create the technology, and those who use it, as well as those people whose jobs may be replaced by AI. This was also a recurring theme in the breakthrough sessions on health and prosperity.

World-changing AI needs massive interdisciplinary collaboration. Owning networks, security and verification can't be done out of one lab. Robert Kirkpatrick (UN Global Pulse) suggested that this could include a Global Fund for AI for Social Good established to invest in cutting-edge research and promoting AI-based tools. The Fund would address the most pressing challenges of the SDGs for the most vulnerable populations and scale proven solutions through open source tools, to help define a common agenda for where the highest priority investment should go.

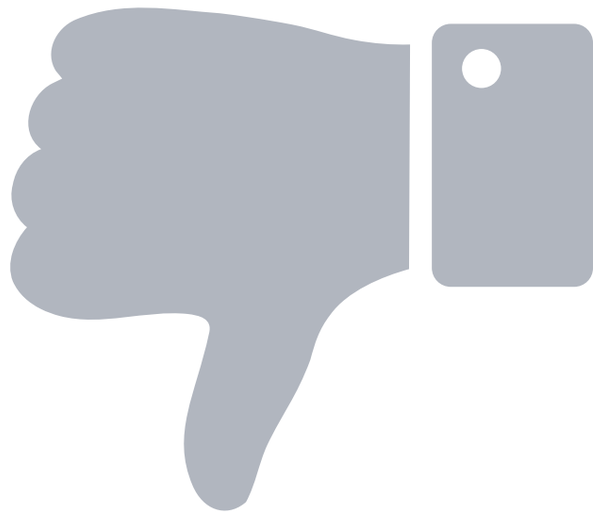


BENEFITS OF AI
CAN BE DISTRIBUTED EQUITABLY.

04.

– DESIGNING THE FUTURE –

THE PROMISE & THE PERIL OF AI



4.1.
THE PROMISE & OPPORTUNITIES OF AI

A number of speakers raised the considerable promise and opportunities of AI. According to Marcus Shingles (XPRIZE), those include gaining insights from "the sleeping giants of data," improving decision-making and "harnessing the collective wisdom of the crowd." AI is being used in a growing number of domains, in new and unexpected ways, many of which can improve human lives. Vicki Hanson (ACM) defined the measure of success for AI apps as the value they create for human lives, according to the 100-Year Study on AI (AI-100). AI can increase the productivity of arable land, detect early signs of cancer on scans, help find out how molecules interact to help find a cure for cancer and/

or design personalized treatments for patients. Mr. Houlin Zhao, ITU Secretary-General, suggested that AI gives innovators the tools and capacity to innovate and to use AI to help solve some of our greatest challenges, starting with the SDGs. This is why it is so important that both developed and developing economies, multinationals, SMEs, universities and start-ups join forces to drive innovation forward.

According to Rupert Stadler, CEO & Chairman of the Board of Management, AUDI AG, "90% of all car accidents are caused by human error. AI and autonomous driving will reduce the number of accidents significantly and will save lives. But of course, we also have to reshape the frameworks in our society – the first countries are issuing frameworks for autonomous driving, including Germany."

AI could be used to help Illiterate people online. According to Anders Sandberg (University of Oxford) AI is getting increasingly good at doing text to voice translation as well as voice to text translation. Even if you are illiterate, you can scan a text although you cannot read the letters, so you become partially literate and can interact with the formal world.

According to Vicki Hanson (ACM), AI can help people with special needs in numerous ways (e.g. autonomous driving for visually impaired people, speech recognition software for people with hearing impairments or loss), potentially helping improve the lives of the estimated one billion people worldwide with disabilities. There is a need to make sure these technologies are empowering and franchising not only across disabilities, but across literacy levels, language and different levels of education as well.

Prof. Fei-Fei Li (Google & Stanford University) warned that, although we have been progressing rapidly, vision technologies are still just at the very brink of making important contributions to our society. AI could significantly help the visually impaired; however, although we have many cameras from space, airplanes and drones overseeing Earth, we have still not yet given sight to most visually impaired people.

Advances in AI also require advances in a number of other companion technologies as well. For example, visual recognition breaks down into object segmentation, object detection, 3D recognition, scene parsing, according to Prof. Fei-Fei Li (Stanford University). Thomas Wiegand (the Heinrich Hertz Institute), believes that AI, machine learning and communications are converging, with work in video compression standards, non-stationary and back projections using neural networks to tell us what in the input picture led to the final classification result.

The ultimate aim of AI is towards self-learning software and computers or 'transfer learning.' Information that has been learned can be transferred between different robots or in the software systems and can be applied wherever various computing processes or connection to computing facilities are available, according to Anders Sandberg (University of Oxford). This can help humans by pushing the frontiers of innovation and driving forward progress in human development.

4.2.
AI

APPLICATIONS

CITED DURING THE SUMMIT

ELECTRICITY SUPPLY

PETER MARX (GENERAL ELECTRIC) described how General Electric is using machine learning for a number of different purposes, including using drones for inspecting power lines and in manufacturing.

IMPROVING HEALTH

According to ERIC HORVITZ (MICROSOFT), predictive modelling of cholera outbreaks can now be developed in advance based on powerful algorithms that can be used to distribute fresh water, or supply vaccines.

NUCLEAR TEST

PROF. STUART RUSSELL (UC BERKELEY) described how AI is being used for monitoring verification of the nuclear test treaty to distinguish between natural seismic tremors and shocks triggered by nuclear tests.

GLOBAL FISHING WATCH

PAUL BUNJE (XPRIZE), described the Global Fishing Watch which uses simple machine learning to utilize the data in fishing vessels and applies machine learning algorithms to identify where the vessels have been and type of activities they are engaged in.

AI APPLICATIONS CITED DURING THE SUMMIT

JACK, THE SELF-DRIVING CAR

Rupert Stadler, CEO & Chairman of Board of Management, AUDI, suggested that reliable self-driving cars will be in place by the end of the next decade, 2030, at the latest, when the car will drive all by itself.

GUIDE ROBOT

Prof. Manuela Veloso (Carnegie Mellon University) has developed “cobots” or collaborative robots to guide people around a building, according to a pre-programmed schedule, and also to serve coffee, and describe (“verbalization”) what they did with different levels of abstraction.

AI APPLICATIONS CITED DURING THE SUMMIT

TRANSLATOR

Google Translate replaced their old system with Long Short Term Memory (LSTM) in November 2016, and it got noticeably better, around 50% better than previous performance. Jürgen Schmidhuber (Swiss AI Lab, IDSIA) stated that Amazon Echo is a LSTM network which has learned to sound like a woman. It is not a prerecorded woman's voice, it is a computer that has learned to sound like a woman.

SKYPE

Skype speaks nine languages, and does real-time translation through machine learning. Training an English-trained system with Portuguese, Mandarin and French produces better results in the original language and enables shortcuts in the training process to obtain very high learning power, according to Peter Lee (Microsoft).

AI APPLICATIONS CITED DURING THE SUMMIT

MONITORING HYGIENE

AI algorithms can provide continuous tracking of clinicians' movements in hospital, without revealing who they are. Sensors in hallways close to hand-hygiene dispensers with a deep learning recognition system monitor clinicians' hygiene practices, with a performance better than many of the state-of-the-art systems, reducing hospital-acquired infection rates – Prof. Fei-Fei Li (Google & Stanford University).

MONITORING NUTRITION

Chris Fabian (UNICEF Innovation) described the use of simple AI in mid-upper arm bands (MUACs) to monitor the nutritional status of children, which are valuable tools for famine response. Companies are developing similar tools using face recognition.

AI APPLICATIONS CITED DURING THE SUMMIT

ANALYSIS OF TUMORS

With regards to computer analysis of tumors, Peter Lee (Microsoft) acknowledged that medical imaging is not a 'replacement' for radiologists, but offers tremendous improvements in augmenting what radiologists are able to do. Radiologists look at scans slice by slice, computers can work in 3D.

CANCER CELLS IN COLON POLYPS

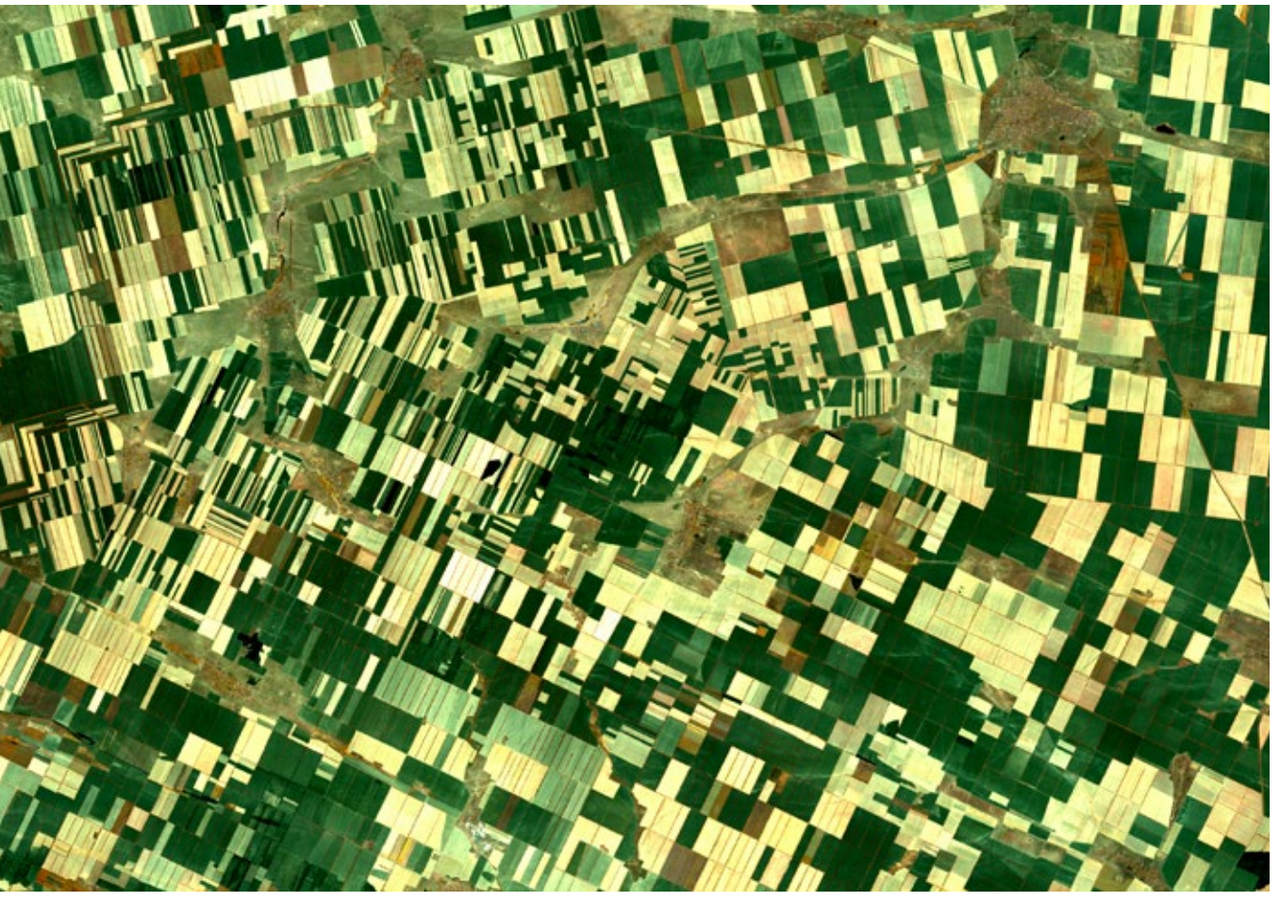
Detection algorithms for identifying cancer cells in colon polyps – these detection algorithms can do better than (very rare) specialist doctors and much better than regular doctors, according to Prof. Yoshua Bengio (University of Montreal). Prof. Lynne Parker (University of Tennessee-Knoxville) provided statistics for medical pathology showing the top human doctors make 3.5% erroneous decisions and the top AI technology has an error rate of 7.5%, but combined together, the error rate can drop to 0.5%.

AI APPLICATIONS CITED DURING THE SUMMIT

TRICORDERS

Basil Harris (Basil Leaf Technologies) designed a tricorder that can diagnose 13 diseases (pneumonia, urinary tract infection, diabetes, acute diseases, chronic conditions, etc), with AI built into the device in the decision-making control.

AI APPLICATIONS CITED DURING THE SUMMIT



USING SATELLITES

Andrew Zolli (Planet Labs) described how Planet Lab is using satellite imagery to monitor planting, agricultural indicators in Kenya, a flood event in Sri Lanka, the growth of Dar es Salaam city and an Internally Displaced Persons (IDP) camp in Uganda.

MIT'S OPEN AGRICULTURE

Labs are embedded within food containers to control temperature, food supply, humidity etc. and use AI black box optimization to evolve a process that gets to the best ingredients to obtain the very best basil, quantity and quality-wise, according to Antoine Blondeau (Sentient Technologies).

AI APPLICATIONS CITED DURING THE SUMMIT

AGRICULTURE

IBM's Project Lucy, where IBM committed a hundred million dollars to enhance African infrastructure, uses AI to help in agriculture so farmers can improve crop yields with less water, to improve education and to enhance access to healthcare services, according to Neil Sahota.

MIT'S CELL C PROJECT

Predicts the onset of sepsis and blood infections in hospitals. The biggest single symptom of a blood infection is a massive drop in blood pressure, but today there is no way to predict it. You can just react to it. According to Antoine Blondeau (Sentient Technologies), an AI project across 6,000 patients was able to predict the onset of sepsis 30 minutes ahead of time, which helped preempt and prevent it in 91% of cases.

"META" INITIATIVE

Sam Molyneux (Chan Zuckerberg Initiative) described the "Meta" initiative within the Chan Zuckerberg Initiative, which is thinking about how AI can be used to solve or power scientific knowledge production, and is in the process of making available a "global scientific awareness system" that can accelerate advances in sciences and make advances available for free, open to scientists, researchers, funders and policy-makers.

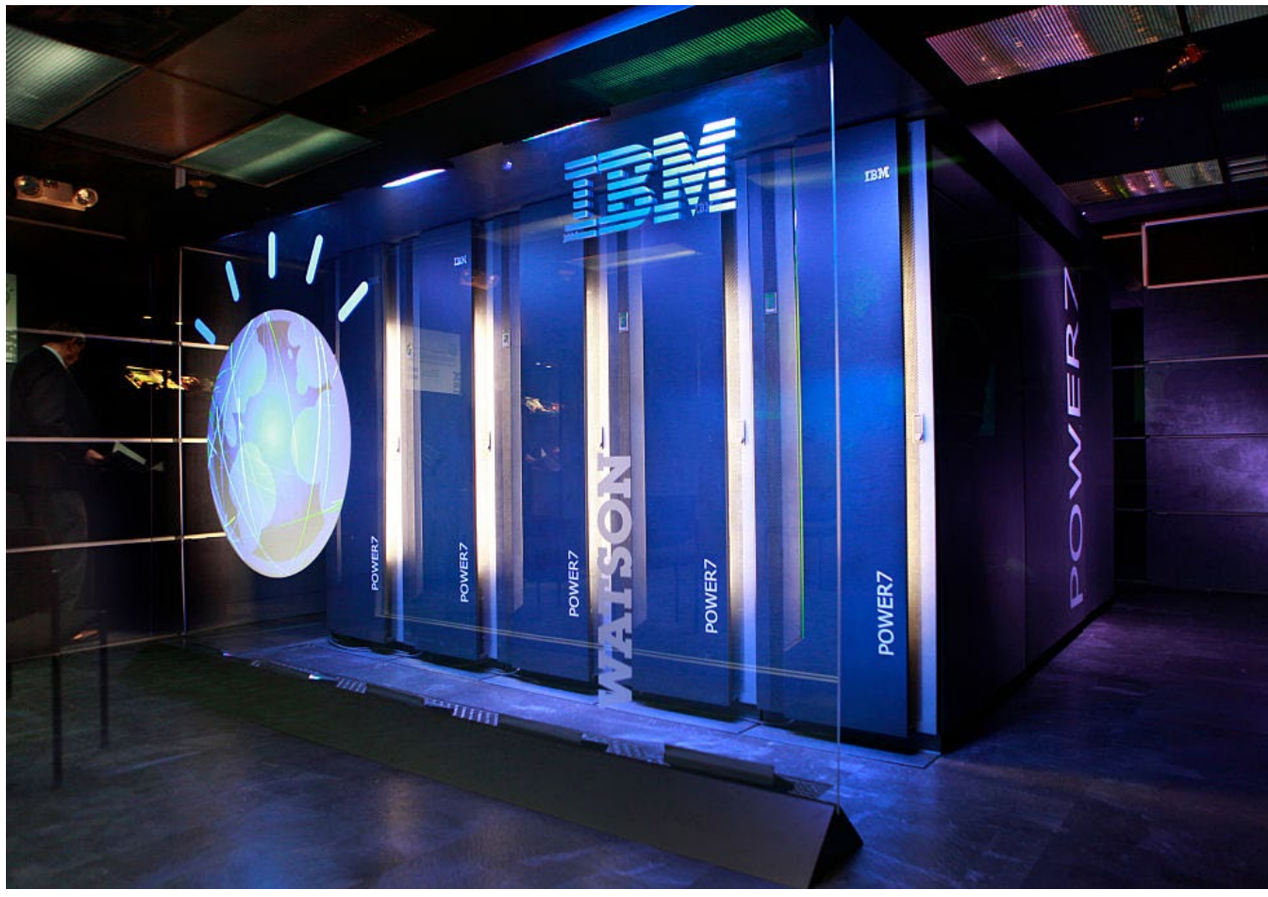
AI APPLICATIONS CITED DURING THE SUMMIT

ALS

Francesca Rossi (IBM, University of Padova) described the use of IBM Watson for combatting Amyotrophic Lateral Sclerosis (ALS), by using AI to examine genes to see whether they are correlated with ALS. 8/10 top ten gene candidates were found to be correlated with ALS, five of which were not known before.

LEARNING CAPABILITY

IBM Watson can be used to see the learning capability of each student, move at their pace and help them develop confidence to master subjects. Watson can recommend things the student might like or be interested in learning, based on their specific personality traits. Watson can adjust the way it interacts with the student based on their age, competency level, vocabulary and emotional state, according to Neil Sahota from IBM.



AI APPLICATIONS CITED DURING THE SUMMIT

REPLICATING A CENSUS

The 200 most populated cities in America are using deep learning to recognize and identify cars (make and model for 2657 types of cars manufactured after 1990) in 50 million Google Streetview images. In additional work, Prof. Fei-Fei Li (Google & Stanford University) observed that car models are correlated with GDP, average income, socio-economic indicators and voting patterns.

"THE LOVING AI PROJECT"

Talking, cloud-based robots and "the loving AI project" to understand the human condition, the value of life, liberty and the value of humans as well as machines. Hanson Robotics has developed a series of robots, which can conduct independent conversations and learn from their interactions with humans.

AI APPLICATIONS CITED DURING THE SUMMIT

FORMS OF INFORMATION

Robert Kirkpatrick (UN Global Pulse) described how big data, together with the power of AI and high performance computing, are generating new forms of information and insight with tremendous value for answering business questions and for fighting hunger, poverty and disease. Labs are using big data and deep learning to map discrimination against refugees in Europe, recognize rescue attempts from shipping data in the Mediterranean, detect fires in Indonesian rainforests, predict food prices from Twitter, fight bottlenecks in sanitation services in refugee camps and generate socioeconomic indicators from satellite imagery and flows of postal traffic.

4.3.
POTENTIAL PERILS OF AI

What will AI be used for? Prof. Stuart Russell (UC Berkeley) suggested that we have to be careful with regards to the problem of specifying the purpose correctly – rather like King Midas, we have to be careful what we ask for. He suggested that intelligent machines will be incredibly good at carrying out what we ask them to carry out. If we ask them to carry out the wrong thing we shall be sorry (like King Midas), and we have a long history of failing to specify the purpose correctly. He called for "human-compatible AI." Indeed, Prof. Urs Gasser (Harvard University) pointed out there is a risk we might start to delegate our questions and our very judgments to the machine and autonomous systems, which could then effectively end up determining which are the important questions.

Izumi Nakamitsu (UNODA) stated that autonomous weapons systems are already in place to select and engage targets independently. AI will increase the speed and precision of action in future battlefields, which could have massive damaging consequences, given their inherent unpredictability. The growing separation between users and targets lowers thresholds for violence, and could strain protection for civilians. "There are currently no multilateral standards or regulations covering military AI applications, and Member States have not systematically considered the challenges posed by AI technology through the UN or otherwise," including any treatment of current or future AI systems.

With regards to the use of AI technologies with malicious intent, Cindy Smith of UNICRI argued that we must think about the new threats to international peace and security that will emerge from the advances in AI technologies – "If you build it, criminals will use it. In fact, some of these technologies have already been used for terrorist purposes, as well as the recent increase in cyber-attacks. What will the availability of new instruments of terror mean for the international community?" Prof. Stuart Russell (UC Berkeley) argued that the use of malware has been a catastrophe, direct theft from bank accounts is now over 100 billion dollars a year. Adding AI could make this much worse.

With regards to technology as the answer to today's pressing problems, Anandan Padmanabhan (Adobe Research India) thought that technology may not actually be the solution; the only solution or even the primary solution to many of our problems – social problems – have to be addressed by social means. He quoted Prof. Kentaro Toyama of Michigan University as saying that "Technology – no matter how well-designed – is only a magnifier of human intent and capacity."

P. Anandan concluded that, only by talking with communities can we come up with interesting interventions to support social processes by leveraging technology. Indeed, Peter Norvig (Google) suggested that "…often, the high-tech part is only a small part of the solution." Robert Opp (WFP) argued that although AI can play an important role in reducing hunger, it is vital that the needs of a diverse range of people, including the most vulnerable, guide the design and development of AI systems. Those who are furthest behind in terms of social and economic development are at the centre of the SDGs and need to be at the centre of design and application of technologies such as AI.

4.4.
POTENTIAL LIMITATIONS TO AI

A number of speakers mentioned important caveats and limitations to current forms of AI. In his speech, António Guterres, UN Secretary-General, stated that "there are real concerns about cybersecurity and human rights and privacy, not to mention the obvious and significant impact on labor markets […] Developing countries can gain from the benefits of AI, but they also face the highest risk of being left behind." Chaesub Lee (ITU) observed that "…we tried to develop design concepts for promoting security and privacy, but unfortunately… security is already gone. Privacy is quite difficult to achieve by design, but ethics by design is also challenging."

Houlin Zhao, ITU Secretary-General, contrasted the 'imagination' of human intelligence with AI outputs based on input provided and data collected. There was broad consensus that humans and machines have different strengths. Humans are good at asking intelligent questions, common-sense reasoning, and value judgments. Machines are much better at pattern detection, statistical reasoning and large-scale mathematical reasoning, according to Prof. Francesca Rossi (IBM Watson and University of Padova). According to Prof. Gary Marcus (NYU), AI is good at categorization, but perception is more than categorization; humans can go on to have further thoughts. Deep learning can identify component parts of any image, but not always unusual or unexpected associations or features. Analysis, language, reasoning, perception – we have made real progress in perception, but not so much progress with regards to the others.

Peter Lee (Microsoft) suggested that machine learning might look automatic, but it actually requires very highly trained and very expensive people. Andrew Zolli (Planet Labs) observed that "…big data is extraordinarily powerful, but it is also a gigantic pain to deal with, as many organizations – especially those at the forefront – do not have the capacity to rapidly analyze and utilize big data." Lars Bromley (UNOSAT) raised the problem of "feature extraction." In the current state of play, there is a trap of spending eight hours doing automated machine learning classification of satellite images to produce 80% of the answer, but an analyst is still needed to clean everything up and come up with an actual precise data set. So nine times out of ten, the problem is still given to human analyst, instead of pursuing automated analysis.

Dr. Margaret Chan, [the now former] Director-General of WHO, observed that "medical decisions are very complex, based on many factors including care and compassion for patients. I doubt a machine can imitate – or act – with compassion. Machines can rationalize and streamline, but AI cannot replace doctors and nurses in their interactions with patients." She asked what would happen if a smartphone app misses a symptom. Can you sue a machine for medical malpractice? Medical devices and practitioners are heavily regulated – medical schools are certified. How can we regulate machines programmed to think like humans?

Participants also broadly agreed that there are problems in accessing data – either due to privacy concerns for specific areas (e.g. health) or ownership. Prof. Yoshua Bengio (University of Montreal) claimed that right now,"…we are not striking the right balance of building something for the good of everyone's health and protecting individuals and their privacy, so their data will not be used against them. We need Governments to get in to this, to make sure that the rights of individuals are protected. We can change the laws so it is easier for people to share their medical data and be confident that it is not going to be used against them, for other reasons than those intended."

Robert Kirkpatrick (UN Global Pulse) also noted "our new natural resource, data, has fallen into the hands of an extractive industry, whose players are opaque and unregulated… Current instruments do not address the risks and opportunities presented by AI, in particular by generalized AI… We can ultimately foresee that there could be an international 'soft law' put in place, potentially a Convention on AI." Many participants called for a "democratization of AI" in terms of access to data, transparency in who owns the data, pooling of data and how should that data be used for the good of all. This was a near universal topic in talks, discussion, questions and recommendations.

05.

THE ETHICAL CONSIDERATIONS OF AI

Stephen Cave (Leverhulme Centre for the Future of Intelligence) called for AI to be autonomous: "We want intelligent machines that make decisions for us, that implement those decisions so that we have our time freed up for other things, or perhaps the machines are making other [different] decisions than we are." However, this raises the vital question of how to get (autonomous) AI systems to conform to ethical codes or human values. Peggy Hicks (UN OHCHR) observed that "We are not free floating in a world without any values or principles; we have been working on this project for many years and we have ideas." She suggested the Universal Declaration of Human Rights should form our basis for those values. Robert Kirkpatrick (UN Global Pulse) also stressed the role of the 'do no harm' principle and respect for human rights, including the right to privacy and building public trust.

There were also strongly divergent views about whether humans will still have a role in the future (not necessarily, according to some participants!) or whether the future will be a "symbiotic partnership" between humans + machines (Francesca Rossi from IBM). There were deeply divergent views on this question. Wendell Wallach (Yale University) suggested that the

"techno-optimists" perceive AI as a source of promise and productivity. And yet, he observed there is a degree of disquiet, and the techno-pessimists are concerned about whether benefits of AI will be distributed in an equitable fashion. There is also disquiet about whether AI will rob jobs or reduce wages, and whether we are building the foundations for a world that is more computer-centric and less human-centric. He observed that "AI on its own is not going to enhance human wellbeing, and there is no guarantee yet about what the outcome of this revolution will be," which is why this Summit is being convened. He concluded we are here "to ensure we have a more human-centric world, a more equitable world, [and] that we do indeed meet the SDG goals."

We need to be creative in thinking about ways to use AI technologies. According to Prof. Yoshua Bengio (University of Montreal), we need to try to shift gears – we should not just consider how we can use machine learning to develop the next gadget, but how can we use AI algorithms for the greater good? This will need creativity and not just from the researchers – we need to work with people to solve these problems. Salil Shetty (Amnesty International) stated that, "…while the use of these technologies is not new, AI can 'super-charge' our real-world processes."

Prof. Stuart Russell (UC Berkeley) acknowledged that "…as we develop capabilities to solve problems, we have a responsibility to use those capabilities and not just an opportunity… Fancy algorithms don't matter, the only thing that matters is the end result for people, who are what's important."

We need to ensure that technology functions at the service of humanity, rather than the other way round. Frank La Rue (UNESCO) asked, at the service of whom, and to the benefit of whom? How far will it reach? Peter Lee (Microsoft) acknowledged that industry may race ahead to build (commercially) high-value apps, while other applications with high (social) value may get left behind (such as loss of hearing).

If you take and take and don't give back, people get disillusioned, reducing trust in businesses and governments. Societies must plan for disruption and growing risks. Data gives formidable power to those who control it.

There is therefore a need to change public awareness and acceptance surrounding AI, perhaps equivalent to the changes in mindset needed in the sixteenth century following the introduction of the printing press for the first time, when people began to want and realize the necessity of learning to read, according to Peter Lee (Microsoft).

Participants were also unsure about whether we can – or should – hold machines to a higher standard than humans, and if so, in which areas? There are areas where machines cannot be held to perfection e.g. perfect self-driving cars. Today, there are still millions of road-deaths worldwide every year. If this is reduced to thousands due to self-driving cars, that would be better than the current situation. With regards to weapons, yes, people can be violent too, but individual violence is relatively limited. With Autonomous Weapons Systems (AWS), humanity could be annihilated in a matter of minutes, so clearly we need to hold computers to a higher standard in this and other areas, according to Prof. Joseph Konstan (University of Minnesota).

Robert Kirkpatrick (UN Global Pulse) described the risk of bias being introduced into AI, either by the data used to train it or by the purposes of the developers who originally designed the algorithm. This creates a need for transparency in AI systems. According to Mady Delvaux-Stehres MEP's (Member of European Parliament) report, "users should be informed in understandable language of what robots are supposed to do, going to do and why they act as they do." However, Prof. Joseph Konstan (University of Minnesota) doubted the feasibility of getting robots and AI programmes to do this, citing the issue of "scrutability," whereby it is difficult to understand how or where results have come from, and the only explanation for a diagnosis might be weighted coefficients in algorithms and dynamic learning processes.

06.

SOCIAL CHALLENGES

Participants also differed strongly with regards to their views on the impact and extent of robots, automation and AI on the labour market (as well as activities and processes within jobs) and the social implications of this. Mady Delvaux-Stehres MEP (Member of European Parliament) called for more expertise and better data on what is happening in the labor market and which tasks are being taken over. There is a lot of research on technical aspects and not enough research on the social implications. Prof. Lynne Parker (University of Tennessee-Knoxville) pointed out that AI might be able to create new jobs, or help with retraining, but Prof. Stuart Russell (UC Berkeley) pointed out that this would not require a billion data scientists! Discussions in the breakthrough groups also highlighted various aspects of this problem, including the need to redesign and adapt education systems, the need for reskilling and the possibility of taxing robots or developing alternative means of value to society for former workers.

Education includes different aspects, primary versus tertiary, the needs of developing countries versus developed countries, as well as at least three functions of education i.e. social order/

control, discipline and acquiring knowledge and skills. AI will be useful for helping promote and achieve some of these aspects, but not all. For example, AI systems could be helpful in improving literacy training for basic developing countries, as well as highly personalized training for individual students to create tailored training programmes, even in large group situations. AI can also help with advanced research in targeting research, identifying relationships in large volumes of data or in refining research questions. Prof. Lynne Parker (University of Tennessee-Knoxville) pointed out that AI can help with students with special needs, as machines can repeat the same task multiple times easily, when human assistants might reach the end of their patience.

Frank La Rue (UNESCO), acknowledged that the Internet can inform and empower people. But education is not just about acquiring knowledge or developing technology – education is also about developing more rounded human beings, with an appreciation of the arts. He called for us to balance social progress with technological progress. Prof. Stuart Russell (UC Berkeley) stated that AI systems have not been very successful in education so far, as they have been unable to communicate with the pupil in natural language, and have been largely restricted to clicking, selecting buttons on menus and canned text. Also, AI systems do not "know" anything about the material they are trying to teach. AI systems are teaching physics without understanding anything about physics, but this is about to change.

Participants also wondered about the prioritization of the most urgent problems needing solutions. One debate in the US focuses on self-driving trucks replacing professional truck drivers, equivalent to some 3.5 million truck drivers in the US, of which 96% are male, so Moustapha Cissé of Facebook suggested we may be working mainly on issues which affect white males. White fly detection and improving agricultural yields for crops such as cassava could improve the lives of 73% of the population of Uganda, around 30 million people. We need to examine which problems we are addressing, according to Moustapha Cissé (Facebook).

The potential for propagating bias: Vivian Ng (University of Essex) cautioned against discrimination with biased data fueling software, and called for a human rights-based approach to manage risk. Harm is unequally distributed and increased marginalization is likely. Bias in 'digital exhausts' or digital data trails can sometimes be allowed for and corrected by software and machine learning, but the gap between the theory of science and actual practice means that often, this is not necessarily happening. Malavika Jayaram (Digital Asia Hub) called for fairness and discrimination controls to be built into systems from the outset, in the design phase. While anticipating resistances sure to surface due to costs, she suggested that if we are not achieving equality for all, we will have failed.

07.
NEXT STEPS

We need a multi-disciplinary approach to developing and debating AI. According to Prof. Lynne Parker (University of Tennessee-Knoxville), to date, our approach to technology has been that "a technologist would build the technology, throw it over the wall and leave it with the social and behavioral scientists." Work in AI lies at the human/tech frontier, so we need to bring everyone to the table and look at the design of AI in collaboration with the social scientists – we need to work together to build the AI. Frank La Rue (UNESCO) made a similar call for social progress in line with and matching technological progress. Two of the breakthrough sessions focused on a roadmap for collaboration between involvement between government, industry, academia and civil society, and different approaches among different stakeholders.

With regards to multi-disciplinary alliances, Prof. Lan Xue (Tsinghua University), observed that there are many different overlapping regimes for AI, and called for a global knowledge alliance for AI so that we at least have a clear sense of where the technology is. Katsumi Emura (Japanese Strategic Council for AI Technology) observed that "The Internet of Things and AI are the keys to realiz[ing] society 5.0," where cyberspace is fused with physical space. In convening different stakeholders from across industry, government and civil society, the key is to start discussing future social issues, rather than starting with the technologies.

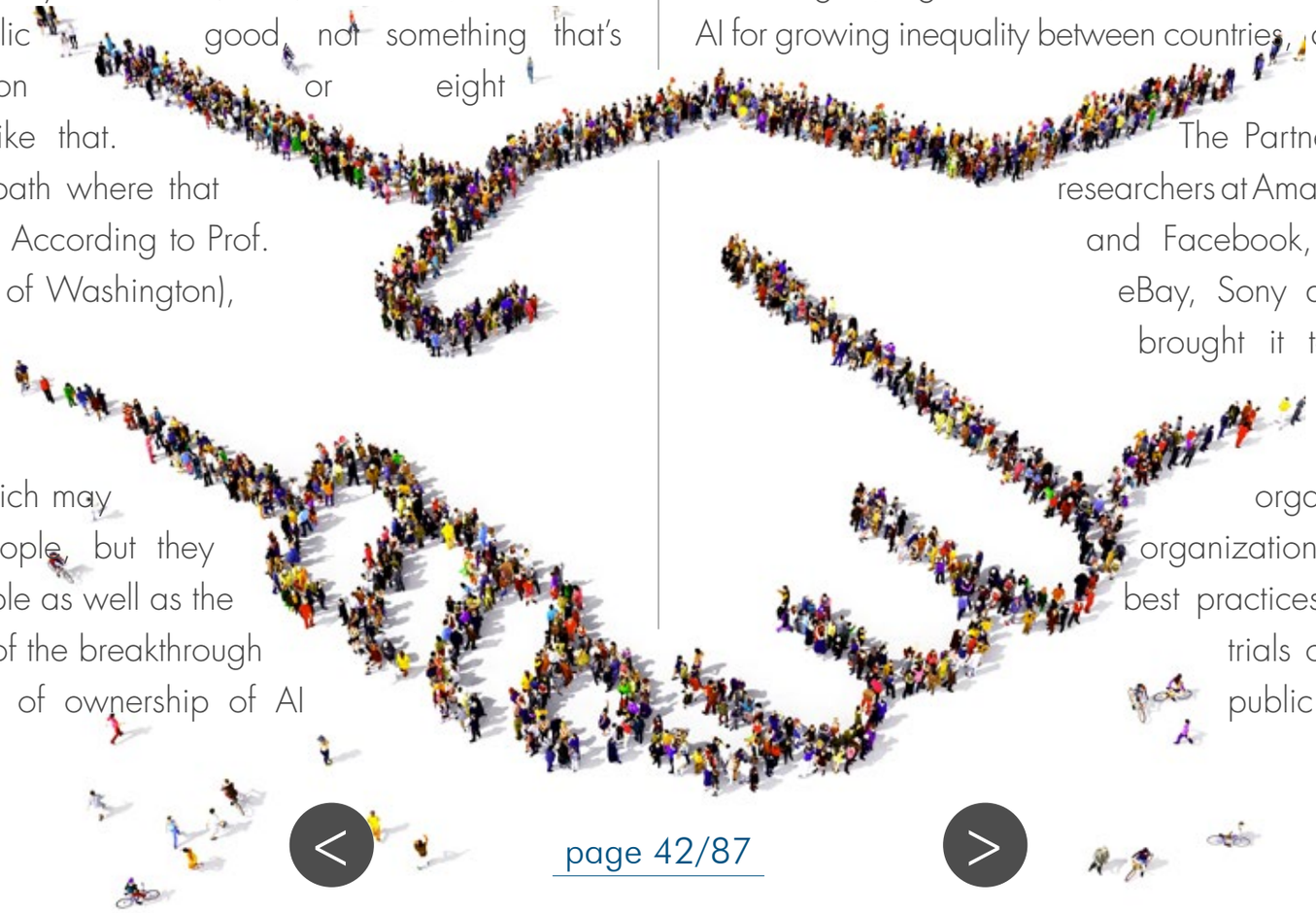
With regards to developing the regulatory frameworks for AI, risks include the need to develop appropriate frameworks for automated driving (as mentioned by Rupert Stadler, CEO of Audi) or how to deal with medical malpractice and liabilities (as mentioned by Margaret Chan of WHO). Prof. Pedro Domingos (University of Washington) observed that there will likely be no single fixed set of rules or laws or regulations or principles that will be good for governing AI. Because AI and machine learning evolve very rapidly, they are changing and adapting continually. Any fixed set of rules risks allowing things that shouldn't be allowed, or forbidding things that should be allowed, and will rapidly fall behind, according to Prof. Pedro Domingos (University of Washington).

Participants discussed the need for standardization. If we want to mainstream AI in a fair way so lots of players can participate, then standardization may be helpful. For example, pragmatically, the use of machine learning in communications is a subject that could well be standardized, according to Thomas Wiegand, Executive Director of the Heinrich Hertz Institute.

08.

INTERDISCIPLINARY COLLABORATION

Who will own AI? Prof. Gary Marcus (NYU) stated that, "in an ideal world, AI would be a public good, not something that's owned by one corporation or eight individuals or something like that. But we are headed on a path where that is what's going to happen." According to Prof. Pedro Domingos (University of Washington), "…only large organizations like companies with a lot of expertise to deploy AI will use it for their purposes, which may largely include serving people, but they don't necessarily know people as well as the people themselves." A few of the breakthrough groups linked the question of ownership of AI technologies, algorithms and/or data with the question of implications of AI for growing inequality between countries, companies or individuals.



The Partnership on AI started among researchers at Amazon, Google, IBM, Microsoft and Facebook, Apple and later involved eBay, Sony and others. The Partnership brought it to the board of directors, scientists and the nonprofit foundation world. This organization (a 503C non-profit organization) aims to develop and share best practices on R&D, testing and field trials of AI technologies, advance public understanding, provide an

open platform for discussion and engagement, and identify and nurture aspirational efforts in AI for social purposes. Intel, Sony, SAP, Salesforce and other firms are joining. The Partnership focuses on industry, but can be broadened, according to Eric Horvitz (Microsoft Research). UNICRI is opening a center on Artificial Intelligence and robotics in The Hague, the Netherlands, to serve as an international resource on matters related to AI and robotics. It aims to enhance understanding of the risk-benefit duality of AI and robotics through improved coordination, knowledge collection, dissemination and awareness.

The IEEE's initiative on ethics was mentioned in several sessions on ethics & privacy. Andy Chen (IEEE Computer Society) described the work of the IEEE Society and its paper for the ethical design alignment for AI. IEEE is engaged in a public consultation, and everyone attending the Summit was invited to participate. The WEF's Global Futures Council on AI and Robotics was mentioned. It has 25 people, many of whom have experience interfacing with policy-makers and thinking about large-scale challenges. Microsoft set up a panel called ether (AI ethics and engineering and research) reporting to senior leadership with monthly reviews, challenges, issues around ethics, AI, people and society. Audi's "Beyond initiative" (www.beyond-ai.com/) has been established with experts from MIT, Oxford University, Singularity University and entrepreneurs. The mission of the Beyond initiative is to apply AI for the benefit of society to shape the AI transformation to help us create a deep understanding and to follow the goal of transparency and algorithms.

LIST OF UN AGENCIES, OTHER INTERNATIONAL ORGANIZATIONS & NFPS ATTENDING

UN Agencies

IFAD	International Fund for Agricultural Development
ILO	International Labour Organization
ITU	International Telecommunication Union
OHCHR	Office of the High Commissioner for Human Rights
UNDESA	United Nations Department for Economic & Social Affairs
UNICEF	United Nations International Children's Fund
UNICRI	United Nations Interregional Crime and Justice Research Institute
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
UN Global Pulse	United Nations entity for exploring big data
UNODA	United Nations Office for Disarmament Affairs
UNOSAT	United Nations Operational Satellite Applications Programme
UNESCO	United Nations Educational, Scientific & Cultural Organization
UNIDO	United Nations Industrial Development Organization
WFP	World Food Programme
WHO	World Health Organization
WIPO	World Intellectual Property Organization

International Organizations and NFPs

Amnesty International	
ICRC	International Committee of the Red Cross
IFRC	International Federation of the Red Cross & Red Crescent
WEF	World Economic Forum

09.

SUMMARY OF
16 BREAKTHROUGH GROUPS

Privacy, Ethics & Societal Challenges

- Enhancing privacy & security
- Future of work
- Ethical development of AI
- Humans & machines

Capacity Building & Poverty Reduction

- Ending hunger
- Education
- Disaster prevention & relief
- Promoting equality in AI

Common Good & Sustainable Living

- AI for prosperity
- Promoting healthier citizens
- Social good data
- Smart cities and communities

Investment, Economic Aspects & Designing the Future

- Approaches by government, industry, other stakeholders
- Impact investment
- KPIs for success
- Roadmap for collaboration

9.1
ENHANCING PRIVACY & SECURITY

Moderator: Irakli Beridze, Senior Strategy and Policy Advisor, UNICRI

Irakli Beridze (UNICRI) opened this session by observing that never before has humankind accumulated so much data and never before has it been so easy to access this data. Frederike Kaltheuner (Privacy International) agreed, stating that many individuals feel that they have completely lost control over their data. She cited a US study indicating that 91% of Americans agree or strongly agree that they have "lost control" over their data. Brian Witten (Symantec) suggested that the passive collection of personal information (e.g. through sensors, cookies, location-based services etc.) is also challenging the notion of informed consent.

Konstantinos Karachalios (IEEE Standards Association) suggested that if a technology is not promoting our autonomy as humans, or our political autonomy, then it is effectively detrimental and of no value. Prof. Virginia Dignum (TU Delft) cited the "A.R.T. Principles" for developing AI: Accountability, Responsibility and Transparency. Drudeisha Madhub (Data Protection Commissioner's Office, PM's Office of the Republic of Mauritius) highlighted the work of the UN Global Pulse Privacy Advisory Group in advancing privacy and data protection principles for using big data and technology in the UN, and observed that the challenges with protecting informed consent for AI will be even greater. Hongjiang Zhang (ByteDance Technical Strategy Research Center) suggested we should rally governments, international bodies and privacy institutions to examine whether the existing privacy and security standards and regulations can still protect and safeguard personal data and privacy. Brian Witten (Symantec) called for a "Hippocratic Oath" for scientists, while discussions focused on the possibility of taxing data collection.

Recommendations from the session included: (1) the need to bring together all stakeholders to continue the conversation on building stronger privacy and security around AI; (2) creating model laws and regulations on security and privacy that are representative of this consensus, and encouraging countries to adopt them independently.

9.2
ETHICAL DEVELOPMENT OF AI

Moderator: Robert Kirkpatrick (Director, UN Global Pulse),

Rapporteur: Andy Chen (Board Chair, IEEE Computer Society).

The moderator Robert Kirkpatrick (UN Global Pulse) opened the session with a general overview of some of the implications of big data for ethics and human rights, in terms of greater information, tracking, privacy, and security. There is a need for transparency in the design of AI. Where there is an error, how can we trace it back and what degree of transparency do we need to have? Prof. Francesca Rossi (IBM Watson) expanded on why she believes the future will still be human + machine. She recommended using AI to augment human intelligence, not to replace it, and spoke about designing and developing symbiotic human-AI systems, as well as ways to evaluate their performance. Professor Rossi stressed the need to experiment with various approaches to embed ethical principles in AI systems.

Prof. Lorna McGregor (University of Essex) called for the Declaration of Human Rights to be incorporated into and used as a basis for the development of AI going forward. She recommended that the decision to use AI must be assessed against its impact on existing international human rights laws, standards and norms. Luka Omladic (UNESCO) described the report of UNESCO's Commission on the ethics of science and technology on Robotic Ethics. He suggested that, in order to deal with the positive and negative effects of AI in a responsible way, citizens need to be equipped with adequate frameworks, concepts and knowledge. Mr Omladic observed that it is vital to include civil society in this discussion on AI. Mr Omladic noted that the question of who is responsible for the consequences of unpredictable

decisions has deep ethical aspects. He recommended that a human should always be accountable for the decisions made by AI. Chinmayi Arun (National Law University, Delhi) described the use of the Aadhar identification system in India and noted some of the concerns which human rights groups have expressed over the use of a unique identity system.

According to Ms. Arun, it is essential to develop globally agreed risks assessment processes, risk identfication taxonomies and risk mitigation strategies for the use of AI. Mr. Andy Chen (IEEE), session rapporteur, also highlighted transparency and the contingency plan to control AI. He summarized that to control AI and ensure that it is ethical, we could establish mechanisms to monitor AI's activity, determine the degree of risks associated with the activity and decide what would be the "kill switch" for the use of AI, thus establishing the risk threshold.

The session concluded with recommendations on ways forward. The session participants stressed the importance of prioritizing the impact AI has on developing countries through ethical guidelines.

9.3
FUTURE OF WORK

Moderator: Marie-Jose Bahnam, XPRIZE;

Rapporteur: Alexandre Cadain, CEO Anima & ENS.

The moderator began by stating that it is widely believed that AI will be able to take on many tasks, in addition to simple repetition, engineering and teaching. There are concerns about what may become of workers, if machines will take over the work – whether, and how people will earn a living, and how they can contribute to society. AI will initially disrupt existing employment patterns, and redefine and redistribute roles between humans and machines, including elimination of certain types of jobs and displacement of workers by machines. On the upside, AI offers the potential for job creation and/or freeing up valuable time and for higher or more creative opportunities.

Barmak Heshmat (MIT) forecast that the idea of secure employment might disappear, with people becoming increasingly specialized and engaged in constant learning and (re)training. Irmgard Nubler (ILO) noted that change processes are non-linear and dynamic, and that societies inevitably respond to technological change. Prof. Stuart Russell (UC Berkeley) suggested that routine mental labor will be eliminated, just as physical labor of humans has largely already been eliminated. Olga Memedovic (UNIDO) stated that although AI is the result of global production and innovation networks, not all developing countries are taking part in AI value chain production. Developing countries face the challenge of how to participate in global innovation and AI value chains (from upstream AI research work to algorithm development; data collection; production of semiconductors; graphical design processing such as for instance China) or they risk otherwise being marginalized from these processes and becoming import-dependent on AI (where they can afford AI imports). The adoption of AI production value chain will likely trigger structural changes in global production systems affecting the geography of production, innovation, consumption and distribution. Some tasks will be in-shored back to developed countries, and developing countries may face job losses (particularly in low skill-intensive manufacturing jobs).

Addressing these challenges will depend on developing countries technical capabilities; access to digital infrastructure; digital and technical skills; and demographic trends. Developing countries with low technological capabilities and rising population growth and young labor force (such as those in Africa) will be affected most. The international community should help developing countries address these challenges, as they are with potential to create various benefits but also negative externalities for the international community.

However, Prof. Manuela Veloso (Carnegie Mellon University) was more optimistic, seeing no limits to human creativity, and many spin-off industries to AI. Plamen Dimitrov (CITUB Bulgaria) foresaw new jobs for trainers, explainers (intermediaries between technologists and business leaders) and sustainers (to uphold values). Ratika Jain (CII, India) called for societies to become more adaptable. Ekkehard Ernst (ILO) suggested there are vast amounts of data available about talent management, but we need tools to process these data, and the private sector is helping develop these tools. He called for UN agencies to help private entities set certain standards in how we classify jobs, so we can track what is happening. Questions explored the nature of change and lags between labour markets, policy reforms and education systems.

Some of the suggested strategies highlighted in the session included: encouraging social dialogue to determine and continuously revisit which data should be open-sourced and which skills are required for the preferred future of work; and promoting the maintenance of infrastructure in which we include governance, to democratize data, knowledge and skills.

9.4
HUMANS & MACHINES

Moderator & Rapporteur: Joseph Konstan,

Professor, University of Minnesota.

This session focused on the changing relationship between humans and robots. It can actually be ethical to use robots instead of humans in highly dangerous situations, e.g. during the Fukushima catastrophe. Marie-Helene Parizeau (UNESCO COMEST) observed that industrial robots can also be used for greater efficiency, higher yield and reduction of arduous work, but asked to what extent can strategic know-how be replaced by AI, and can robots replace humans? To what extent can human expertise and know-how be replaced by AI?

Participants cited the use of robots as a therapeutic tool for treatment of children with autistic syndromes, noting that this nevertheless needs peer review and consideration of the research ethics. Mady Delvaux-Stehres MEP (Member of European Parliament) observed that AI tools can be very helpful for medical diagnosis for people without access to medical services. Apala Lahiri Chavan (Human Factors International) called for technology to help those at the bottom of the pyramid. Prof. Nic Bidwell (University of Namibia) called for AI to increase access to resources for marginalized people, including in language translation in countries with many different languages. The session considered Asimov's Laws of Robotics, as well as issues of responsibility and liability.

Some of the suggested strategies highlighted in the session included: human-centric, accessible, and transparent design; accommodating physical, cognitive, literacy, language imitations; sensitive to different cultural norms and communication styles, providing access to internal models and learnings; encoding ethical legal and HR criteria, which cannot be limited to universal principles and have to be anchored to local systems and evaluation criteria; and helping Governments and NGOs and industry set priorities towards protecting and enhancing health, safety, education and wellbeing.

9.5
AI FOR PROSPERITY

Moderator: Yoshua Bengio, Professor, University of Montreal.

Rapporteur: Sean McGregor, Oregon State University.

Prof. Lynne Parker (University of Tennessee-Knoxville) pointed out that AI for prosperity relates to what the Summit is really about, using AI to solve problems like poverty, hunger and education for example. She called for "an agency of shared AI expertise, which is a group of experts that can serve as experts to these developing countries on a not-for-profit consulting basis." Philippe Beaudoin (Element AI) agreed, citing the experience of Image.Net.

Peter Lee (Microsoft) underlined the need for sustainability in the data sets needed for AI systems – current models are not sufficiently adaptive – face recognition models for Rio, Beijing and the US differ. Anja Kaspersen (ICRC) observed that data has become highly political as technology enables us to generate data at scale and design better ways to collect, store and understand data. However, we do not yet have maturity in our political systems and legislation is fragmented and varies greatly from country to country. There is a vacuum on how to govern this "resource", an immaturity or lack of literacy of the impact, and we must be vigilant against the impact of growing of data monopolies run by corporate interests, especially where people are vulnerable and find themselves in situations fraught with peril. Sam Molyneux (Chan Zuckerberg Foundation) suggested the creation of philanthropy or government-funded AI teams, uniting top engineers from tech companies to engineer large-scale solutions to address big challenges. He also underlined the need for open curated data for AI.

Ankur Vora (Gates Foundation) observed that AI will increase income inequality between countries significantly (the Industrial Revolution raised average incomes in the top ten industrialized countries to an average of fifty times more than the bottom ten countries). He called for the UN and governments to have a role to play to develop policy recommendations to address this income inequality. Wendell Wallach (Yale University) called for us to be acutely aware of the potential risks and harms and dangers of AI. He raised the issue of an AI tax to counter the negative impacts of AI on jobs, but the session concluded with no clear direction on this.

Suggested strategies highlighted in the session included data stewardship and good faith fellowship. The proposal is to create a non-profit organization (NGO, government funded and/or UN) which helps to prioritize AI for good projects based on the real needs and maximum humanitarian impact and channels funding to these projects, brings together the associated datasets, makes them easy to use by the community of AI researchers from around the world and funds teams which implement and deploy solutions in the field.

9.6
SOCIAL GOOD DATA

Moderator: Miguel Luengo-Oroz, Chief Data Scientist,
UN Global Pulse;

Rapporteur: Rene Clausen Nielsen, IFRC.

The moderator Dr. Miguel Luengo-Oroz (UN Global Pulse) kicked off the session exploring how we can use AI to distill insights from data in order to create inclusive applications for social good, with particular focus on developing countries and bridging the digital divide. Dr. John Quinn (Pulse Lab Kampala) presented some of the data innovation projects developed by UN Global Pulse and partners, from the use of mobile data to understand population movements during crisis and measuring poverty with satellite data in Uganda, to crowdsourcing social media for insights on food prices in Indonesia. One notable example was a prototype developed by Pulse Lab Kampala that uses radio as a source of big data to measure SDG progress. The Radio Content Analysis Tool uses speech-to-text technology to inform on topics of interest for local languages (the software has thus far been developed for three languages: Ugandan English, Acholi and Luganda). Moustapha Cissé (Facebook) emphasized the importance of data and the insights that can be extracted from it. Data gives us the means to tailor our services, and to create technologies and applications and research centres that can be used to improve the experience of users. He called for a future circle of innovation which is open source. Fei-Fei Li (Google Cloud) observed that AI is not new, it has been around for the last 60 years. In her opinion, the biggest success story in AI is really supervised learning and deep learning using big data and labeled data. Leila Zia (Wikimedia Foundation) raised the issues of free open licenses and freedom of panorama.

Lars Bromley (UNOSAT) described the work of UNOSAT as an on-demand satellite imagery analysis service for the UN system, and described the problems of 'feature extraction' and time allocation, noting that today it is still sometimes faster to get humans to do the job, rather than have humans clean up after automated analysis. Chris Earney (UNHCR Innovation) noted that looking at the datasets that UNHCR currently

collects, AI could be applied in many different scenarios, but it is critical to first set up the right frameworks to ensure we protect people's privacy and identity – especially in the case of the most vulnerable. Partnership is key, as joint work from UNHCR, UNOSAT and UN Global Pulse has shown. Moustapha Cissé (Facebook) suggested we may be working mainly on white men's problems, but that there is an opportunity to affect the lives of millions of people if we find the right problems to work in; for example, working on white fly detection in cassava crops could change the lives of many millions of Ugandans.

Some of the strategies highlighted in the session talked about the need to ask the right questions of AI (not just address problems that concern the already privileged). Participants concluded that we need a global community of practice and funding to be able to have global impact; and that we need to democratize data – not just through data-sharing, but also by sharing the dataset labels, sharing the technology and making the data available.

9.7
PROMOTING HEALTHIER CITIZENS

Moderator: Mohamed Alkady, Hart;

Rapporteur: Preetam Maloor, ITU.

Barry Ressler (International Space Medicine Consortium) described the challenges in space medicine, as well as extending medical technologies to underserved people on Earth. AI can play a critical part of our success in overcoming these challenges, including robotic surgery and anti-microbial resistance. Abha Saxena (WHO) asked how the AI industry can ensure that the algorithms and outposts include developing countries.She highlighted the role of AI in the long process of new drug and vaccine development, but care, compassion and trust in physicians remain important values in the medical system. Mohamed Alkady (Hart) suggested that AI will not solve everything. It has a place and position for what it does, so how and where will AI and humans work together?

Christiane Woopen (University of Cologne) suggested three options in healthcare: 1) Data (surveys, data collection, interpretation, correlations and hypotheses); 2) Processes (e.g. surgery, robots, tailored medical applications etc); and 3) Applications (decision support systems, diagnosis, integrating data, merging results with current evidence). But integrating AI in evidence-based medicine is another challenge. Jay Komarneni (Human Diagnosis Project) distinguished between augmented intelligence (expanding the capability of a human or other agent using machine intelligence), pure AI (having an AI answer a question better than a human e.g. with radiology images) and integrated intelligence. Labeled training data is understood by clinicians, but not always by community health workers. We need to build interfaces that capture, structure and encode labeled training data to enable us to solve the right problem. The panel concluded with a discussion of rising inequality and how AI can be used to allow humans to narrow the solutions base faster. The value of humans to AI is understanding when situations are ambiguous and allowing humans to basically close the loop.

Some of the suggested strategic thoughts highlighted in the session include: AI can help contribute to healthcare by establishing how to learn about healthcare systems; not all data are equal; and how can we use AIs to train humans, rather than using humans to train AI.

9.8
SMART CITIES & COMMUNITIES

Moderators: Frits Bussemaker, CIONET; Kyle Nel, Lowe's Innovation Labs;

Rapporteur: Michael Martin, XPRIZE.

Okan Geray (Smart Dubai Office) observed that cities are dense and complex structures that occupy 3% of the Earth's land surface, but accommodate 55% of the world's population, projected to increase to 60% by 2030 (and 70% in 30 years' time). Smart Cities aim to enhance the quality of life and try to address the present and future generations' expectations addressing social, economic and environmental problems. He noted every city is different, with many different challenges, from carbon dioxide emissions, issues around providing water and energy, digital transformation in the public sector and accountability, to the provision of basic electricity. We hope that AI will help in eradicating poverty and slums.

The co-moderator Frits Bussemaker (CIONET) asked about applications of AI in autonomous driving, urban farming and critical infrastructure. Kyle Nel (Lowe's Innovation Labs) stated that "many possibilities of AI are too abstract to be understood. We need to develop a picture of where we want to be in the future to understand which policies will take us there." He observed we need to avoid proprietary data in cities if we want to use the full potential of AI. Peter Marx (GE) discussed the question of ownership of data, noting fully open data, data shared by regulated industries. According to him, many proprietary companies refuse to share data. Antoine Bordes (Facebook) called to decouple big data from AI.

Igor van Gemert (SIM-CI) stated that cities are engineered in silos, and called for cities to be made more resilient by design. He suggested that the "combination of cloud computing and open source will allow governments and city administrations to implement affordable smart cities solutions," as well as gain a deeper understanding of what's going on in a city and its underlying processes. He called for a global repository to share insights into smarter functioning of cities.

Thomas Wiegand (Fraunhofer Heinrich Hertz Institute) noted that in AI for smart cities, there are three key dimensions: security, terror and crime prevention, and energy efficiency. He described Jevon's paradox for video compression, whereby improved efficiency in the use of a resource lowers the relative cost of using that resource, paradoxically increasing the quantity demanded. Discussions focused on whether regulatory incentives can be established for cities to reassert ownership of data in favor of their citizens.

Some of the suggested strategic thoughts highlighted in the session include: developing a transparent approach for data privacy ownership and transparency to ensure that any AI system deployed by a city will benefit citizens (which might also include algorithms and models); identifying KPIs to assess and measure before implementing on a broad scale (organize living labs & pilots and share the results on a global scale so cities become smarter); and ensuring that AI solutions will increase access and decrease stratification across gender, age, race and class.

9.9
ENDING HUNGER

Moderator: Robert Opp, WFP;

Rapporteurs: Johanna Jochim & Jamie Green, WFP.

Robert Opp (WFP) opened the session by stating that while the world has made progress in the fight against hunger, 800 million people worldwide still do not have enough food on a daily basis to reach their full physical and mental potential. New technologies, including Artificial Intelligence, can help get us to Zero Hunger by 2030. WFP's Sarah Muir showed how WFP is planning to use AI to analyze Very High Resolution Satellite Imagery and identify and assess food security hotspots in hard-to-access areas. Uyi Stewart (Gates Foundation) described an AI solution in Kenya. There are around a billion people in Africa, of which 60-70% or approx. 600 to 700 million people are linked with agriculture, mainly as small-scale farmers. AI can be used to collect data on farms, rainfall, acidity levels etc. Farmers can now call in to get information on when to farm, when and what to plant. However, it is important to contextualize our models using indigenous knowledge to ensure farmers can act on insights from the models. Behshad Behzadi (Google Switzerland) observed that machine learning has made a lot of progress in recent years, especially in voice recognition.

Andrew Zolli (Planet Labs) joined remotely to describe Planet Labs' work using miniature satellites aiming to ensure that satellite and new data sources can be used to achieve highest scientific, sustainable development and humanitarian impact. He described the use of satellite imagery to monitor planting, agricultural indicators in Kenya, a flood event in Sri Lanka, the growth of Dar es Salaam city and an IDP camp in Uganda. Marcus Shingles (XPRIZE) claimed that there is "an Entrepreneurial Renaissance occurring of innovators that we have never seen before," based on crowdsourcing insights to generate critical mass.

Robert Sutor (IBM Research) observed that AI is sometimes viewed as a proxy for computer science and applied mathematics, but that many of its precepts are of long standing; there are many different technologies that can be applied. Behshad Behzadi (Google Switzerland) hesitated to define AI as machine learning; there is a wide range of broader problems that can be addressed using classical optimizations and machine learning or different types of tools. Questions focused on food distribution issues and the political causes and implications of drought.

Some of the suggested strategies highlighted in the session include: being user centric and inclusive, i.e. taking the needs of all people, including the most vulnerable, into account when designing and developing AI systems; safeguarding the privacy and protecting the data of the most vulnerable people.

9.10
DISASTER PREVENTION & RELIEF

Moderator: Louise Story, NYT;

Rapporteur: Paul Bunje, XPRIZE.

The moderator, Louise Story (The New York Times), opened the session by asking what is AI? Can AI, machine learning, open data and information sharing more broadly help us with some of the challenges we face today?

Nick Haan (Singularity University) defined AI as incredibly powerful computing processing that uses massive amounts of information, can process complex algorithms and make predictions in real-time. He described the role of AI in food security analysis, and how it could help in the analysis and/or declaration of famine. Chris Fabian (UNICEF Innovation) described UNICEF's work trying to map schools worldwide, blockchain for paying teachers in South Africa, or facial recognition to detect malnutrition in Kenya. UNICEF is working with operators and Google to build mobility matrices to map movements of people. It is often necessary to aggregate the data, so it is no longer the private, internal data of a company. Six years ago, UNICEF, USAID and 17 other agencies published "principles of digital development."

Pablo Rodriguez (Telefonica Alpha) described Telefonica's work deploying ad hoc networks in times of disaster relief. He described how Google balloons were deployed after floods in Peru, giving access to 150 gigabytes of data to hundreds of thousands of residents. In Telefonica's survey, more people cared about their data, transparency and traceability.

Katherine Maher (Wikimedia Foundation) described how Wikipedia is very open, but very reflective of real-world biases. English Wikipedia is the largest, at 5.4 million articles. 1.3 million articles are biographies, but only 16% of these relate to women. Only 3.2% of content indexed with a Geo tag is about Africa. She called for the industry to be more transparent and more participatory as to how technologies are being developed; this is the only way to address any bias.

Some of the suggested strategies highlighted included: building a process to ensure data and development of AI is transparent; ensuring openness, inclusion and diversity of who contributes to and benefits from AI; and using AI as a tool to support action and decision-making.

9.11
EDUCATION

Moderators: Alex Mejia, UNITAR; Fengchun Miao, UNESCO.

Rapporteur – Kristian from e180.

The co-moderator Alex Mejia (UNITAR) observed that on the upside, broader access to knowledge, peer learning, crowdsourcing, new content, machine learning and online learning are improving education and resulting in more tailored education. However, AI may well render current education systems obsolete and we will need more and different skills for the changing workplace. Fengchun Miao (UNESCO) stated we must ensure AI will not further widen education and learning divides by 2030. Prof. François Taddei (Paris Descartes University) wondered whether machines can be trained to ask the right questions. He suggested we shall need more ethics in the age of machines, not less.

Prof. Cynthia Breazeal (MIT Media Lab) called for an "open AI innovation engine" that can power data-driven literacy for a worldwide community of stakeholders (including developers, technologies and adopters) to figure out solutions that work. Mark Nelson (CSTA) stated that, in his view, "AI applications in K-12 education have largely failed to meet expectations." He called for the AI community and UN to include teachers' voices in educational solutions. Prof. Robin Murphy (Texas A&M University) observed that AI will help greatly for education and disaster response. Adam Klaptocz (WeRobotics) described WeRobotics' work in providing access to AI and robotics training in developing countries.

Some of the suggested strategies highlighted in the session included: using AI in education to first serve the underserved – not something that actually came out as a big priority for education in the panel, but basic literacy should be a priority. Before thinking about scaling with AI, we first have to redefine what great education and learning experiences actually are; and learning has to be self-directed for meaning.

9.12
PROMOTING EQUALITY IN ACCESS TO AI

Moderator: Sherif Elsayed-Ali, Amnesty Intl;

Rapporteur: Ahmed Motala, OHCHR.

The moderator, Sherif Elsayed-Ali (Amnesty International), opened the session by asking whether human rights form a good basis for equality in access to all. Lydia Nicholas (Collective Intelligence Nesta) called for AI technologies to be used in a way that involves people and in the full awareness how the data collected and reads. Standards for data are still fairly abstract and open to interpretation. Encryption programmes exist to encrypt the data on phones, so users can decide what to share. However, Malavika Jayaram (Digital Asia Hub) stated that only two industries talk about users' rights – the drug and tech industries!

Peter Lee (Microsoft) stated that "AI today is largely based on machine learning, which is largely based on data, the direction of insights and model and data. That data today is largely the exhaust from human thought and activity." The fact that today's AI is being trained on data based on human thoughts and behavior might actually be a limitation – he looks forward to future AI trained on data excluding humans. Lorna McGregor (University of Essex) called for principles and values to be integrated into AI as a safeguard (as we see in privacy and constant technology). She called for conducting human rights and tech assessments at each state designed for application for monitoring of the use of such technologies. Frederike Kaltheuner (Privacy International) claimed "we are living in an age of surveillance capitalism." She noted that most people are fundamentally unaware about what kinds of data are being generated, collected, processed and shared. Even phone data can be used to make inferences about users' personalities. Discussions focused on whether software can be used to correct or eliminate bias.

Some of the suggested strategies highlighted in the session include: development of AI should take an inclusive approach; there should be meaningful participation of individuals and communities in how data is collected and analyzed and used; there should be regular review of the design, development and implementation of AI; democratization; low cost representativeness; giving people a voice; and education measures for all people to understand the implications and how to use AI tools.

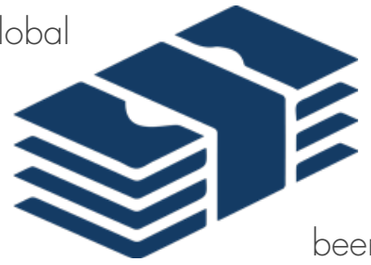
9.13
INVESTING FOR IMPACT WITH AI

Moderator: Ash Fontana, Zetta Capital;

Rapporteur: Rigas Hadzilacos, WEF

The moderator, Ash Fontana (Zetta Ventures), opened this session by stating "we all have a moral imperative to ensure a certain quality of life for everyone on the planet" and defined the purpose of the session as developing some guidance as to how to go about this.

Christian Steinruecken (Cambridge University, Invenia), addressed his central question of how can we make machines most useful to humans? He acknowledged that "AI can be used to solve big problems, global size problems, and that's an opportunity that is really up to us to take up." Automated decisions combined with machine learning can make a big difference in running electrical grids more efficiently. However, matching public benefits with incentives for private investment will be hard. Ash suggested that software can help allocate resources, with minimal capital investment. Sven Strohband (Khosla Ventures) described a company that is using robotics to help produce more food. The computer distinguishes between crops and weeds, and sprays the weeds with targeted pesticides to avoid 'broadcast chemicals,' thereby reducing costs for farmers. He suggested that the lack of datasets for developing countries could be holding back the adaptation of AI to the needs of developing countries – we are actually quite good at retraining on novel data sets.



David Hunter (Optimal Agriculture) described the use of mental models and higher order effects. He described Optimal Agriculture's work optimizing and automating hydroponic greenhouses in the Netherlands to reduce the energy consumption within existing greenhouses. Ankur Vora (Gates Foundation) described the use of AI for SDGs 3 and 4, where tremendous progress has been achieved already, but there is a need for better information to guide investments. Prof. François Taddei (Paris Descartes University) suggested we can analyze evolution of the past but we are very bad at predicting tomorrow – we can try engineering the future, but we constantly have surprises when we do this. Discussions focused on the difference between private data sources and the public data available.

Some of the suggested strategies highlighted in the session include: creating a platform that allows regional governments and non-profit organizations to submit problems with associated datasets on which machine learning practitioners can work (the UN could be a good forum for this, where there is not enough data); creating a search fund that identifies existing AI solutions that can be easily and cheaply adapted for the developing world; and creating a fund that offers grants to private companies to collect socio-graphic survey data, and share that data via APIs.

9.14
KPI FOR SUCCESS

Moderator: Chris Fabian, UNICEF Innovation;

Rapporteur: Sean McGregor, Oregon State University.

This session engaged in a highly interactive brainstorming session of many different indicators or KPI for success. It spent some time defining what an indicator was, with reference to the 17 SDGs and 169 targets and 230 indicators, and then proceeded. It discussed three sets of indicators:

1. indicators about how well we're doing the work we're supposed to do;

2. indicators about AI technologies – are they good? Can we interrogate them?

3. indicators of the input level – what went into making this technology?

Discussions focused on how choosing targets and indicators can change behavioral incentive structures, and the need to start doing, rather than waiting until the system is perfect as we can still progress through trial and error. AI can already help to make sense out of all the existing data.

Some of the suggested strategies highlighted in the session include: developing indicators – encourage investment in fairness, accountability and transparency; and on global ethics – the community of the conference should adopt a process or framework for assessing the ethics of real-world changes produced by an AI system before deployment.

9.15
APPROACHES BY GOVERNMENTS, INDUSTRY & OTHER STAKEHOLDERS

Moderator: Prof. Lynn Parker, University Knoxville-Tennessee;

Rapporteur: Preetam Maloor, ITU.

The moderator, Prof. Lynne Parker (University of Tennessee-Knoxville) opened the session by observing that many countries have been developing strategies around AI, but are there ways that we can work together to address this grand challenge, or lessons we can learn?

Ekkhard Ernst (ILO) suggested companies lack standards or some kind of general understanding about how to make use of the data that they have. There is also the important issue of guaranteeing data privacy, that is certainly also an important topic for some of our UN agencies here. Konstantinos Karachalios described the work of the IEEE Standards Association to create a collaborative 'Ethically Aligned Design' platform in ICT technology and AI to educate the engineering community to deliver better products and better global rules, as well as various projects.

Prof. Francesca Rossi (University of Padova and IBM Watson) described the Partnership on AI, which started from six companies (IBM, Microsoft, Apple, Google, Facebook and Amazon), and later expanded to include E-Bay, Intel, Sony and others. The Partnership aims to understand what will be the main impacts of pervasive use of AI – on our lives, economic impact and societal impact. We want to understand how to address issues including data handling, data policies, data privacy, ownership, storage sharing and combining data. The Partnership is aiming to understand how AI can be beneficial for all, and to mitigate some of the risks, including the digital divide, the inequalities and bias.

Jonggun Lee (UN Global Pulse) suggested we might need to start small, and bootstrap. Anja Kaspersen (ICRC) suggested that AI is forcing us all

to be early adopters without the (digital) maturity to support it. She also urged that we break down the silos given the interdisciplinary nature of AI based technologies. Uyi Stewart (Gates Foundation) described his work on a public-private partnership with the government of Kenya and the research organization around incentives for ease of doing business. Letting students (Fellows) experiment with open data and tell Kenya's story using big data for process re-engineering encouraged reforms and boosted Kenya up the 'ease of business' rankings.

Some of the suggested strategies highlighted in the session include creating a repository of AI for Good case studies, activities, partnerships, and best practices used as a resource to understand how different stakeholders are solving grand challenges using AI, and to help them collaborate. Multi-stakeholder partnerships should agree on workable incentives and governance structures for data sharing and should encourage global open standardization and availability of open-source software relevant for AI applications. Ideas such as this will help in working towards mechanisms that address the inequalities in the distribution of knowledge and wealth surrounding AI, so that developing countries cannot only catch up, but leapfrog in the AI revolution.

9.16
TOWARDS A ROADMAP FOR COLLABORATION

Co-Moderators & Co-Rapporteurs:

Marie-Jose Bahnam & Paul Bunje, XPRIZE.

The moderator, Paul Bunje (XPRIZE), opened a very interactive session by asking participants for examples of how AI could meet one of the SDGs, and where the real priorities lie. He noted that we need to think through which of our current problems we can address with today's AI techniques and where we need new AI techniques that don't yet exist, and how we want to balance our investments between developing existing techniques and commercializing new ones.

Prof. Gary Marcus (NYU) suggested that the set of values about egalitarianism are values we want, but we have to be realistic about the mechanism we will use. Current machine learning techniques are knowledge-free and don't argue over semantics, but we might get to systems that can do more causal reasoning. He suggested we might want a way of institutionalizing collaboration and also of sharing AI by having something like CERN as a model for AI.

Chaesub Lee, Director of ITU-T, observed that AI originates in the technical domains, but the 17 SDGs are structured vertically, and each vertical has its own ecosystems governed by specific Ministries in countries, or even our UN agencies. Extensive collaboration is needed to achieve the SDGs. Prof. Robin Murphy (Texas A&M University) suggested progress is not just about technological drivers, and is something that a government or a government agency has to invest in because it won't simply be taken care of by a smartphone app! He pointed out that real collaboration, like real innovation, is built on repeated trial and error. Peter Marx (GE) described how Los Angeles published all its datasets as open data. Robert Opp (WFP) called for us to always consider the needs of the most vulnerable people when designing AI systems, as well as privacy and data protection more generally.

Some of the suggested strategies highlighted in the session include: Collaboration is Key – engage the crowd, build institutions for collaboration (CERN for AI); build platforms for collaboration among technologists and between developers and users and stakeholders; Inclusion is Key – include diverse perspectives, communities and under-represented individuals; include leaders from all sectors of society in tech; include diverse approaches to solutions; and Access is Key – expose the world to efforts; build transparent systems with clear intentions and stated purposes; democratize access to development, tools, data and solutions.

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Helix Advanced Networks

Human Factors International

HumanityX - Leiden University

Humans Fund

IA Collaborative

IBM

IBM Research

IBM Watson Group

ICANN

ICRC

IEC

IEEE Computer Society

IEEE-SA

IFIP - International Federation for Information Processing

IFRC

ILO

impartial.ai

Indeed Innovation GmbH

Indian Institute of Technology New Delhi

INSEAD

Institute of Customer Insight

Institute of Global Industry, Tsinghua University

Institute of Information Management at University of St. Gallen

Institute of National Communications of Mozambique

Internal Displacement Monitoring Centre

International Civil Aviation Organization (ICAO)

International Development Research Centre

International Federation of Red Cross & Red Crescent Societies (IFRC)

International Fund for Agricultural Development

International Labour Organisation

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International Organisation for Migration
International School of Geneva
International Space Medicine Consortium Inc.
International Training Centre of the ILO
Invenia Labs Ltd.
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Irdeto
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MHC International Ltd
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Microsoft AI+Research
Ministry of science and technology
Minstry of Science and Technology,People's Republic of China
Mission of Estonia
Mission permanente de la France à Genève
Mission permanente de l'Ukraine
Mission permanente du Portugal
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MIT Media Lab
National ICT Regulatory Authority
National Law University Delhi
Natural Intelligence
NEC Corporation
Neopas
Nesta
NeuralMimicry
New Frontiers Engineering - Cisco Systems, Inc.
New York Times
New York University
Norwegian Refugee Council, Internal Displacement Monitoring Centre
NTRA
nViso
OECD
OFCOM

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Office fédéral de la communication OFCOM

OHCHR

OMS

One Concern Inc

OpenEth.org

Optimal Labs

Orange

Permanent Mission Germany

Permanent mission of Belarus

Permanent Mission of Belgium to the UN - Delegation Générale Wallonie-Bruxelles

Permanent Mission of China

Permanent Mission of China to UNOG

Permanent Mission of Germany to International Organizations in Geneva

Permanent Mission of Hungary to the UN, Geneva

Permanent Mission of India

Permanent Mission of Latvia to the UN in Geneva

Permanent Mission of Switzerland to UNOG

Permanent Mission of the Kingdom of Lesotho

Permanent Mission of the Republic of Kazakhstan

Permanent Mission of the Russian Federation to the United Nations Office in Geneva

Prime Minister's Office of the Republic of Mauritius

Privacy International

privacyshell.com

Project Connect

PwC

pymetrics

Quantum Leap

Royal Holloway University of London

Royal Society

RT-RK Institute

Rwanda Utilities Regulatory Agency(RURA)

SAP Hybris

Saziba Group of Companies

Secretariat of the UN Chief Executives Board for Coordination

Secretariat of the United Nations System Chief Executives Board for Coordination (CEB)

Sentient Technologies

Sequoia Consulting

SIM-CI

Singulaity University

Smart Dubai Office

Sofi systems

Sparrho

Stanford University

Startup Sweden

STATE Festival Foundation

State of Geneva

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Swisscom
Symantec
Telefonica Alpha
Terre des hommes Lausanne
Texas A&M University
Text100
The Center for Research and Interdisciplinarity (CRI)
The Geneva Learning Foundation
The Human Diagnosis Project
The Permanent Mission of Japan
Trace Media International
Tsinghua University
TU Delft
TU Kaiserslautern, Germany
U.S. Department of State
UBENWA Intelligence Solutions INC.
UBS
UCLA
UK Mission
UN Global Pulse
UN Mission Korea
UN Office for Disaster Risk Reduction
UN System Chief Executives Board Secretariat
UN Women
UNCHR
UNCTAD
UNESCO
UNGSII
UNHCR
UNHCR Innovation
UNICEF
UNICEF Innovation
UNICEF USA
UNICRI
UNIDIR
UNIDO
UNITAR
United Nations
United Nations Department of Peacekeeping Operations
United Nations Global Pulse
United Nations Industrial Development Organization
United Nations Secretariat, Office of Information & Communications Technology
United Nations World Food Programme
Universal Doctor
Université de Montréal
Université Laval
University of California, Berkeley

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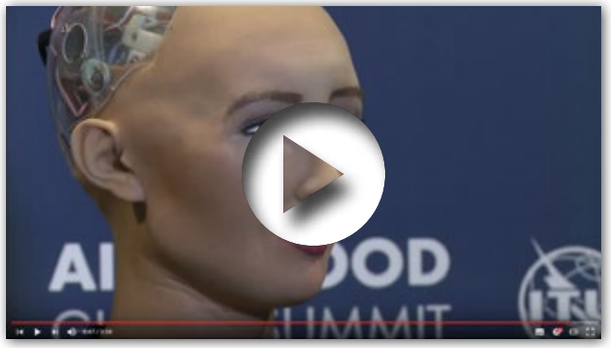
Univerza v Ljubljani, Filozofska fakulteta
UNODA
UNODC
UNOG
UNOSAT
UNSW Australia
US Mission to the UN Geneva
USAID (Global Development Lab)
Wardman Communications
Waseda University
WEF
WeFindX Limited
WeRobotics
WFP
WHO
Wikimedia Foundation
WikiNet
WikiOmni
WIPO
word4app
World Economic Forum
World Health Organization
World Summit AI/ Inspired Minds
WTO
Steffenraetzer
XPRIZE Foundation
Yale University
YES GLOBAL INSTITUTE
Zetta Venture Partners

VIDEO HIGHLIGHTS

Day 1 higlights

https://www.youtube.com/watch?v=UWw_8Obl5eY

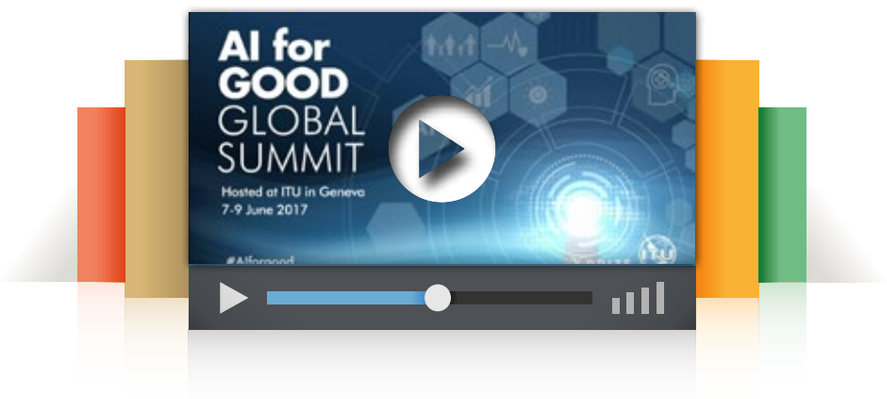
Day 2 higlights



https://www.youtube.com/watch?v=vB-JqN41bB9g&index=2&list=PLpoIPNlF8P-2PFPZFhYVaUsZrlxcQr6Bhx

Day 3 higlights

https://www.youtube.com/watch?v=giSbu-W7o_7g&index=3&list=PLpoIPNlF8P2PF-PZFhYVaUsZrlxcQr6Bhx



AI for Good Summit video playlist **90 videos**

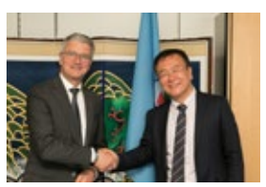
www.youtube.com/playlist?list=PLpoIPNlF8P2PFPZFhYVaUsZrlxcQr6Bhx

WEBCAST

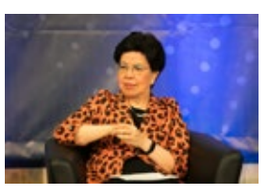
Webcast

www.itu.int/en/ITU-T/AI/Pages/webcast.aspx

PHOTO ALBUM

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ITUNEWS https://www.itu.int/en/newsroom/ai-2017/Pages/default.aspx

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Continue the discussion.
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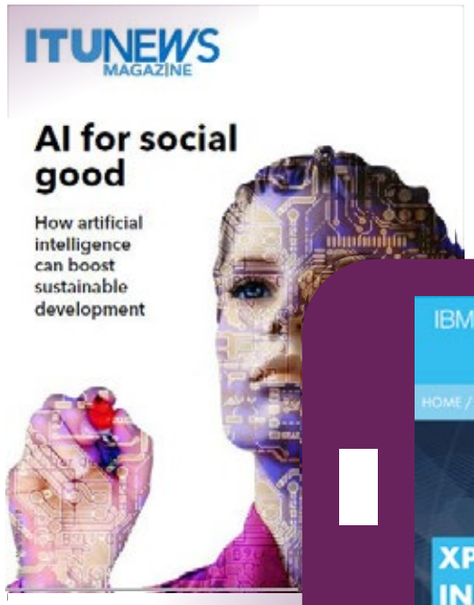
https://www.linkedin.com/groups/8567748



https://ai.xprize.org/AI-For-Good