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>> ROBERT OPP: Okay. Good morning, everybody. Let's maybe take our seats if we can, please. Great.

Well, good morning, everybody. My name is Robert Opp. I'm director innovation and change management. Welcome to this breakthrough session at ending hunger at the AI summit. I'm really excited about the conversation this morning because we have a great panel that is joining us. We also have some remote participation. We have lightning talks and all of that. We've got about the next 75 minutes or something like that. Okay.

What we'd like to do in the context of the AI summit, we're

talking about AI for good and we're talking about some of these specific applications of AI. This panel talks about ending hunger and some of you may have seen the session just previous to this one in the plenary and I mentioned a little bit about the context of hunger, but I may just repeat that very quickly for those of you who didn't join. But essentially, and I can be a little more frank and relaxed in this group than I was in the plenary. It's an outrage that we still have 800 million people that do not have enough food to eat on a daily basis. It's absolutely outrageous in this day and age. Yet hunger persists. We are making progress against hunger. We have reduced hunger despite population growth. Hunger has been reduced by 200 million people over 200 years, but we are not going to make it to zero hunger by 2030 which is one of the sustainable development goals. So the question in front of us has the world food program working in the Eco system of players alongside the food and agriculture organization, the national for agriculture development, NGO partners and many more, the question before us is: How are we going to take advantage of the technology, tools that are out there to address this issue? On the first day of this conference, Marcus Shingles who is the co-sponsor of this entire event put out the challenge of exponential technologies. We are very interested in leveraging exponential trends in the connectivity between among people the internet of things, the computing power that is allowing us to build AI systems. How can we leverage those in the fight against hunger? We have an interesting line up of panel and also a few lightning talks. And we're going to kick off with lightning talks first to give us food for thought when we get into the discussion.

Now, first, however, I want to introduce our distinguished panel. And I will let them introduce themselves when they speak, but just starting from my left, I'm pleased to welcome Uyi Stewart who is the director of data strategy at the Gates Foundation. Marcus Shingles. Beshade Behzadi who is the lead Google assistant in Google. And Bob Sutor who is cognitive block chain and quantum solutions. We have Andrew Zolli who is vice president of Impact for a company called Planet Labs as well. He is one of our lead panelists.

But first, to kick us off and start us thinking a little bit

how we can work with satellite imagery and high resolution work, I have Sarah and she will give us a few thoughts about what WFP is doing right now. Sarah, please join us.

>> SARAH: Hi, everyone. Good morning. So I'm on the vulnerability analysis and masking units. This is WFPs analysis and trend service. We are the eyes and the ears of WFP established to have secure and at the right time and right place to have the right system needed. We have a great capacity for sattistics, economics, markets and the spacialingsinal sis. I represent the spacial team and the masking part of them. We are the eye in the sky for WFP.

Before I jump into very high resolution imagery analysis, I will give you a quick overview on what you are currently doing with satellite imagery to our team. We routinely download, process and map, load and medium resolution satellite imagery. This is monitoring agriculture (?) to WFP. This helps secure and identify locations or hotspots that are outside normal ranges in which the inhabitants are food and security. They have remote sensing processing, which are pixel based. Okay.

So what is very high resolution satellite imagery? We use global monitoring low and EPM, resolution imagery which is by promises 250 meters. We also have access to essential 1 and 2 products for ad hoc products for more local scale monitoring. And then the very high resolution imagery that we just acquired is down to less than one meter resolution, which is highly detailed and involves different ways to analyze and process and drive information. Using all of these together, very high resolution imagery is no matter than the very low resolution imagery. They all have very good applications. You can use all of them together to best get information. You can use low resolution to have areas of hotspot or pronounced change. And then request the analysis of very high resolution imagery. So get on to the VHR stuff.

We are using a pure identify monitor and assess prevailing conditions in hard to reach areas. We're looking at service countries with 20 different locations. Each is about 200 kilometers squared and we collect an image every week. This analysis interpretation is a well-established approach and useful for driving information about an area remotely without the risk and investment of time and resources of a field visit.

The observations and information from this helps them understand how ground conditions are changing. We're rapidly involving conditions may require intervention. We use this analysis as a last resort when we don't have information at all about an area. You want to understand whether 20,000 people need assistance or 22,000 for counsel.

Can I continue? Okay. On the screen, this is an example of some of the analysis we have conducted. So we have been monitoring remote area in Nigeria for the past year and a bit looking at displays people and trends in the IPT camp. This kind of imagery allows us to get information on the number and locations of displaced people and also identify where not to look. So we're not sending WFP stuff where we don't need to be sending them. It is also very useful for identifying informal and spontaneous counts that are not yet registered. So people that have official classes so we can use fast light imagery to identify and be spontaneous counts and hopefully direct assistance to these areas. You can look at land cover change, structures, dwellings and so forth in the satellite image. You can identify a car or vehicle, but you're not able to see a person.

We're able to see that there are a bunch of settlements they are pressing one image where a few months prior, there are no images. We can get an idea, a very rough estimate on the population for sizing in that area. So this is all very well and good, but each of these buildings or shelters or features that were in the image we are identifying manually. As I said before, we're monitoring seven countries with 20 different areas of interest. And that is weekly acquisition of the imagery. To go through manually to count, which is what I have been doing, the structures is very labor intensive. We need a way to automize this feature. You have an object-based approach to pull out object features from this image and do that analysis for us. Then use expertise from the remote analysts to further investigate those areas and validate the information. That's why I am here today because we would like to -- we need to in order to scale out this project. We need AI to push this project in this very useful tool forward. So, this is when we will do today and thank you very much for your time.

[APPLAUSE]

>> ROBERT OPP: Thank you, Sarah. We have new ways of applying technology. So Sarah said she spends too much time at her desk looking at satellite images and she needs a little bit of help with that. Thank you, Sarah, for coming to give us that talk.

I would like to turn it over to Uyi who will give us lightning talk that he's done in Nigeria and other places. Uyi?

>> UYI STEWART: Good morning, everyone. I have two slides. My name is Uyi Stewart. A lot of what I will talk about today is from the world that I just left. So I've been with IBM research for about 13, 14 years. So today I will look back with a view to look forward. Okay? The last four years, I had the honor and privilege to represent IBM in Africa to set up a new research lab. This was in Nairobi, Kenya. Now that lab is up and running and one of the things that we focus in the lab is agriculture. Now, with a solution using AI in Kenya and as part of my mandate and responsibility, I also took that solution to Nigeria. That's what I will take you through. So there are two parts to what I will present today. In the lightning talk, I will focus on the model that we build that allowed us to the image of the people in that part of the world. What did that entail? During the panel discussion, I will focus on some of the challenges that we encountered in developing that solution. Okay?

So my slides are up. Now, in Africa, hopefully you have seen the stats. It's roughly a billion people. And statistics are crazy sometimes, but they're said between 60 to 70% are in agriculture. That's true and that means we are looking at roughly 600 to 700 million people who are in agriculture. But there is a problem. This really 700 million people walk in farming. They are small scale farmers. Who does that mean? It means that the farm are less than 2 acres of land and the farm lives. That's not sustainable. Right? We have to find a way that you can unleash the people out of poverty so we can drive economies of scale. That's the solution that we developed and I want to take you through that. Next slide, please.

So on your right, I have -- so this is merely a visual presentation and I will talk you through it. So on the right

is the way that farmers basically predict when to farm right now. They look for butterflies in the sky. That's not sustainable. Right? The onset of butterflies is basically on us. Farming is really at apologetic level right now. Not just in Kenya, but across Africa. On the left-hand side, there's a vision of this wonderful -- I'm not (?) but physical analysts with a positive system called pairs that allows you to take some of the data actually, a lot of the data that Sarah just presented. And all kinds of data and dump it into this AI cloud and modify the reference a little bit. My colleague Bob is here. I kind of adjusted this to soothe this audience. The knowledge itself fits all kinds of data to generate a model. All right? And that model is what provides insights through the fammers so they can farm better. Take this super model, super platform and localize it to Africa. What I wanted to take you through now is what did we do to make it useful to Africa? Now, facts number 1 and I want to emphasize this. It's not magic. I have been in the audience the last two days and talked about these two things. It's not voodoo. It relies on the quantity of data that comes in. Garbage in, garbage out. Right? So you bring data and don't expect the machine to do those wonders for you. In Africa, we found it useful to approach the data that goes into the platform by working on a quadrant. I will take you through the four categories very quickly because this is a lightning and then end with of the derivatives when you do this because your model becomes richer and better. Number 1, we need to collect data on the farm. You had about different kinds of thing in the last two days. So we need to instrument the farm in such a way that we can collect data. Right? About the soil, about assiduity level and all sorts of things that affect use and optimization on the farm in Africa during the terrain people live. This is often lost over. We need to collect information on the farmer. So we focus on the farm and the environment and all these things that we do in our collection when we neglect the farmer. It is important because these are not loaning to farmers. The biggest impediment is lack of access to credit. They don't have a digital identity. If we don't focus on them, we have scale substantive farmers forever. We need to collect information on farmers. But let me see the high points because of the

lightning talk. We need to collect information about the environment. I think this is obvious. Right? Some of the work that Sarah talked about helps us to do this. Right? And then finally, this is often glossed over and I want to emphasize this in our work, the supply chain. And then this is huge. The distance to hospital. The ability to collect pesticides, all of these affect optimization on the farm and we need AI systems to help the farmers to optimize and therefore farm better. That's eye high level view of the categories of input that we need to supply into the model in order to (?) to help these people. That's my final slide.

When we do this, when we do this, there are your outcomes. There could be more, but this is what we saw in our work. I want to run through this very quickly. We know the farmers. We have information about these farmers and these are dieing to actually reach this community. The problem is foe one is collecting data on them. This is our work we now have data and we have a partnership with a bank and therefore, we're able to provide access to the farmers. It is access to resources. So we can basically optimize what is the distance to water, what is the distance to the hospital, all of those things that affect the farmer. Moving on down very quickly.

We provide advisory services. This is the most powerful things that happened with technology. Right? Because of access, this is the mobile home and farmers can now call in and get information on things like when to farm, when to plant, what to plant, how to plant. These things are important. Otherwise we cannot migrate from the right to the left and then finally, this whole issue along map access and value chain because we now have relevant data personalize to the individual and help them to optimize use on the farm. We talk about challenges in the panel discussion. Thank you.

[APPLAUSE]

>> ROBERT OPP: I want to go quickly to our next lightning talk. Andrew Zolli who is joining us from a very different time zone. I think he's up really late actually. So, Andrew, are you there?

>> ANDREW ZOLLI: I should say good morning, everyone. Not very sunny San Francisco where it is currently about 2:00 in the morning. I would have a greatly enjoyed being with you and

was looking forward to that today, but unfortunately some other matters intervened. It's wonderful to be with you. My name is Andrew Zolli. I will give my colleague a chance to start the slide presentation. I will give you a very quick talk and if you don't mind, I will say next as we try to go through this. I represent an organization called Planet based in San Francisco. We are working through a GA spacial organization that deploys the largest cons tillation and works directly on some of the everybodies that you heard UYI and Sarah talk just a few moments ago. What we do at Planet on Global Impact is insure that the new data source can be used to achieve its highest scientific sustainable development humanitarian and related impact. Can you go to the next slide? So Planet's overall mission is to help life on earth. With that broad mission, we have a number of enumerated. Literally mission number 1 and there are missions 2, 3, 4, et cetera to use this breakthrough remote technology to make global change actionable. I want to mention it is also the connection to some of the exponential forms of growth that service this kind of consensual back drop-for-the whole conversation of this event. Many of the world's most complicated challenges are that way because they simply report salient to our normal modes of human cognition. Many of the challenges whether they are climate related, whether agricultural related, whether they involve the pulsing and cities are so large that they swamp our natural rate of cognition. And it's difficult to fix what you can't see. So making change on earth salient is the first step towards making it addressable. The other thing that's interesting about this if you go to the next slide is how we achieve this. Now, normally when any one of our national governments or the military or industry has built a satellited size of school buses, there are decades and hundreds of millions of dollars to design, build and manage. But one of the fundamental changes of ex51 everyoneiated change is when you have anything that yokes to that accelerating curve undergoes really forms of compression. Compression in size, compression in speed, compression in the amount of energy and efficiency and especially compression in time. So what you're looking at here is a satellite called the dove. Most of the satellites that come from a military background name for birds of prey. They're

what we call the angry birds hawks and more. That satellite that you're looking at there is about the size of a loaf of bread. It is 30ent is meters in length from one end of the camera to the other one. Not on the solar panels and it is about 10 centmeters square. They're very small.

If you go to the next slide, we have deployed them into a sun synchronized orbit which goes over the poles between the sun and the earth and back to the dark side of the earth. The earth turns Perpen Dickual Arlee. By high resolution here, we mean three meters per pixel. There are some other technologies that we also run that compliment the three meter imagery with 80 cent meter. We do change detection in the three imagery and then we look when we detect change that we think we need to really attend to whether a natural disaster or order forms of change, you can zoom in and pay more careful attention to a particular part of the planet where changes have this quickly.

So what can you see with these kinds of tools? Let me give you a couple quick examples. Here you're looking at agricultural planting during March of 2016. Just to show you the difference here, these are very large format innages. We can zoom right in to a 3 meter plot. You can imagine this is quite detailed. If you go to the next one, you can just see the transition between March and May when we're looking at months in the same period and looking at the rate of harvesting, looking at effectively tracking and automating the tracking. Sarah, I think pointed out a need for automated tools that allow for us to understand both in quantify change and characterized change. The first thing in order to do that is you have to see the change. Now we have the instrumentation to do that. Please continue to the next slide.

Here's another quick example. This is one taken from a couple. Some of you know there was a very significant flooding event in Sri Lanka. Looking at flood extent maps between high imagery May 22nd and May 27th a few days later on the onset of this flooding event. It demonstrates that when you have the whole earth every day, not only do you see change, but you see the system before it was disturbed which is often just as important as seeing it afterward. The baselining of much of our work on the sustainable development goals is really uneven. This is a very useful technology. Next slide.

Here we're doing other work using those technologies and combining sophisticated data sets. In this case, round through building heights and geometries with persistent remote. In this case, Dar es Salaam is growing at a rate that no one can determine. Yet the people charged with planning the city. So what we're doing is using computer techniques both to assess the continuous feed of Dar es Salaam and they can plan for best disastrous production, taxation, all of the things that go along with that. Next slide,please.

Here, I will give you a simple example. We're very careful with the release of this data which we get very carefully before we put it into wide circulation. But here you can see the emergence we have over the Washington post of a new large scale IPD camp in Uganda. We now work to train to look at and understand the visual signature of the emergence of such camps so that we can automatically detect them and continue to bring down the data that helps have to work with to that which is more (?) and salient to work with. Next slide.

A word or two. We're also using these technologies and I will use a minutessal model for you in a moment that in some sense for the power of this imagery. We're working with a team at Stanford with a data set. In this case, taken and using the team learning techniques to do a statistical correlation that allows us to see economical activity and track poverty and inclusion using the satellite imagery. Next slide.

Here we're also working with that same team at Stanford to do in season agriculturally indicators working in Kenya. We're doing in season May's predictive modeling. We get some sense for the total yield of the May's crop will be before it is done growing in the ground. So one of the most important things about the tools is that the combination of AI and persistent remote of all types when put together not only helps us move data into the human decision cycle in the present tense, but it help us get reactive to real time predictive and predictive to cross. What should we do to change the statistical likelihood and this data in turn we are feeding some elements of this to an organization based in Kenya called Farm Drive which uses this information which extends credit to farmers. In Nigeria, there's a different side of the story. We're finding that the data is incredibly valuable for control trials which

increases the efficiency with which we can execute those trials and increase the nuance and sophistication of the interventions we make to reduce hunger and hunger risk. Next slide, please.

We're almost done. What you're looking at here is all of our imagery taken from China and specifically what you're seeing here is a visual search engine in which someone is clicking on one solar installation in China and we are going out and finding. This is built with a partner organization with Planet. You can imagine the tools being used in the right happens and with the right controls to find the every informal IDT camp in a particular region or every indicator of a human rights violation, every prop that shows signs of agriculturally disease or related risks. And this kind of searchable and transparent system we think is going to shift the human decision cycle in a way that it will accelerate it. The last thing I want to show you and I think we'll be done -- it is really a mental model we use a lot at Planet to talk about these changes. We spend time talking and I think just in general talking about both the power and the annoyance of big data. Big data is many things. It's extraordinarily powerful and it's a gigantic pain to deal with. Most organizations especially forefront organizations don't have the organizations to do so. We think this is going to betranser toy especially in the end user experience. We believe we are headed into an era we refer to big indicators. We call it the four eyes model. If you can click next, please.

At the bottom, you have fundamental information transformation we're all seeing which is a revolution in remote sensing and transactional data and embedded IOT systems and all the rest of it. It is a huge explosion of information. Much too much to deal with for a typical application. Thankfully on top of that if you go to the next slide. There is a concurrent insight revolution and the AI revolution we see today is mostly about a specific and general some moving toward generalizable AI for us primarily about insights and driving deeper insights into what matters and all that information. When the invites prove to be stable over time -- if you go to the next slide --

They become the foundation for new forms of indicators about how systems are doing. If you think about something like the Nasdaq or the Dow Jones industrial average or the index, for

view people in this room can tell you how any of those are used. But they're sufficiently reliable and expectable that we can trust them to trade. And in some ways, we're heading towards something like that in the realm of sustainable things like that. When the indicators are sufficiently robust -- next slide please.

That's when you build new technology and policy instruments. Now most of the U.N. infrastructure is about these kinds of instruments. It's about what we do. I think what we're moving from is the sandwich where much of the work that's happening and information today is beginning to happen in the insight. It's creeping upwards towards the big indicators and big instruments. Next slide.

This is the last point here. As you move up that pyramid, you can click next. At the bottom of that stack, you get a lot more information and a lot less value per unit of information. You move to the top, you get a lot more value and a lot less information. And ultimately what we hope is they'll be thousands, millions of people who use AI, use satellite imagery and never see a pixel. All they get is the sufficient support to make a best decision.

With that, I will say thank you very much. If you go to the next slide, that's my e-mail address. I would love to hear from you. If you have questions, I would love to hear from you. Thank you again. It's an honor to be on this panel.

[APPLAUSE]

>> ROBERT OPP: Andrew, thank you again for the talk and for joining us today. Both you and we are on the panel with us. Before we start talking about more solutions, I want to just take a pause and look at the challenges. Andrew, from your perspective, what are the challenges that stand between what you at Planet are doing and having a bigger impact on food, security and hunger as an issue.

>> ANDREW ZOLLI: I would say the first one is that these technologies we tend to talk about them in very abstract terms. They're really a political philosophy encoded in a technology. It's not they bring us new capabilities, but new culture. The technologies accelerate the human decision cycles. They will ultimately cause many more things to be measured and are presently measured and they will lower the cost of measurement

and increase the value of judgment. And especially speedy judgment, quick judgment. Right now most of the -- most important actors who could and should be using the tools even in their form don't have the culture around their use. They don't have the familiarization. They don't have the language. They don't have technologies at the right seat of the table. Not telling people what to do, but enabling them to do more effective things. I think what's coming is a cultural revolution for the way we do both humanitarian response and sustainable development. I think that anything we do to build that capacity and that self-confidence at every level from the community level up to the big institutions like the U.N. would be extraordinarily valuable to accelerate that.

>> ROBERT OPP: Can I turn to you and ask the same question essentially. What are the challenges that you witnessed out of the material you presented on the lightning talk, but even in general if you wish? Just talk.

>> UYI STEWART: There are many, but I will call out two because I've had the privilege to see the guided principles they're working on. I know we're short on time. So the first one is the challenge of the ability of insight. So ultimately, AI systems and the models behind them will speed out insight. Right? But how will this -- (?) how will they consume the insights? That's a challenge. I will give you one quick example we encountered. So the system is great and it came out with a prediction about rain fall. I think it was two millimeters of rain was expected. And we spotted that inside out to the farmer. It was HUH? What is two millimeters of rain? What does that mean? What do I do now? Is this too much rain or how does that affect my crop? That just opened up a new conversation for us that we needed metaphors to translate the insides in a way it becomes consumable by the users. That's number 1.

And the second is close the link is the nation of indigenous knowledge. Ultimately what we're doing and now I'm speaking like an employee. You remember my visual. We want to go from the right to left. This means people have to give up their way of doing things and adopt the new way of doing things. But in order to realize behavior change, we need to accommodate indigenous knowledge. So issues of contextualization of the

models that we build. Right now, that is in AI systems and these are two challenges I want to call out.

>> ROBERT OPP: Great. Thank you. I want to start looking at what are some of the solutions basis here. Marcus, if I can turn to you. Thank you for co-sponsoring this event. The people have been brought around the table. But from your perspective at XPRIZE, we've worked join thely with the world food program and the literacy prize and we worked on the AI prize. How do you see the kind of stimulation that XPRIZE does for market? How do you see that with some of the challenges?

>> MARCUS SHINGLES: Part of what it gets me excited being at an event like this is when we see what Sarah talked about. You got me very excited because the reality is this. You see a gentleman like this and you see the impact one person is having and the reason I get excited about that is because the way I'm wireed is when I talked about the first day on the main stage. There's an Entrepreneurial Renaissance occurring of innovators that we have never seen before. You're working with tools and technology to do the impact that you're doing that only government and big industry had 20 years ago. But it's a drop in the bucket and I mean that in a positive way. You're making an impact and we can do so much more to get so much more impact going. The philosophy we have is just a crowd sourcing philosophy. Crowd sourcing is something we're talking about today. We weren't talking about it 10 years ago because there was no crowd. XPRIZE has been doing it for 15, 20 years, but now it's becoming extremely relevant because of the emergence called the connected entrepreneur. What is exciting is when you see individual entrepreneurs doing so much, you can have hope. What if we get thousands of folks like this that are innovator using the technologies? Now, we've not -- the world is not lucky enough to have a lot of what you're doing or what Sarah is doing or what others are doing. You have lots of passion. You have to have a passion that does it and wants to make a difference. Not everybody has that passion to go make impact that way because maybe it's not the most profitable line of work. Do it anyways. So XPRIZE we want to take the Google engineer by day nights and weekend solving big problems. And the reason we want to do that if we know we can crack the code

on that, we're going to generate critical mass, a lot of folks like this. Imagine if you can duplicate him a thousand times, rapidly experimenting because you did fail and learn fail and learn, fail and learn. A lot of diversity meaning if you needed critical mass with a lot of rapid experimentation, I have an engineering problem or an artist trying to reach learning. If you can crack the code inha formula, statistically speaking, you will find a needle in the haystack. It is a modern way of problem solving. I don't think there's any way to keep up with that pace of change which problems now exponential. And you need solutions that are exponential. We will not hit critical mass on problem solving unless you figure out now methodologies that are contemporary and how to solve problems. Before I was doing XPRIZE, I was consulting with CEOs of Fortune 500. I was having bank s and con super product companies and car companies and retailers. They're figuring out how to use all of the crowd to start making pro ducts faster, better, cheaper. So that's an asset class. And guess what? The crowd is motivated under nights and weekends not to help the next company make sugar water. It is to help make impact. It is a conditioned model for social impact. If they're motivated to help the bank do something, comb their data, I guarantee they will help give food to part of the world. A lot of discussion and network that's done here is actually -- I think the tone has to be how to rethink problem solving in the process.

>> ROBERT OPP: Marcus talked about the Google engineer by day.

>> MARCUS SHINGLES: Do you nights and weekends?

>> MARCUS SHINGLES: I think we have to promote the modern day social entrepreneur. It's a parenting thing. My son's in college. My daughter is out of college. My son is in college. I think all parents have to start telling their kids this. All of us who are parents, we have kids that let's spend this holiday season and go to the soup kitchen and give food to the poor. Give back. Everybody has the wanting and need to give back. You have a super computer over in your room. Go try to solve a problem. Do something bigger. Make a moon shot with that. If you need inspiration, go to XPRIZE.org. There are plenty of places you can go. The more we bring a social conscious up in the world that let's people know you have super technology

in your pockets and in your room, that's where if you want to give back, go do that. Get out there and use the technology. So --

>> ROBERT OPP: Actually, your day job is to look at some of the most cutting edge technologies when it comes to AI and how they're being applied to search and other thins. Hearing some of the challenges that you've heard today, what are some of the things you're looking at that you think will make a difference for people who are living in poverty or hunger?

>> UYI STEWART: As you mentioned, it's very related to like the newest parts of mission learning in AI that we are building at Google. So I have been working on the search people for the past more than 10 years and in the past three or four years we're building Google assistance with the goal of trying to have a conversation when you say Google and talk to TR mobile phones. You try to have a natural conversation and get information pretty much on all the ranges of questions that users might have. So I think there are multiple aspects I wanted to cover based on some of the previous points.

First I wanted to say that is not magic. But machine learning has made a huge progress in the past three or four years. Many things which was not possible four years ago today is possible. Like image or technician is understanding images is much better than four days ago. It sending what people are saying is much better than four years ago. Four years ago you could not really talk reliably with phones today you can. Same goes for natural language and understanding. I work on conversation. We think of conversation as a way that people do not need to learn new thing. Everyone knows what to do from a kid to some older people in all different countries. They can talk in languages that they have and they can ask for different types of information or help they need. Interface to the technology in this case. I'm working on a search and giving information to be easy, to be easy as possible. But the same applies also for tools and machine learning components. One of the challenges which are not directly at my team but at Google we're trying to make these components of machine learning components to be very easy to use. There is many of the problems that were shown in these talks are in the fields of -- is in the field of helping to solve hunger problems very classical problems. These are very solved

problems trying to understand what's in the pictures or trying to predict things, trying to connect farmers questions which in any language it is to the data and trying to optimize local problems with organizations. These are all solved problems. So the challenge today is try to -- how to make all these tools available to many people to manner people who are not Google engineers and don't have the skills of coding. This is one of the top priorities for us. There are many places that try to make this very much easier and useable and available. There are challenges which I wanted to mention with challenges which is how we make shire all the different types of examples that are happening is aligned or the learnings are shared. I think there is many countries or many places that are going to use technology to use production and consumption. Is there actually an alignment? There are very similar problems being sold many, many times. So some were like Google and can help by trying to have on one hand the tools which is usage, but on the of the hand to get all the other organizations a place where not only knowledge, but also data and take a hard problem. This is a challenge that can be sold.

>> ROBERT OPP: Making this easy as possible. Andrew was saying the translation element, the useable of insights. It is fascinating stuff. Bob, can I turn to you? A similar question as the one I just asked, but at IBM research, you are looking at some of the biggest issues facing us in AI and block chain. Based on what you heard here and thinking about the challenge of hunger and people living in vulnerability, what are the things that excite you the most in your portfolio that you think can make a difference?

>> ROBERT SUTOR: Certainly, it's political problem. There is a correlated with economic problems as you mentioned on the main stage. Sometimes it's a supply chain problem. When it really gets down to it, let's talk about agriculture. Somebody grows something. It starts with a seed and eventually that becomes food and ends up in someone's stomach, one would hope. And that result is extremely complicated. What is supply chain? Now, I want to point out that and by itself isn't new. All right? So in the second world war, there was I lot of applied map applied to moving people, moving ships, moving tanks, moving food, moving all sorts of materials around the

world. This was in the early 1940s. It was called operations research. It is still a very important part of what we consider supply chain. So I do think we have to be a little bit careful here. AI has been used as a proxy in a conference for all computer science and all applied mathematics. It can be very precise about AI, but it's been used anything we can do with computers applies to these problems. Because they're important problems. I have no problem applying all these things. But in that regard, let's take operations research from the 1940s. AI an overnight success in 70 years. And that is because frankly the exponential curves don't look like it shoots off to the moon. It's a very slow growth and then suddenly it starts building and then you start to see as they say the curve. Now we're hope think it's not like law, which is proceeding up, but it will start flattening out.

So what technologies can help there? So one of the other speakers on the main stage mentioned something called precision agriculture. Again, it's a fairly large field and that phrase covers a lot of toward. So think of it as a field where you want to grow something. Every single point in that field you could imagine absolutely everything. How much sun does it get? How much water does it get? How windy is it? What's the mechanical composition of the soil? If not, all those things really -- that data is there. You may not be collecting it. So given that, what sort of seed should you plant in that spot for maximum yield? You're thinking of your field and it becomes an optimization problem of growing exactly the right thing to grow as much food as possible and from there, it becomes a collection and distribution problem and so forth. So whether you call it AI, whether you call it optimization, you have a lot of data and this is why we call it big data because there are many, many different types of data. There's weather data and satellite. It all comes together. And it's a question of the model that we're talking about. The model combines all these interesting things together to give us more. Now the supply chain then goes from there to ultimately feeding people. And that's where you also want to look at efficiencies because the food gets shipped. It gets put in a container. It may go through inspections and all these things happen. This is where this technology called block chain which grew out of bit coin,

but can talk forever about block chain. It is starting to really come into effect. There's a lot of news and people adopting, but the idea is really increase the efficiency of moving something from one place to another or in this case food to people. Right? So you got some sense of ground truth. You know that certain things actually happen. You know that the food was actually inspected. Once you do the normal things, you can start turning additional data such as in that refrigerated truck or container, you can say what is the temperature every 15 minutes? It's an important part of increasing amount of food which is reducing food waste. It's let's stop wasting what we have in addition to all the other things. So the discussion of block chain gives you a lot of information which you can then measure and potentially reduce waste. Then you look at the whole thing from an optimization perspective and say can you optimize this? We don't have to do things the way we used to do it. We can figure out new more efficient ways ever getting that food to the right people. So my main point here is it's obviously a critical problem. There are many different technologies that are coming into play. I think we need to use all of them.

>> ROBERT OPP: Great. Thank you.

[APPLAUSE]

All right. So our time is actually running a lot quicker than I thought it would. We're getting a little bit short. I want to turn out to the audience and get a couple of questions and comments. I want to turn to colleagues that have joined us from the international fund for agriculturally development. And what would your comment be?

>> I just wanted to say that (low voice) really to have partnered with WFP and the team. All of you were absolutely, you know, outstanding and you are the cutting edge of your field. And I came to the session thinking that we are going to be talking about the most vulnerable only in terms of quick onset image, rapid image and feed. What I heard was you actually made the bridge, you know, from image all the way to longer term development problem. We to Andrew, et cetera, and the last speaker. So thank you very much for that.

The big issue for us really is although in each of the disciplines we have moved so far ahead and how do we bring it

all together? So within the content of implementing the SDGs, we need to look for intersectal approaches. People talk about multi-disciplinary, but what I hear is: How did you develop multi-stakeholder teams to be able to get the best information, you know, which is already available and it's so fascinating to see what's available. How do you get it all to come together? That is really the key question and some of it was answered by you. So perhaps platforms on the agencies that are considered the lead cluster in good and agriculture. I wonder if we can somehow provide those platforms of multi-stakeholder partnerships that can bring all of these disciplines together and really get the best of knowledge down to the rule. And thankfully not just the people affected by emergencies, but small holder communities that are also hungry of seasonal hunger resolve the problem. We have the tools. We need to take it to the instruments that Andrew was talking about. Thank you so much again.

>> ROBERT OPP: Thank you. And I saw -- we have someone who's got a question remotely. Is that it? Oh, Andrew. First, can I just turn? I saw a hand here. We have a couple other hands up. Let's go quickly here first.

>> Thanks very much. I wanted to ask a question to Uyi and to Andrew specifically about how you could apply your innovation without becoming too overwhelmed into other sectors? The change effect is afford and the question is: How can that be translated intord sectors? That's my particular interest. Andrew, looking at that organization, that is located with trajectories, but a very specific question about from your perspective, how can that learning be applied? It is slightly different about how you can be multi-disciplinary.

>> Thank you.

>> ROBERT OPP: I saw two gentlemen here in the back row.

>> Thank you. Richard Himm. I wanted to build on the latest comments which is AI is not going to solve everything. They can obviously help. So it would seem many ways and I wanted to come back to your initial comment. Hunger is an outrage. And as you mentioned in the plenary, the causes include poverty and war. We saw the application of satellite imagery to improve delivering aid, but satellite imagery can and has been used to target people and prevent the Convoy. We have to be careful

with this stuff. I think in addition to technical things to talking about, we have to go back and address the real issues poverty and war. We know how to solve poverty. We don't like it. We don't like to pay taxes, at least some of us don't. It's necessary. And this has to start happening internationally now, which is not the case. We're not doing enough to aid people. And in terms of war, we can start by stopping the funding of war and stop selling weapons to people that want to kill each other. This was mentioned in other sessions. Maybe we need to think about taxing robots and things like that and in terms ever stopping the escalation of wars, agree not to use cyber weapons against civilians. Thank you.

>> ROBERT OPP: Beside you, there was either.

>> John Shines. I have a challenging food security question for you. Right now as we speak, there's a serious drought in Somalia and food security is eroding as we speak and famine is a real and present threat on the immediate agenda for some of the most impoverished and vulnerable people in the world. Human rights watch for observation data to look at this issue and I know many wonderful colleagues within the U.N. and other sister agencies are also using this to look and assess the root causes of this drought. Now the challenge, which I think I would love to hear some advice from the panelists on is how should let's say the practitioners and the managers and the analysts like Sarah and many others in this room, how should they handle the information that they obtain from all of these fantastic new technologies when that information points to let's say politically sensitive or awkward causes of this drought? Now, for those who are not familiar, the root cause of this drought is primarily upstream water diversion from the two primary rivers Yuba and the Jabel. They are being diverted for large scale agricultural and hydroelectric projects in Ethiopia. And this is really caused quite a profound institutional issue. I know from people who are remote sensing experts, they don't quite know what to do with this information. I worked in the U.N. and in all of the critical responses, we always ultimately came up with these very awkward institutional moments when the information we have obtained the insights that we've obtained from this technology are fundamentally at odds with the institutional mandates or directors or policies of the

senior management of the assistant secretary generals who lead the U.N. sister agencies. It's an unresolved question and crisis. What had be the professional responsibility of people who manage and collect and curate this information. What do they do with it? How do they operate it in a way that it has a humanitarian impact, but it doesn't jeopardize their unit, their career, their profession?

>> ROBERT OPP: I will go quickly to Andrew who may have also had a question. But Andrew, the questions around use of satellite imagery and privacy and things like that. I know you have worked through them on Planet Lab. Just from your side, there's a commercial company. How are you dealing with some of those things and give us any other thoughts before I turn to the other panelists as well.

>> ANDREW ZOLLI: The journey is not over. Just to use the transitive property. If information is power and big data is potentially big information, then big data is potentially big power. And we have to think about the disproportionate and complicated effects. I can give you two examples before I address something that Robert said at the end of the discussion. The ethical issues are not just harming organizations. They are also about what happens when you take in a society if you have two groups within a society and they have different levels of capacity and social standing and they have abilities to use the technologies. Then you distribute them for free. You end up disempowering or radically empowering a substantial margin and increasing the inequality. Even while you raise the net level of both groups, it's a very complicated story. It's one that we continue to wrestle with and what we decided to do in addressing it because we have humanitarian and a commercial purpose is to enpanel organizations with people with capacity on the front lines of the questions where we can work on them together. If there isn't a single silver bullet to all these questions. I want to leave one thing. I think Robert said AI is an optimization opportunity. I would say that that is true. It is, but only up until a point because the -- in a very deep way, I think I heard it in many of the questions in the last few minutes. It's also an interactions issue. The SDGs are 17 separate silos that it often feels like with very little cross coordination between the institutes that are charged with

and thinking about and implementing them. The reality is we have profound interactions with each. Those interactions are not well understood today. What we do to diminish the potential for conflict may have some implication for how we resource management and we in turn affect food, security and a large multi-polar optimization phase. Many potential relationships between those systems is possible is a perfect environment for illuminating those interactions which allude the best team. Giving us a wider variety of choices and I think that's what plays where AI will play a huge role not just come making sure the right stuff gets on the right place. But understanding and really learning and really developing insights about how these activities influence each of the and shape continuously more thing landscape of risk and change in opportunity. I think that's a deep learning opportunity. That's a general raised AI question about discovering principles that were not obvious to us today. I think they'll be on the operations. I really appreciated that commentary at the end. I think history is very helpful. I do hope that AI will begin to be used with issues that will be on optimization questions. I don't think that answered all the questions, but I think there (low voice)

>> ROBERT OPP: Maybe we kick off. There's a question about behavior change. We go for any other reactions from the panel.

>> UYI STEWART: I may use my time on the floor to change that. We all had an opportunity to teach a little bit. So 20 years ago when I joined the field, I started out as a condition expert. I know we talked to that. But there's been a change that's happened and it came from speech with a lot of the work. If you look at what's happening now with this broad reference to AI is that there is authorization on data and the tools that we use to derive invites from that data. There's been a shift on how we design systems as well to answer your question. So 20 years ago, there was a demarcation between the front end and the back end and there were people who were designated UI specialists who focus at the front end. Then the program who did a lot of stuff based on requirements that were given. Right? There's been a big shift now. A lot of folks who used to walk on the front end are now walking in the back end because the back end is all about data now and that data is work influences what happens in the front end. So to your question,

it is diagnostic and everything happens in the back end. Yeah? Okay. Cool.

>> ROBERT OPP: Any other comments?

>> I was trying to use reaction research. I think it's really important for people to start. A lot of what we call AI on the enterprise side on meetings and organizations is machine learning. Fairly basic stuff. If you have a lot of data, there are standardized things you can start getting insights from that information. There are commercial tools and open source tools. We're talked about people who do in their spare time and evenings and weekends and start applying this to the problems. So don't be afraid. Don't worry about, you know, some day some expert will show up. I think there are a lot of people who are gravitating towards this. We have 15 projects this summer. We had 500 applicants for this. These were undergraduates and graduate students. By the way, half of them were women which is highly unusual. This is fundamentally breaking a lot of the stereo types of software engineers, scientists going for the dollars. People have a hunger to did this. But get started. You may heard a lot of these huge plans and how we can do all these wonderful things. Start on some data and figure out what you can learn.

>> BEHSHAD BEHZADI: I also personally don't like to define what AI is because many different people think many different ways about it. There are all these problems and you want to solve those problems. There are technique and technologies like mission learning. It is well defined. You give examples and you define good, bad and then you want the machine with new examples you have not seen before. What happens in the inside is improving and that's why things are changing. But then there's a wide range of problems in this generally which it could have classical optimizations and machine learning or different types of tools to be used there. I think what I said before is that it is importantd tools are becoming more and more usable and easier to be used. I will give you an example like in Google. The number of times you are using and the number of directories like four years ago, it's around 100. 100 different directories you have machine learning. Today it is like 20,000. Just that number. So it is showing how much more it is becoming easier to use it. But because it is easier to

use it, it is being using the ranges of the tasks. I think I (?) problem solution are very similar. Data is a very big part of it. But if you're really trying to make that users and people are really connected directly to the set that this is my data and this is the problem that I have and try to get connected to the latest and try to share that, I think they're trying to go towards the next level hopefully.

>> ROBERT OPP: Marcus, any thoughts from your side?

>> MARCUS SHINGLES: One of the things you had brought up is the education system right now is probably not conducive. You were sharing about the complexity of what you were doing. It isim isular to old data warehousing and analytical housing. It is what panel was saying. AI is not the only solution, but if you go into a particular field, you are probably going into that specific field. It might be an AI computer science thing and also you need to understand biotechnology. You also need to understand robotics. You also need to understand the block chain and new capabilities. There is new education and kids are getting through school let alone when you get out of school. So it is fundamentally a dysfunction with how any population is educating their youth to be prepared to capitalize on these things to solve problems. Some people are figuring out they need a major overhaul and you put it through the lense and it is much more significant of what is required. Almost to the point where you can be learning things that are relevant when you get out and are completely relevant.

>> ROBERT OPP: Conscious of time. The other sessions are running a bit late. All right. Let's take one burning question and then I want to come to the principles coming out of this session.

>> Thank you. This does relate to the principles as well as Marcus' comments about interdisciplinary and integration between things. I think there's a recognition that we already have plenty of data with sensors that is being brought out is there. And I think there's also recognition there's a limit to its usefulness when looking at these things in isolated context. Perhaps a proposal or at least a food for thought nugget that I might have is whether in this scenario or others, AI would be best leveraged as a means of connecting and translating in flights across sometimes desperate fields or at

least on the different sides of the various equations. I think you might have answered most of them. One is the tension between technology and behavior change. The second was the production and distribution equation. Third is the relationship between policy and market forces. Fourth is micro-systems and macro-systems and how they translate into macro trends or vice-versa. But then finally I think one that I'm really concerned about is how climate change and different environmental factors are going to disrupt even the fundamental environment of some of the systems. If you have, you know, equier toual areas that are simply inhabittal in 20 or 30 years or, you know, different areas are just so altered that culture and people's way of life fundamentally has to be moved into a new way of being. How can either AI or other kinds of considerations maintain those individuals and societies ability to still proceed with dignified meaningful lives. So I know there's a lot there.

>> Excellent thoughts and we will leave it more as a comment than a response because I do need to wrap this up.

>> ROBERT OPP: As I think about the conversation we've had, which has been excellent and knowing that the breakthrough sessions really have the challenge of putting forward some principles that come out, one that comes clear for me quite I would say stark is the refrain around usability some kind of that cultural element. I think AI as it gets adopted into different parts of the work that we're doing and food security and hunger needs to be very sure that it's attuned culturally to the ultimate users frankly. In other words, your example of the Nigerian farmer not understanding what a metric of rain fall was, a millimeter of rain. Make sure that our systems are designed with the user in mind. The other one that has come out and I'm not sure how we craft this, but the concerns about privacy and protection of data and things. It does speak to me to have AIs haves that are very transparent and accountable. So we'll think a little bit how we might put that one forward. It's very clear when we're doing things like collecting satellite data and imagery about people especially who are most vulnerable, how do we make sure they understand what they're granting access to or if they have been able to grant access to that data or how they've been able to insure or how we're

able to insure that data is protected and we handle it responsibly.

With that, I really want to thank my panelists for their intense wisdom that's been offered this this short amount of time. A special shout out for Andrew who is now out 3:00 to 4:00 in the morning. And really thank all of you for your participation today and look forward to continuing the discussion. So thanks again very much.

[APPLAUSE]