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AI FOR GOOD GLOBAL SUMMIT
INNOVATIVE APPLICATIONS OF AI & DATA SCIENCE IN THE FIELD
MAY 15, 2018

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>> CHRISTOPHER FABIAN: Good afternoon. We're apparently on our own in terms of show running. I'll kick it off with a song, I'm not actually going to do that! I would like to ask everybody to sit down so we can get started with the session so you won't have to hear me sing which will only happen if you do not sit down, it is sort of a perverse incentive for some people. Comrades by the door, hello, good afternoon! Can I welcome you to this session? Everybody, thank you for coming.

I'm Christopher Fabian. I work in UNICEF's Office of Innovation. I'm very excited to take up the first 4 minutes of this session to warm-up the audience, tell my three jokes which I have told one of, and to talk a little bit of where we are now versus where we were last year in this discussion and in this conference. I think when we were here last year at the very beginning -- guys, if you would love to sit down, welted be thrilled to have you in seats. Thank you -- when we were here last year, we looked at a bunch of issues, two that really stood out former ELs us in the Office of Innovation at UNICEF, one was the ability for us to have a conversation about 15 years in the future without us being locked into the present. We're excited to have a few models of innovation in this space around machine learning and Data Science that are doing things right now. The thing we saw in the conversation, a lot of conversations were

happening in three, four places globally, Silicon Valley, Parts of Europe, and it wasn't really a conversation reflective of the technology and science we see developing in some of the places in the world with the most interesting constraints. The way we'll run this session, it is a little bit unusual in our flow. If that's okay with you, just give me a thumbs up, a bit unusual? Okay. Everybody who hates unusual, thumbs down? All right. You're in the right room. Thank you.

We'll do this as follows: We wanted to present the three examples of innovators and do the whole thing. We wanted to present the three examples first and give each about 7 minutes to talk about work being done in their context. Then we wanted to get into a bit more of a discussion on the architecture that we're seeing emerge and in the United Nations but with our tech and private sectors. And Robert Opp will give a bit of a closing thought on what that means for partnerships going forward. We really wanted to highlight one thing that came up in the planning session, we have great work being done by big U.N. agencies and tech partners that you know about, you hear their names everywhere, as we were planning this session, we also discovered some new acronyms in the U.N. system which is cool, and we also saw work that was sophisticated being done in Open Source AI and machine learning in parts of the the U.N. we never would have expected. Not that we shouldn't have, but we wouldn't have looked there necessarily. I think there are two sort of discussions that can come out of this, one, a question of how these big projects that you'll see that are far along already, how they take advantage of the situation that we see in the advances in the world in the last twelve months and how to gather together to create portfolios of and to authorize, to give the space for some of the new projects to succeed and to grow as well. That is how we wanted to structure the session. I did want to give a bit of a mention to some of the smaller projects of who are more in a start-up space, working on machine learning platforms, WIPO, the CTBTO, a great acronym! Love it! And working on drones and AI. All four of those agencies, if they're around, is anyone from any of those in the room? Only one? Okay. If you go, find them after -- find a representative of one of those, you will find rich and exciting discussions happening at a early stage. We look forward to having the discussion again next year and I want to open with that and hand the -- I don't know if I can get the next slide -- hand the next part of the presentation over to the three presenters, each will get up at some point and they'll present themselves and then present their work for 7 minutes and after 7 minutes we'll clap for them and they will sit down, that's followed by Manuel Garcia-Herranz, that's me, it is finished, there you go!

Excited to have the three are presenters coming from various fields of expertise sharing the work they're doing in exciting applications of large amounts of math on big datasets that I have yet to see.

Thank you all.

>> BERNHARD KOWATSCH: I'm head of the innovation accelerator of the World Food Program. I'll try to stick to 7 minutes. It is a tall order.

What I'll talk about, using Artificial Intelligence for direct analysis of data from drone image analysis. This is part of the work that we typically do at our accelerated work prom, we're looking for entrepreneurs or internal teams to help us make emergency assistance more effective or help lift people out of hunger and AI is one of the technologies that we're really also applying as one of the frontier technologies we're trying to use.

Now World Food Program, most of you know, in a lot of cases we're actually active in dire disaster situations, people that have been displaced either hit by natural disasters or also by man-made disasters and now what I'll talk about, it is the specific scenarios. I'll take you on this journey, imagine you're living on an island and you have been hit by a hurricane. All of the infrastructure has been destroyed and what happens, typically the emergency teams of humanitarian agencies and NGOs, they're deployed to those situations. Now, in that particular situation, what you often have, you actually see that you're there the first day, you lack information. You need to know where is the destruction of places, which houses are still intact, where do you need to actually bring food, shelter, water, and this is vital information that's lifesaving for the people that are living there and have been hit by disaster.

In a lot of cases with hurricanes, it is the the blue sky that you see there and what you see is it is actually cloudy and what you can use then when the clouds, the hurricane, typically it is 6, 7 days when you still have no actual satellite image available, you can fly drones. With flying drones, they fly below the clouds so you can get detailed data of whether buildings are still intact, whether for instance some roads are destroyed, where people have been displaced.

As you see, those drones, they're quite widespread and commercially available, a challenge, you see in the picture here, professional data analysts, he or she will take half a day to analyze the 20 minutes drone flight. Imagine, you're sitting there, half a day, manually actually analyzing this satellite images. In order to really use that information in a disaster setting, what we have embarked on is a journey to use Artificial Intelligence to automate the images. What you see there, this

is essentially one of the examples of mapping we're doing, a satellite picture identifying the houses but other structures and then you can tag whether the houses are intact, an intact roof or destroyed. Ultimately, what this is supposed to help the whole humanitarian industry, you're not relying on guesswork but you have data points that you can use to make informed decisions and so to be more targeted in what you actually provide is helped.

When you think about it, in the case of the hurricane again, for 7 days you don't have a satellite image and it is essentially guessing where or people in need are, by the time the 7 days have past, you're making decisions already of where you will move all of the assets like the food, shelter, the water.

Let me show you currently how the minimum prototype looks like. You have a map, you fly a couple of drones, you have different pictures and then you stitch these pictures together to one overlay. Then the Artificial Intelligence actually used, the machine learning process, it highlights what's the number of buildings and what's the status of the structures in the areas and then analysts can go there, you can look into the picture and say this is where we really need to provide specific analysis or send another monitor to check out the information and currently we're supporting the cluster, it is the cluster activated in emergency that's hosted by the humanitarian community.

A glimpse in timeline, we started this in December, gathering test imageses in Colombia. Now -- it took time to gather all of that, we started the image annotation, what you need to do, you have this raw image, you have to label them, you stick labels on this this raw images to start the machine learning process and then we begin the actual AI development for the first test to be ready by the later half of the year, hopefully to be deployed by the end of the year. This is a model example of what you can do, how to use AI, we're also working with private sector here like people like machine learning experts, AI engineers that dedicate their time on the pro Bono basis. A reason is, actually having the expertise to work together with our internal teams, entrepreneurs, innovators, and it is actually really important to have that expertise and secondly, what's also important, it is to work with the use of gathering the images in Colombia, having this data from disaster simulations, it was really important to us. We can readily deploy in the future. I think that's 7 minutes. If you have any questions afterwards, you can find us online.

Thank you.

>> PAUL HIDALGO-SANCHIS: Good afternoon. I work for Pulse

lab Kamapala, it is going to harness big data for the public good. It is 17 years now, in Africa, Asia, -- sorry. Update that. Thank you. Thank you.

That's me. Okay. What I want to share with you today is the reflection from those years of experience working in the field.

AI offers unlimited possibilities to transform human behavior, elements from the surface of earth and synergies between territories and societies into digital data. For the first time in human history with AI we can measure, quantify, monitor the three -- let me measure them, human behavior, elements from the is you are fast of the earth and then synergies between territories and societies into data. This is new, and because it is new, we also have new ways of understanding and using the type of data. Let me give you an example of the work we're doing from Kamapala. In Uganda we use AI to respond to the following question, how can the response of the U.N. and the government to a refugee crisis be better when we analyze and filter people's voices. You see on the slide, it is voice, how the computer sees voice. How did we approach this? We decided we would analyze what people say in social media. In Uganda, what people do on social media, it is radio, public radio discussions, they're used as social media Facebook, Twitter platforms in other parts of the world. So with partners, we developed this tool that combines picture recognition software developed with deep learning methods and data mining techniques. Quite a complicated thing, we have developed it for African languages. The speech recognition part, it is specifically the difficult part. The first generation of the tool, it was developed for Uganda and the second generation of the tool, it is easier, faster to be developed in the languages, it is developed for 12 additional African languages. We use this tool to ask the question, how can the response of the U.N. and the Government of Uganda be better when we include the voices from the people and filter. I'm going to show you what we found out.

We spotted rumors in this and outbreaks, it was valuable as actual civilian data. We spotted in the rumors in the radio discussions, discussions of a cholera outbreak 17 days before the outbreak was officially declared in the country. I'll show you a second finding, our second finding, we have spotted rumors of inflated Figures related to refugees, and that refugees, it was 100 days before international media was reflecting on this issue. In early February, the international media reflected on allegations about these things and we spotted them 100 days before they broke in the media.

The third finding, when you try to do this work, analyze

public radio discussions, 24/7 for a community radio station in a place like Somalia, for example, where most of the development partners are confined in an environment where they cannot live. If you would want to do this community-based radio analysis, you would have to be within an area of 50 kilometers. That's the estimated range for this type of local radio stations. With this tool, you can do it anywhere in the world basically. .

Those were my 7 minutes. I'm from UNICEF innovation and we'll talk about the school mapping initiative, Madga Biesiada and I'll start with examples of the schools and what they're used for and then we'll talk about some of the results we have. (Madga Biesiada (the first is a school in Brazil, most of the communities in the region, they're very hard to reach, it is the biggest rain forest in the world. It is difficult to bring quality education to these communities especially secondary education where there is not enough qualified teachers. The Government of Brazil has an initiative where they provide secondary satellite communications. The schools also use other purposes than education. For example, it is also used for a school feeding programme and this is an example of that.

They also used as center points for emergencies and this is the emergencies that have happened throughout 2017 and 2018.

So to be able to do all of these things, we need to know where the schools are first and we also need to know the infrastructure around them. Even if this seems very obvious to do, in many countries, for many cases, the permission is missing so we asked the following question: Can we map every school in the world? Can we use existing datasets and apply new computations like deepal learning creating a map for facilities. How does that look like? These are schools provided by the government, and what we explored is whether there are specific or unique patterns for schools and this can be the shape of the building, the size of the building, the presence of our playground or even the location of the school within the community itself.

So from here, we started dealing with 1720 schools as well as imagery from other schools and we combined the solution imagery with computations to see if you could automatically detect the schools. The preliminary organization results, they showed an overall accuracy of 75%. To do this, you have to partner with different situations and companies as well as, including where we got the second prize during the challenge that happened a couple of months ago.

I want to go through some of the examples and the different approaches we explored. In the best case scenario, we have good quality training because we know it is risky for AI and you can aim at detecting the school location. These are the results,

the yellow tiles, they're the testing tiles, the blue ones, they're the school locations provided by the government, the red ones are the ones that our classifications algorithm, predictor predicated on the schools and the other ones are the ones that are to the left.

This is the same results for the whole area. In many places, we don't have good high quality training sets and we have supervised and developed some training datasets to create them and we have gathered and regrouped different groups, different clusters depending on how similar they are with each other and the research shows that most of the schools fall within 3 specific clusters. Even if it is not estimated to be as good, we have the space that we need to search quite considerably. We have reduced the times we need to look.

This is another it chart showing a map where the orange squares or tiles, they're classified -- falling within a class of where most of the schools are. Yeah. Through these, what we want to do, it is to create a global map of school locations together with the connectivity level and we believe this is going to be useful or helpful to improve and optimize the delivery of services as well as different humanitarian programs. This is still work ongoing and we're partnering both with private sector and companies as well as academic institutions to be able to do this. Thanks.

>> MANUEL GARCIA-HERRANZ: I'll be moderating this panel today. First I want to thank the speakers for the amazing examples of the field, they present powerful initiatives and with a lot of intelligent people, they thought through problems, they found partners and worked hard bringing the value of AI. I remember this morning the cerebellum, the, and when we learn how to drive, it helps us learn how to move our hands and we're learning basically how to drive and that's conscience. When we learn that thing, the task of driving is taken on by the cerebellum and we just drive, we don't think about it. A thing he mentioned, the cerebellum has a lot more connections. So this panel actually is a lot about those connections. How do with he transition from the samples we have seen to actually incorporate in AI without thinking about it. As the U.N., with partners, how do we create networks that will allow us to use AI without thinking about it as one more tool. So without further ado, I'll introduce the speakers that joined us today and they present a lot of the a ecosystem that has to come together in order to bring these things and hopefully they'll share some experiences they have had, some tools they have used especially for connecting better.

I want to introduce Madga Biesiada from the Malawi office, coming directly from the field. Next to her, Mark Doherty, the

head of the earth observation applications within the European space agency, we have big intergovernmental institution so welcome, mark.

We have Anita and we have looked at the most vulnerable, the problems and how to be efficient. then we have Rebecca Distler, the global health lead from Element who is basically private sector looking into AI technologies to make this a better world.

Welcome, panelists. I'll then join them up there.

Let me see. This works. Perfect.

I think that's not enough of an introduction. I'll actually ask some questions to the panel and allows you to be kind of brief and we still have time and it will be great if we can have some open space for discussions and question and answers from the crowd.

The first is for you, Madga Biesiada, you come from Malawi and you're basically trying to create an ecosystem. What I have seen in the Malawi country office, in 2017 you launched the drone corridor, that's in part because Malawi understood that drones could play a very important role in issues. Instead of commissioning some drone solutions, you went on and tried to create a drone ecosystem which includes a drone corridor and you realize that you need to bring AI into that equation. My question for you, first, can you tell us a bit more about that, what opportunities and challenges do you see as a country office for creating that ecosystem for innovation and what are the key players that you have in mind for implementing that.

>> Thank you for the question. First of all, I should say hello to the audience (Madga Biesiada) it is a pleasure to be here and to share our experiences from Malawi, but to get to your question, manual, yes, we have recognized the importance of use of drones. Quite early, I believe we started 2015, some work with drones, it was first around transportation but then we realized that drones and imagery and live video feeds can help us in assisting in emergencies, and then as progress of the ideas we have come up with an idea of humanitarian drone testing corridor and by the way, it was a first African, humanitarian drone corridor launched in 2017 and the corridor itself, it addresses three different uses of drones, transportation, connectivity, Internet or telephone activity and, of course, data and images. .

The drone corridor, it is quite important, but really over the time as we're doing the work we have also realized that it is not only about drones. Really what we need to do, it is to look at the data ecosystem that would help us in decision making. Our current idea, our current scope of work is to look into data intelligence platform concept. The data intelligence

platform, of course, includes drones, includes geospatial data, it includes use of Artificial Intelligence to analyze crowdsource data, satellite imagery and then also find synergies between drone acquired images, satellite imagery and then also grand truth data. All that is in the background or to serve really to assess how our UNICEF programs work so whether we're effective in our programming in UNICEF, and also to see if there is any change facilitated by our programs. We're looking at change issues.

In terms of partnerships and challenges, of course there is dozens, many. What really -- what we notice at the beginning, or actually through our work, it is quite challenging from the U.N. perspective to quickly and effectively partner up with private sector. In terms of data acquisition and data analysis, that's the first sort of challenge and difficulty for us, U.N., UNICEF as we do have quiet robust administration and that actually doesn't really facilitate too much, facilitate partnerships with the private sector, and another issue is also skill sets. We're talking about Artificial Intelligence, drones, imagery, geospatial data analysis, that's a challenge as well. In terms of implementing the ideas and nevertheless, we have managed to partner within the drone corridor and then drone ecosystem, partner with universities such as Virginia tech or Keyota University with private sector interested in data analysis, Artificial Intelligence. So far the landscape looks good for us. The work is incredibly interesting and we do see results of our work and we think there will be time to give a couple of examples of that.

>> Challenging when you say private sector, academic institution, I would love to know more what we can offer to them.

I want to ask mark, mark, you come from a different side of the equation, you come from the European space agency, which to many of us sounds like satellites. I asked what this is, when I asked you what is this, you said that Phillip is an open mind and an open door to actually create partnerships that can move faster, to move all of the frontier technological things that matter. So for me, the question is the same, how do you find those partners, what do you need in places such as the U.N. to make those things and where do you see the value or the challenges and the opportunities of what we see ahead? I come from different end of the spectrum, if we're talking about the SDGs, it is really by joining up all partners in that and having value -- European space agency is an intergovernmental organization, 22 Member States, it is not quite the U.N., but, you know, decisions aren't made like that and it is an organization that drops a small satellite on to a comet, and

that's not something that you do in three months. You have to have very long technology cycles and long-term programs. ISA is behind the satellites that provide weather and we have to plan those on decade long skills, we can't take any chances. That's an organization that's primarily to do what countries on had their own cannot do, to manage very large projects and it breeds -- its strength is based on that very strong, long-term project management that can prepare technologies, that don't exist, and a time skill.

Actually what we see, we're not alone in space agencies, it is a tsunami of technology that's coming from outside. I guess everybody from every organization and company in this room, they're seeing the technologies. Actually they provide fantastic opportunities for what we do in satellites. In particular, they're at the earth site of extracting, if we talk particularly about AI and here we talk about machine learning deep learning, convolutional networks, these are technologies, if you talk to anyone in our agency the chances are that worked on these things 20 years ago, and that their reaction, what is all the fuss about. The fuss is simply with the convergence of IT, computing technology, methods, you know, that staticians have been using for a long time, it unlocks the potential.

For us, we, me, ESA, the earth observation world, we're primarily about monitoring the planet and providing information that's needed to understand how the earth system works and to provide the data information to help people make better decisions.

I will give a talk tomorrow where I can illustrate this a little bit better.

Essentially we have now in to the reverse direction a tsunami way of observations that are coming down and they're supporting policies and they're being made freely available. Actually there is so much data that we can't actually extract all of the information from them with the traditional means, we had an example earlier on. Half an hour to an nice satellite image, what you want is for example flood coverage in seconds in order to get out to people in the fields who need this updated information.

That's where we want to deploy that sort of technology. In terms of an open door to ESA, like I'm sure many U.N. agencies, you have long-term plans, but you need to open the door, you need to be more responsive, and in terms of partnerships, we have seen I think a lot of the benefit of what comes from satellites and some of the examples we'll see, it is primarily going to be in Developing Countries. That's where -- you don't necessarily have the skill sets in place, you don't necessarily have infrastructure and there's a technical agency that we have

cooperated with many U.N. agencies, I won't list them all, to actually bring the damage potential but it frequently falls short because actually it is so demanding in terms of infrastructure, resources, expertise and what we see now is IT platforms that are accessible on the Internet, you get aic ses to the data with the processing, coupled with AI tools and it means that this technology, the barriers to using it are really reduced particularly to people in Developing Countries who don't have that type of infrastructure.

New partnerships, and any business of the earth observation, the whole value chain has dramatically changed. We see new entrants coming in, the Googles, the Amazons, they're now in the earth -- they're not in the earth observation business but they're integrating this type of geospatial data in the business be it for good or other, and we actually see beyond them giving access to thousands, tens, hundreds of thousands of people who previously would never have had access not so much to the data, but to the information.

>> I think that's interesting. What you were saying, you have collaborated in the past a lot with a lot of U.N. agencies that for that to takeover, there is so much of a demand. I'm seeing can we share a bit and can we give some kind of that IT support also for some countries and one last question for you, super quick, because I think sometimes we don't realize what are the opportunities that can be lost. Speaking with you, you once said okay, right now, all of the governments are putting together that effort to provide this data for free. We can monitor, we can get satellite images from the world for free. If we don't use it, we may lose it.

>> Again, there is a system that I will talk a bit more called Capernicous, it is a European public infrastructure monitoring the globe and it represents 8 billion euros investment to maintain this infrastructure for decades. Really, the key thing here, it is it has a free, open data policy. Anybody on this planet can get the data. The argument for that, this is put up not as a market, a business, it is put up to make better decision making. That's the justification for the investment.

To be brief, the data is being used in Europe and the states, no problem. It could be and should be much better used in Developing Countries, Frankly, the infrastructure is not there and the information has enormous impact and I think it is it U.N. agencies working with the development, it falls to them to enable that but there is no reason to continue if the benefits are not he realized.

>> That's a call for action. We talk about data and we don't use it, and you come from basically a social enterprise

that has AI and data science deep within the core capacity, but also a good amount of the U.N. DNA in the foundations, and you have been looking into AI for identification of malnutrition. Can we take a picture, know if that's malnourished or not, and you started with that in the U.S. and then along with UNICEF innovation fund you have been transaction ID significancing to an Open Source solution -- you have been transitioning to an Open Source solution for children in Kenya.

A question, an impact on the project, why is AI an important driver to change the way we deal with malnutrition but most importantly, how do the mechanisms like the fund UNICEF has in place and UNDP has another one, there are many of these mechanisms, what is the value that it brings to you as a social enterprise in order to bring these AI value for the social good.

>> Thank you. So this stands for methods for extremely rapid observation of nutritional statuses. We developed an initial model prior to the funding that we received from UNICEF. We used pre-trained convolutional neural network to extract features from 650,000 facial images drawn from a database called the morph database, it was from North Carolina. We then used machine learning to train a model to come up with different categories of weight, under weight, normal weight, overweight and associated BMI scores.

We achieved a correlation of 78% and proof of concept. We were then provided with some catalytic funding from the UNICEF innovation fund in order to refine and further develop the model to look at malnutrition in children under 5. The key drivers on the ground were the UNICEF country office that really helped to facilitate the data collection, the African medical research foundation that granted us the ethical clearance, the Ministry of Health that validated the methodology and permitted the research, and of course the communities, the caregivers that consented, provided informed consent for us to be able to take photographs of their children and the children themselves who tolerated our enumerators taking photographs so key ingredients had to.

Could together for that. The potential impacts, we don't know the process yet, we're still in the process of training the model, they're four hold, one, if this works, it could be as accurate or potentially more accurate than traditional methods because it doesn't rely on enumerator interpretation of measurements.

The second thing, that is not indue save and inconspicuous.

In the four counties where we collected the data, we asked beneficiaries what they thought of the photo and they all said, the vast majority of beneficiaries say that taking a photograph is culturally acceptable and they preferred that to traditional

measures because it was less invasive and there was no contact between enumerator and child. This has potential in cultures where physical contact between enumerator and a child, particularly a girl child is not acceptable and it has potential application in high-risk areas like conflict zones where armies of Ouattara theme raters and fleets of vehicles, bulky equipment can't easily be deployed. The third area, it is cost effectiveness. So taking a photograph, it is relatively cheap compared to traditional surveys.

I would say that the final potential impact is to do with scalability. I mean, if this works in Kenya, it could potentially be used in other countries with children from different nationalities and it could also be used for edema detection and these are some of the potential opportunities that we could explore as we scale up.

I would say that the UNICEF innovation fund and other mechanisms like this, they're absolutely essential and key to social enterprises like ours that are small, not very well-known, and have the potential and the technology and the know-how, but don't necessarily have a use case and don't necessarily have the funding. What the UNICEF innovation fund did is took our proof of concept and gave us the opportunity, served as an enabler and served as a client to give us the opportunity to be able to build the partnerships that we needed for the Ministry of Health, the UNICEF country office, and with the communities themselves to try and take this innovation forward.

>> Let me touch base on that piece, one thing you said, the connections with ministries and the ethical boards and so on. I think that brings a lot of value that we may not be fully I a wear as the U.N. that we can provide with mechanisms in the innovation fund, those innovation funds. It is not just about funding. It is making the connections better. You were mentioning on the project, when you were developing that in the U.S., you counted with a database from the University of Carolina, that includes 650,000 pictures of faces, probably faces from the U.S., when you go to Kenya, for kids, probably the number of databases that were available were close to 0 and the ethical challenges of collecting that data are really, really high. Actually you have said that you have to go through all those processes and we will probably hear about data inequalities and about ethics during the Summit, a question for you, what do you think could have been in place that maybe the U.N. could facilitate, that the governments could facilitate so that we could reduce the gap on data inquality so that training AI in the U.S., no matter if it is formal nutrition, something else, it is very easy and if you go to Kenya, you have to go

through eight months of what thing is missing there that could actually benefit?

>> Sure. I will just take the opportunity to elaborate on the data inequality for a moment so that you have the context. There were two issues with the data. One is quality, the other, quantity.

In terms of quantity, the morph database supplied us with 60,000 images. Even though we went through an extremely expensive, it cost 50,000 dollars, the data collection processing in Kenya, we collected 4750 images. Out of those 4750 images, 1,000 of them we're struggling to use. The reason is, the child is either crying and this has resulted in major distortion of the facial features or the photo is taken at a certain angle so we're unable to see the entire face. The face isn't frontal facing and the expression isn't neutral, or there is an obstruction like a hand in front of the face. These are some of the challenges we face and we're trying to deal with the images and still be you be able to use them.

The second thing I mentioned, with the 4750 images, what we had to do, we had to build in an additional step to use an auto encoder, a different type of neural network to reduce the dimensionality of the 4750 features that we had in the orange model down to 512 to make sense of them. This is technical challenges. I think the way we could overcome these in the future, there are three things, three key ingredients I would say.

One, a recognition that this kind of work is extremely intensive. It requires a lot of good quality and quantity data. This in turn means in many contexts that we have to collect it from scratch. To collect data from scratch is expensive. The first thing, it is that we need to cross the data collection in proportion to the technology itself. The second thing, we need to allow time. In our contract with the innovation fund we're supposed to have -- to build a second model, got the ethical clearance, done the data collection, trained and tested the model, had written a general Article all within a year. That's quite a challenge. I think we need to build in sufficient time, a lot of this, it is -- you don't know what you'll end up with until you start working.

Sufficient funding for data collection, sufficient time built in to the whole project, and I would say agreements, prior agreements. In the case of Kenya, we were fortunate, because there was a lot of work done with UNICEF and we had an excellent relationship. There was a champion, the chief of the nutrition section was phenomenally supportive. She was a champion, she got it. She drove it. If you don't have this in other country offices, it will be really difficult. I think you need prior

agreements from global level with country offices and country offices in turn with government. In the case of Kenya again, we were lucky because they were so curious and keen and supportive of this. That may not happen elsewhere. Those are the three key ingredients I would say that are critical to success.

>> That's great. Actually two of them, they talk about policies, policies that we can advocate for on agreements for data collection that we built in pipelines beforehand that makes everything easier.The second thing, we could talk forever, what happens with data afterwards and so on and we build the databases that are accessible and the data divide doesn't stay forever.

I want to follow-up with rebecca, you come from a similar background, a company that has a lot of AI capacity, you're working on projects that supply the field, very different in the sense that in the same way that you're looking into malnutrition, you're actually looking to an identical, how do you provide the identity without the need for any hardware. The data, picture, be uniquely with that individual and also you started with the implementation in different hospitals, in Bangladesh, Cambodia, and you're going through the challenges that you'll transition for children. I have two set of questions for you, the first, the same thing that I asked about the data inequalities, how do you see, what is the take away on that piece? The second, because element is a bit more into we have a pilot, we implemented that already into some hospitals in Bangladesh and Cambodia, what are the challenges you face and what things can enable that transition better from having a pilot to actually having an implementation.

>> Absolutely. First of all, thank you so much for having us here today. To questions on data and quality and scale. These are questions that we felt needed to be asked at the beginning of the product development and the genesis. What may be helpful is to take a step back and share the element technology and how we got to where we are today. That's important and those are questions that have to be asked at the beginning.

In many ways, elements started with scale. We started with the problem, there is one billion people worldwide that do not have official identification. At the same time there is nearly 3 billion smartphones in the world today projected to be 6 billion by 2025. So in 2002 our cofounder asked the question, what if we take the mobile devices, smartphones, tablets that already pro live rate the world and could we use that to deliver digital identity, not just any identity, but bio metric recognition, the gold standard in human recognition. In asking this question about mobile delivery, we needed to sort of in

thinking about the common cameras on the devices, how -- I could say that one of the things that's interesting about bio metric identification, it is this is something that we have done for years, we have had hardware solutions that are funky, be expensive, and are not built for scale. The question became how do we leverage the common cameras on the devices that already pro live rate the world. In doing so, he turned to really understand how to apply deep learning techniques to the image processing and if you think about bio metric modalities and you think about them in terms of a natural signal processing challenge, the deep learning technique, it is uniquely suited for that. That's the platform that they have built today. An element is a software only solution for bio metric recognition running on any tablet or smartphone offline without connectivity, no specialized hardware and when it means is that I can enroll and authenticate on my device and I can do the same with everybody in this room and with a bit of connectivity, I could sync them to your device which means that we could enroll online but authenticate on yours. That's what we refer to in the delivery of bio metric identity. When we -- when we think about that platform, you mentioned, it is deployed in Tanzania, Bangladesh, Tunisia, that was five years of research and development. To your point exactly, that was thinking about the data inequalities, thinking about are we building a system that's robust to differences in human forms, to lighting conditions, can it work on the galaxy and also the Samsung? That was a tremendous amount with data collection, acquisition, it is expensive, time consuming. You know, we needed to think about any number of these conditions in just the training of it. What it means and to your point on scale, it is that from the beginning, you know, we were thinking about the challenges so that when it came time to scale, and to scale in the traditional sense of technology we weren't necessarily asking questions about how is this going to work in the lighting condition and the clinic, for example, we were thinking about what's the human centered design process and how do we take the technology that we have built into these algorithms for the recognition and how do we actually deliver this in a way that can be used by a community health worker in Bangladesh, that becomes much more of how do we change it so that we can reorient the tablet when authenticating someone else, doing a self-authentication. Basically the sign of technology, you were thinking on scale --

>> Exactly. Then you go to a hospital in Bangladesh, for example, you say hey, I have a new way for you to provide this. How do you do that? What are the partners to actually help there --

>> Absolutely. I actually think -- I'll take the example

of Bangladesh. What was really interesting about our work in bang a dash, in many ways we were introduced to the hospital and to our champions through the work on infant bio metrics. As mentioned, we have this adult solution for doing it with Palm and faces, what we're implementing, but then two years ago global good, the collaboration team of bill gates intellectual adventure approached us with this, there is no bio metric for infants, the features, it changes rapidly, it is difficult to capture. We set out with them to develop this research partnership on the infant bio metric and that was leveraging relationships for example with the research institutions in Bangladesh and they became our partner on the infant bio metric work, we started to follow infants and young children leveraging what we see from the adult solution and starting to build that in right away in the product development. The question to how it went, when it came time, for example, our partners in the institute of Public Health and the University of oslo, they were implementing what's called an eRegistry, a care built on the tracker, an Open Source solution, they were also working in Bangladesh at the same time that we were. They were having trouble and challenges, if you will, with their trial because they were trying to follow women in the community and following up with neoNatal care visits and as we worked on this, they said you have an adult solution, you're working in this population, the principle investigators, they know you, how do we work together. That's what really started the conversation that today has become a part of a bigger partnership with the University of oslo on DHI institute tracker to really understand how can we integrate the technology with the tracker solution.

>> That's great. I love to hear about those networks and research institutions and how collaboration between the different universities lead up to new opportunities. Actually I have a question for you, Malawi has another example which is kind of that thing, but within the U.N., you have the one specific project the drone data, the satellite data, with AI, with malnutrition status, mapping, and the interesting thing about that, it is that's a product that involves UNICEF Malawi, UNICEF headquarters, WFP Malawi, headquarters, it the UNDP, it is kind of that ecosystem of who puts what and coming altogether into building something different.

For me, what do you see as the value for that thing as UNICEF and for the U.N. and the second, it is how can we get more of that, what's missing in the ecosystem to actually have more of those structures, more of the U.N. networks.

>> Actually, the title of the project is using satellite and drone imagery to map crops in Malawi. UNICEF seems a bit of an odd partner in that project because we don't directly -- we

really don't deal with agriculture, but, of course, we have a very strong, big nutrition site, nutrition programme and it is within UNICEF so indirectly we were very interested in that project as well. The partnership came about, we gathered around application for UNDG funding and then this project is at this stage a proof of concept, but when we were meeting with the other agencies and talking about how do we go about solving the project and implementing it, it was really incredible how everything fell into a had place. There were certain -- there were certain number of tasks that we took up on each other and the division of tasks it, it was really extremely natural.

When we started as UNICEF, we had experience with drones, we took up the drone work and for the project, the WFP, they have an incredible on the ground experience so they took up the task of the data collection, the FAO has an extremely robust relationship with the government in Malawi with the Ministry of Agriculture, so they were the partner -- they are the partner that liases with the Malawi government and UNDP by default is taking care of the finances in that we spend the money wisely. The taskers and coming up together, it was very natural actually and came in sort of like pieces of a puzzle in a wonderful way.

>> Each of the agencies are strong, what you're saying is that all of them together, they're stronger because there are different capacities?

>> We would not be able to do -- UNICEF would not be able to solve the project on its own because we don't have expertise in grant and identification of the crops. The UND, , they have different type of expertise and they would not be able to do it on their own as well.

Really, the advantages for this project, it is that we had organizations eager to work together so that was the first thing. We really -- we really saw or are seeing a big potential in applying Artificial Intelligence to satellite imagery.

There is an expertise around these issues, both in terms of grand truth data but around advanced technologies. We also have a space to do that. We all know that taking a drone image, it is not -- you cannot just go to the field and photograph somebody's piece of crop. We're organizing -- we're organizing the project within the humanitarian joint corridor of which I explained a few minutes ago. We also had a physical space to capture the data and to experiment on so to speak.

We have a consent of the government, actually the Malawi government was taking part in the project sponsored by World Bank, that looked at the similar issue, looking at satellite imagery and an estimate of crop yield for the country and they were actually quite interested, they're actually quite interested in our solution, so what they want to do, at the end

of the project, it is to actually compare the the two methods and to see which one is more financially feasible to scale up and to apply to the scale of the entire country.

Of course, another element, it is access to Artificial Intelligence which WFP and also UNICEF, we do have it more and more and it doesn't cost us an arm and a leg. There was several elements that came together for this project and we're really excited about it. It is in the process, actually as I speak, the grand truth team, they're in a humanitarian drone corridor collecting the grant data and pairing up together with the drone team that they work from a sample plot to a real plot and gathering the data for the project. Really exciting.

>> Thank you.

I hear a lot of different things, some are the opportunities of working together, mark has pointed out on the urgency of working together actually we don't want to miss opportunities on the necessity for having some policies and mechanisms in place. I want to leave space for a couple of questions in the room. I want to ask each of you if you can give me in 10, 20 seconds, looking at the future, 10 years from now, looking at the audience, characterization inning one thing, from the U.N., from your side that would make things easier, what would that be? I don't know who wants to open that.

>> MAARK DOHERTY: Three words, satellite data, invest to use.

>> Invest to use.

>> MAARK DOHERTY: Invest to use. It is here, it is not a new technology, we don't need new projects, we're working in particular with the World Bank and other development banks, forget projects. It should be something you is just reach for and use as best practice. That scale, best practice, tools and investing in people to use, yes, you need to invest on infrastructure but invest in people, skills, there shall are multipurpose, they'll be used, you know, if data is the new oil, they'll create businesses, invest to use.

>> Okay.

>> Happy to take this. You had three words, I think I may go with one. Cocreation. For us, I think that encompasses everything when you think about sort of this total market approach to product development and deployment. That's everything from working with U.N. bodies to set the standards and understand policy frameworks to implement this technology because it is evolving quicker than the standards and also thinking about the data in equalities, we talk to many that say the technology is incredibly exciting, we want to use it, come when it is ready. As we know from these modern AI approaches, the technologies, they much more than any other rely

tremendously on the quality and quantity of the data and that's fit for purpose. I think the more we see cocreation, we'll see more technologies that are built for purpose.

>> Cocreation.

You want to take 10 seconds?

>> I will take 15.

I want to tell you about one thing that keeps bothering me perhaps, but for that, I'll tell you who the world looks from the perspective of my desk. I come on Monday morning to work and I sit in front of the computer and open a window to the 21 #st century world where I, you no he, I read and learn and apply Artificial Intelligence and I turn around and I have a couple of drone images to analyze, to look at, then there is partnerships with Virginia tech or you name it and an incredible innovative, wonderfully 21 #st century world, and then I take a breather and turn to the direction of my real window that goes on the street the long way, and I see a child walking by without shoes. I'm thinking that child has almost 0 data footprint. They don't use the data. They don't generate the data. Yet, my whole work world is all about how do I analyze the data. I'm thinking where is the middle ground? How do I reconcile the two words, the 21st Century with bare feet child from Malawi. I'm thinking is the Artificial Intelligence going to close the gap between the two worlds or will it actually widen the gap between the two worlds.

That's the question that I ponder for nearly two years now. I'm hoping to find some answers here.

>> That's hopefully what we're here for. I want to open up for one question, maybe two from the room, there is a pressing question, I want to leave space for you, rob, to close the session. If we could have a -- yes.

>> I'm with autistic minority international. We're a member of UNICEF's global partnership on children with disabilities. My question goes to rebecca and others on what was just said about lack of footprint of children in Developing Countries. What is the relationship between the the identity you're creating and birth certificates. Many don't have birth certificates, Human Rights issues go unknown because they're not registered at birth, is there a way to overcome the issue?

>> Thank you for the question. I think this is something particularly at element that we take tremendously seriously. It is one of the reasons we started to engage quite actively with conversations around civil registration and vital statistics, looking at identification for development group and other partners that are thinking about how to strengthen the CRVS systems. In in answer ways, bio metric, it is a tool, right, an identity module. When we think of how the tools can help to

your exact question about creating official identification for infants and young children, we need to do this hand-in-hand. We are the governments with the power to bestow that legal identity amongst them. For us, thinking of leveraging the deem learning techniques and on the infant bio metric, we're exploring multiple modalities because we want to understand what's comfortable, easy to capture and what's inclusive. To your point exactly, this is what we're thinking about, how can technologies like what we're building at element, what many are building, helping to create more inclusive systems.

>> Thank you.

>> Actually we have a number of questions in here and we don't have time. But very relevant questions such as how the private sector is actually getting this, how do we mobilize that talent to work at the projects that we have right now. I would love to leave some space for rob actually to close this event. I thank the panelists for being here, presenting these different ingredients for an ecosystem that needs to come together. Join me in thanking the panelists and hopefully we'll continue this conversation over the rest of the Summit.

Thank you.

>> ROBERT OPP: Thank you to the panelists, the presentsers, to the organizers again. Join me in one more round of applause for them.

You know, what a fantastic array of examples that we have seen. It is truly I think indicative of how fast things are moving in this space. I actually just wanted to give a very few takeaways. I don't even think I'll take my 3 minutes until the end of the session I hope.

Just based on sort of what I have heard here today, as well as what I have been tuned in to over the last couple of years or so, I should introduce myself, I'm Robert Opp, I'm director of innovation and change management for the United Nations World Food Program and coChair along with Christopher Fabian that opened this session of something called the U.N. innovation network. My three takeaways from this session, they're it looks like things, AI is being used more frequently, and it is being used more impactfuly and that's really good news. Let's not forget the problems we're trying to solve. Let's not forget that we're trying to fix humanities greatest challenges here. We'll need all the help we can get. AI with all of the power that we're starting to see is going to be able to help us, and as mark said, in the last session, let's not keep inventing new little projects, let's look at things that are actually working and let's build them towards scale.

My second observation, take away, it is related to that. That is let's make sure that we stay focused on the signal among

the noise. So there was a mention of a tsunami of data that's coming. There is also a tsunami of tech out there. Let's not forget that we're -- we need to stay focused on people's problems. Whatever we do, let's consider -- whatever you want to call it, human-centered design, participatory research, whatever it is, let's make sure we focus on the needs of those that are furthest behind when looking at the application of Artificial Intelligence to address their needs.

The last thing, we can't do this in stove pipes, we can't do it -- there are is no one organization, no one sector, there is -- it is not possible to do what we need to do with the Sustainable Development Goals unless we do it together. I know you know this, there is a lot of mention of partnerships, that stuff, I want to empathize that again, this is multisectorial and this is across agencies, so this is government, this is civil society, this is private sector, the U.N., others coming together to look at how to partner, how to cocreate, how we can really build sustainable solutions together. With regard to that, I wanted to mention, there is one platform inside the U.N. that we're using to work on this, it is the U.N. innovation network. This is something -- this is a platform we created to share experiences across all kinds of different innovations, including Artificial Intelligence, blockchain, satellite image uses, things like that, and it comes together very -- I would say very organically, collaborative and on the screen here we invite anybody to become a part of this. Also outside of the U.N. We have U.N.-only discussions but we also have greater partnership community of people who are interested in doing these kinds offer things and we invite you to get involved and let us know.

The contact details, they're here on the screen. If you're interested in coming together with a like-minded community of agencies, individuals to really try to solve the biggest problems in the world, do reach out to us.

Thank you very much for coming. Thank you to everyone involved, including the organizers.

Have a good afternoon.