JP Morgan 39th Annual Healthcare Virtual Conference

Company Participants

- Harlan Sur, JPMorgan Chase & Co
- Kimberly Powell, NVIDIA Corporation

Presentation

Harlan Sur {BIO 6539622 <GO>}

Good afternoon. Welcome to JPMorgan's 39th Annual Healthcare Conference -- usually held here in San Francisco, but virtual this year. My name is Harlan Sur. I'm the Semiconductor analyst for the firm. For the third consecutive year, we have the team from NVIDIA presenting.

For those of you that don't know NVIDIA, they're a leader in visual and accelerated computing silicon and system level solutions in areas like artificial intelligence, deep learning, powering some of the world's largest supercomputers and driving compute innovation for cloud and hyperscalers as well as larger vertical markets like healthcare.

And with us today from NVIDIA is Kimberly Powell, Vice President and General Manager of Healthcare at NVIDIA. She is responsible for the company's worldwide healthcare business, including targeted hardware and software platforms for accelerated computing, AI and visualization that power the ecosystems of imaging, genomics, drug discovery and precision medicine.

Given the battle against COVID-19, the NVIDIA team has contributed its compute acceleration solutions to aid in the fight against the virus. So Kimberly, thank you for joining us today. And with that, why don't I go ahead and turn it over to you?

Kimberly Powell {BIO 22145194 <GO>}

Thank you, so much, Harlan. It's truly a great honor to be here as always. I appreciate it every year -- and especially this year. I mean listening to the talk this morning -- and it's just truly inspiring to see the tremendous global effort to eradicate coronavirus and build up a speed of the light response system.

As devastating as the virus is, it's really created this extreme focus on the healthcare industry. Of course, in pharma and healthcare delivery, but government, academia, start-up and the tech industry like ourselves have all joined together and trying to create a response.

So today, I'm really excited to be here, and I'll share some of the critical role, really, of artificial intelligence and computing across healthcare and what we think could be truly 2020 was the beginning of what I'm calling the AI healthcare era.

So if we could advance just quickly, let me remind you of our safe harbor statement you're all familiar with and for any forward-looking statements.

And on Slide 3, a picture we're all very familiar with, but let me put it into perspective of understanding human disease and discovering therapies is truly the greatest human endeavor. The drug discovery process really represents the incredible complexity of this problem.

There's no equation for biology, and it's been an incredible past couple of decades where we've set out to digitize as much biology as we can through things like genomics and electron microscopy for 3D protein structure or cell imaging and (inaudible) human data, all in the form of now digital data.

This is the amount of data we can produce today and more biomedical data in about three months than the entire 300-year history of healthcare, as said by our fellow partners at GSK.

And so this is now becoming a problem that no human really can synthesize that level of data, and we need to call upon artificial intelligence to truly take some of the next steps necessary in understanding human disease and discovering therapies to serve it. And that's about biology.

And then you have to introduce, of course, the chemical space. As we look at the chemical space, there's more than 10 to the 60 [ph] potential molecules out there, essentially an infinite problem.

And so again, here, applying artificial intelligence to discover novel compounds and being able to stimulate and create digital and virtual microscope is something that is being sought after by the entire industry at large. And so this is truly an artificial intelligence problem and a computational problem.

And so we're really excited to be helping to advance our discovery through computing in a drug discovery process, this very complex process where one phase fits into the next essentially making recommendations. And artificial intelligence computing can truly help us bring recommendations and accuracy levels of those recommendations better and better so that we can attack some of the major challenges.

The fact that it takes about 10 years to bring a drug to market is far too long. So accelerated computing can serve that. The fact that our success rate and the cost to discover these things is far, far too high of a cost and too low of a success rate, this is where artificial intelligence can come in.

And so without a doubt, this is -- artificial intelligence is the most powerful technology force of our time. And 2020 really ushered in breakthroughs in biomedical research driven by artificial intelligence.

AI (inaudible) achieved experimental accuracy in a lot of domains for the first time ever. Experiments are slow. They introduce human error, and you can largely not do them in parallel like you can do in computers. And so increasing the speed and resolution of predictions and simulations has been a tremendous breakthrough in 2020.

Let me give you some just incredible examples. Genomic variant detection. So Google in their beat variant was -- has essentially created a universal variant collar so that we can now harness not only short read sequencing technology but also long read sequencing technology.

So it's a universal variant collar that doesn't require human statistical algorithms in order to increase our single nucleotide variant accuracy. And NVIDIA, (inaudible) have implemented in the Google deep variant, and the world is now leveraging that. It's getting tremendous traction. And in the precision FDA challenge, the accuracy levels were far better than ever before.

Virtual drug screening, being able to go through that -- what seems to be an intractable chemical space of compounds and being able to do that at a pace where the more molecules we can dock, the more we can discover.

And so (inaudible) and his team created a -- an application called deep docking [ph], where AI and docking was able to essentially screen through 400 billion compounds, and for coronavirus, discover 1,000 hits that are now going into the lab there from UBC at the Vancouver prostate center. So 4 billion compounds, something they can do now in a matter of a couple of days versus the month -- many months that it would have taken previously to combining the effects of artificial intelligence and accelerated and high-performance computing.

As many of you have probably heard, the incredible breakthrough recently also of Google's (inaudible), the second generation of their 3D structure prediction algorithm driven by deep learning. Their first incarnation of this was using (inaudible) neural networks and -- which is more known for working with imaging data.

But recent breakthroughs in natural language processing and machine translation known as transformer models, so things that really are more used in the area of text and understanding text, they use those algorithms to make a truly breakthrough in 3D protein prediction -- structure prediction and achieved experimental accuracy. This is just a tremendous breakthrough that could be very, very transformational to the industry.

All the way through to a recent (inaudible) price, which is essentially the Olympics, if you will, of accelerated computing and supercomputing, (inaudible) in the HPC

COVID-19 consortium, they really put their heads together to say how can we use artificial intelligence to drive molecular dynamic simulations. And essentially, they were able to create what they call a computational microscope.

In computation, being able to see the coronavirus and how it enters the cell at atomic scale and resolutions that truly no instrument actually can even produce. There's just a handful of critical breakthroughs in 2020 where both see artificial -- high-performance computing and now being enhanced with artificial intelligence techniques, creating tremendous breakthroughs. And what that's done is, really, it's double the level of computing that is needed throughout the drug discovery process.

From the right-hand side in the chart, our high-performance computing -- computational demand is increasing because the data is increasing, the length of time scale is increasing, the way we can scale across supercomputing has been increasing.

But now with this biomedical data values and bringing artificial intelligence into the equation, we've literally doubled that. And so for each drug discovery organization, a minimum of 10 petaflops of computing is now going to be needed, and that's just at the beginning of this new AI revolution.

Artificial intelligence is really about software writing software. It's software that writes software that no humans can. And -- but it's a little more than that. If you think about artificial intelligence, and we even think about in healthcare and the practice of medicine is intelligence is domain specific.

The data that you need in order to leverage artificial intelligence is domain specific. It could be imaging to the genomic data. It could be electronic health. It's very domain-specific and different than consumer artificial intelligence that we know today.

At the same time, in order to deal with those data specific features, you also need to have algorithms and compute that are aware of that domain specificity. Different model architectures are used for medical imaging than is used for when you're tagging a picture in your Facebook.

And we need to be aware of that and create the algorithms and the frameworks in order to bring the domain experts into this artificial intelligence era. And similarly, the task that artificial intelligence performs is also very domain specific. The automation of skills, that truly is what artificial intelligence is. And you can see that healthcare and the practice of medicine incorporates many different domains that are all incredibly domain specific.

And that brings us into what is the mission of NVIDIA healthcare. And our mission is to bring the state-of-the-art computing approaches into the domain of healthcare, and we've done that over the last several years with a computing platform we've

called NVIDIA Clara. It's named Dr. Clara (inaudible). She was the inventor of the American Red Cross. It's a platform to help people.

And this platform is domain specific, and it's really in the center there -- visualized in the center of this chart where you can see that pretrain models that are fit for chemistry, genomics, imaging, biomedical, natural language processing, these pretrained models are one of the cornerstones of any AI computing platform.

It's where -- it's the starting point where you can now start to introduce domain-specific data and train those models. And so in order to train those models, you need what's called a training framework. And so we're built on the shoulders of giants.

Facebook has largely developed an open source framework called (inaudible). And we recently also announced (inaudible), which has been dubbed the pie which is healthcare because there is so much domain-specific software development that needs to go into this.

We've even created training paradigm known as something like federated learning [ph] where, in healthcare, we know that the security of data is paramount. So how can we learn from the data that resides in the walls of the hospital but not have to move it or compromise its security, and we do that with something called federated learning where hospitals all over the world can contribute to the learning but not have to compromise their data security.

And then lastly, how do you deploy these algorithms in a hospital setting inside an instrument, large-scale and a genomic sequencing center, on the cloud. This deployment platform for where these AI skills want to live is very diverse, and it's very domain specific. And so NVIDIA serves that with the NVIDIA Clara platform built on top of our ubiquitous NVIDIA computing platforms.

NVIDIA's computing platforms are available in every public cloud, in every OEM data center products. And even for a specific embedded low-power, high-efficient instrumentation, just like our self-driving cars are our computing problems go inside of medical instruments, even handheld medical instruments that are now being made possible because of our official intelligence.

NVIDIA Clara as a computational platform for healthcare has gone through an incredible expansion in 2020. You've known us for imaging and instruments for over a decade. At the last JPMorgan conference, I introduced our -- introduced us into the area of genomics.

And we've expanded into 3 other also very critical areas, natural language processing, where tremendous breaks that have gone to super [ph] human levels of performance to be able to -- and we made a specific biomedical version of natural language processing, domain specific, so that it can be much more understanding of the lexicon of healthcare, diseases, proteining [ph], all things that we just studied

Wikipedia or Reddit, we wouldn't have that deep understanding on a biomedical level.

This is going to be critical for taking some of the dark data in healthcare such as our unstructured clinical notes or even the structured data on electronic health records and making fantastic associations to lead us to better discoveries with language processing.

We all sort of introduced Clara Guardian, which is a conversational AI platform. With the incredible pressure that the coronavirus has put on our front-line workers and our healthcare delivery systems, we need to find ways to automate and protect patients when a nurse may not always be able to be there. We can do that by using voice, speech and vision systems that are -- were used to our everyday houses.

We have smart speakers. We have smart cameras that know who's at our door. These same technologies with some domain-specific models and applications can be made so useful to scale our healthcare workers. Whether it's scale as a patient assistant, where a patient can ask, what is my procedure today?

Am I allowed to have water instead of having to call a nurse to get that information? Or how can we be able to monitor patients both for their safety if they're going to fall or their vital signs? All can now be done through some of these smart sensors, and we've introduced the platform for that, and we had tremendous uptick in it.

And then finally, what I'll talk to you about in just a moment is our drug discovery platform called Clara Discovery. With the addition and massive expansion to NVIDIA Clara, we have fivefold increased our downloads in just 12 months. It's just been an amazing year, and the response from academia, start-ups industry in leveraging our platform to have critical breakthroughs is amazing.

We made another record breakthrough with over 1,000 NVIDIA inception AI healthcare start-ups in our program. NVIDIA is in contact and in a member program of a virtual accelerator.

We have over 7,000, but over 1,000 of those are in healthcare alone. And we've also reached a critical milestone and critical mass of over half a million NVIDIA GPU instruments out there and deployed for this industry and to serve both clinicians and patients and understanding and figuring out how to treat them in most efficient way possible.

So introducing NVIDIA Clara Discovery, just at the tail end of last year, it's an AI computational drug discovery platform. Again, it really builds upon the last 10 years of NVIDIA Healthcare. Everything that we're working on, whether it be in imaging or genomics, is truly in service of drug discovery because it's such a multidisciplinary and such a complex problem.

We partner with the industry leaders, whether it be in 3D structure prediction, applications and platforms or whether it be in simulation. We partner where the applications are being built to make sure that they can scale, run as fast as they can, be as accurate as possible. Where no solutions exist, we've gone off and built them.

With NVIDIA, Parabricks [ph] and our rapid platform in genomics, again, our rapid GPU accelerated data science platform for searching the chemical space and doing docking, again, our own biomedical, bio megatron, natural language processing algorithms, and of course, our Clara imaging platform, all of this connected in to really reimagine this drug discovery process, which is AI and computationally driven.

The AI-driven Doug discovery process is being adopted and driven by the world leaders in drug discovery. This is just an incredible snapshot of some of the innovators in AI drug discovery that are truly looking at each and every corner of this process and learning how we can do things better, faster, cheaper, with more accuracy.

An example of Regeneron Genomics Center, they initiated that genomics center because they understood that genomics could really be critical in doing better target discovery, being able to make genomic and phenotypic association to enhance their target discovery, which literally starts the entire process of drug discovery and harnessing that genetic data information.

They use NVIDIA Clara Parabricks to generate the world's largest whole (inaudible) database of 200,000 whole (inaudible), and they were able to compute that in just under a week. Regeneron Genomics Center is one of the most highest throughput genomic centers in the country, and they really saw the accuracy gains of using deep variants in terms of the single nucleotide accuracy as well as the speed and scale that NVIDIA Clara can bring to them.

Structura Biotechnology, their platform is instrumental in cryo-electron microscopy and using AI-driven 3D reconstruction to build 3D protein structures. In fact, the team who started this company was the first to build the 3 structure of the COVID-19 spike protein. And because of the speed and artificial intelligence, they were able to do that in 12 days, something that just a few months ago would have taken a few months to do.

When we're in a race against time, which, of course, the coronavirus has created that, what artificial intelligence and accelerated computing can do is create a time machine.

Relay Therapeutics has used NVIDIA's GPU data science platform to really be able to interactively explore the chemical space to be able to look at millions of compounds in an interactive manner such that they can make better decisions into the rest of the compound discovery and lead optimization hit to lead process.

And it's just an amazing accomplishment to say something that would have taken hours or days and turning that into seconds, which really transforms the way that we are going to work, and it allows us to open our aperture where we have 10 of the 60 chemical (inaudible). Continuing to open our aperture is going to allow us to feed more and more drug discovery.

Adam Weiss [ph], another leading start-up company, has invented Adam Net [ph]. And Adam Net is able to screen 16 [ph] million compounds in under two days. So this ability to then take and open the aperture and understand what drugs we should be docking and then sampling all of those into this massive screening so that we can better -- lead to better outcomes of what we're going to feed into, again, the next phase of the drug discovery process.

Vyasa [ph] leveraging NVIDIA's biomedical NLP [ph] so that we can help synthesize all of the incoming COVID-19 data. There's dozens of papers being written every day, and systems like theirs that can leverage both the literature and the real-world data that's coming in to help us have a better understanding for both vaccine and therapy discovery.

Schrodinger [ph] has been pioneering the spaces of simulation, one area of binding free energy with their FEP calculations being at the cornerstone of what they do for, increasing and doing better lead optimization.

And over the years, introducing AI into the platform and increasing FEP into absolute calculations, they're able to really transform not only the amount of throughput of the system, but also the accuracy and success rates of simulation.

And then Recursion [ph], another leading-edge company here who really understand -- sees how being target agnostic is also another approach to drug discovery, where being able to build the world's largest now digitizing biology, building the world's largest human cell imaging data sets and putting to the power both automation to build those data sets and then machine learning to extract features out of the data sets of high (inaudible) screening and being able to really reimagine the drug discovery process through digitization of biology. So these are just a few examples of just incredible breakthroughs by the world's innovators and AI-driven drug discovery.

We know that drug discovery and the amount of computing and the complexity of the computing also needs its own and new instruments. NVIDIA has recognized that the U.K. is one of the most innovative and, really, a melting pot for AI and healthcare innovation in the world that we have decided to build the computational instrument for AI healthcare called Cambridge 1 [ph] and AI supercomputer in the U.K. The U.K. is known for discovering the structure of DNA.

I mean, they are pioneering in so many forms of healthcare, one of the world's largest healthcare systems, home to some of the most important pharmaceutical companies in the world and even amazing technology companies like Oxford

Nanopore who are reimagining genomics in incredible ways. And we're building the supercomputer so that we can partner with these industry pioneers on very large-scale AI research.

Artificial intelligence requires this new computational instrument. This computational instrument is built with NVIDIA's DGX superpod. It's essentially a data center as a product. And this supercomputer will be the U.K.'s fastest AI supercomputer and the world's top 5 green supercomputers. It'll have over 80 nodes inside with 400 petaflops of AI compute.

We've selected the site. The system is being built. We're delighted that it's being powered by 100% renewable energy. And we'll invite you to our GPU technology conference in April to hear about some of the initial work with these fantastic partners that we're going to do on it.

This resource is going to serve as a hub so that we can do large-scale research with the industry, but that we can also collaborate with universities and start-ups in the U.K. and educate the future AI practitioners in the healthcare domain. So very excited about this. It's the world's largest AI supercomputer, dedicated to healthcare, and it's in a perfect location in the U.K. to do so.

It was another -- it was a record year for AI healthcare start-ups in 2020. Not only did Q3 break every other previous quarter in terms of funding over $2 billion in a single quarter and is expected to be well over $5 billion in total funding as opposed to the $4.2 billion in 2019. Just a tremendous year. And it also fuels the NVIDIA inception program where we connect with every AI start-up as a virtual accelerated program NVIDIA inception.

We provide them training, early access, technical integration into industry platforms as well as introducing them to our industrial collaborators. We've increased fourfold in just a few short years, and we broke through 1,000 and ended the year at 1,095 AI start-ups in our start-up program.

And these companies are coming from all areas of healthcare. And you can imagine, digital health is an incredibly important sector now that we are in a pandemic where virtual healthcare needs -- and synthesizing all of this incredible data is important. So the funding in that domain incredible.

Imaging and instruments so that we can create new instruments that have never been thought of before through artificial intelligence. Caption Health is the first AI-guided ultrasound that can be used by a nontrained professional to perform a cardiac exam. FDA approved. So critical, actually, on the front lines of COVID-19 where a nurse is treating a COVID patient can now also administer a cardiology exam because we know that this virus affects the cardiac behavior.

And so being able to capture that as a front-line worker instead of having to move the patient around or have it being done by another healthcare professional, just

incredible, and dozens of industry first just got AI. The first application to be reimbursed by CMS. So, so many dozens of industry first. This is just an incredible breakthrough year.

And the practice of medicine and AI in the practice of medicine is what is the future. Healthcare spending is reaching an all-time high. We continue to have aging population and growing population, chronic disease management, and we haven't even gotten to prevention yet. But there is such a great, bright future, and you can see that.

Look at the AI papers submitted to PubMed in 2020. This is an exponential growth. And it's all areas of medicine. And what we need to remember about artificial intelligence, like the practice of medicine, is it's constantly learning. Like the practice of medicine, we want to learn from the patient before even.

The doctor -- we want to learn from the data. We want to learn from the changing environment. And so that means that in a continuous learning environment and computation, we need to become software-defined, and that's what NVIDIA platform provides to this industry so that we can continuously learn and deploy these AI skills into the domains that need them.

So there's a software-defined AI instrument revolution going on right now. As you know, so much of the way that we work in the practice of medicine is driven by instruments. And we're seeing new instruments we couldn't even have dreamed of just a couple of years ago, whether it be smart cameras for monitoring patients and vital signs or handheld genomic sequencers or a portable MRI device or an AI-guided ultrasound.

And these NVIDIA computing platforms allow for -- an artificial intelligence allow for these instruments to not only one being innovated in the first place and secondarily to be constantly learning and improving over time.

And such a great example of that is we're announcing today with Oxford Nanopore technologies they've adopted NVIDIA DGX for their ultra-high throughput per (inaudible) instrument. This is truly a breakthrough device as is all of their other instruments.

This one in particular, coupling up with our supercomputer, the AI supercomputer DGX station, it's a real-time sequencing instrument, and it's all AI driven. If you look at the chart, the first leap they had in performance came from adopting deep learning in the first place.

And then through models and training -- different architectures and training, they were able to achieve some incredible breakthroughs. So not only is it high throughput at 10 terabasis and can do 100 human genomes per run.

But through deep learning, they're base calling, Bonito [ph] is able to reach an overall accuracy of 98.3%. And AI-driven single nucleotide variant calling gets them to 99.9% accuracy.

And here's a technology and instrument that truly touches on the entire practice of medicine. Whether it be the COVID epidemiology applications for COVID-19 testing that they have recently had a breakthrough on, they were always used for the viral sequencing so we can understand the mutation and the spread of coronavirus but also in human genetics. And long-range sequencing is going to be so incredibly important -- is already so incredibly important in cancer research.

So in summary today, we believe AI and computing is enabling the AI healthcare era. We are excited about Cambridge 1 in partnering with the world leaders, not only in the U.K., but also the NVIDIA ecosystem of innovators in AI drug discovery.

Our NVIDIA Clara platform has expanded far beyond imaging and instruments into genomics, natural language processing, patient monitoring and drug discovery. Our start-up program is vibrant as ever. And we're so proud and excited to be working with Nanopore on this next -- this third generation of sequencing of long read sequencing.

So with that, Harlan, I'll turn it back to you, and we can take some questions.

Questions And Answers

A - Harlan Sur {BIO 6539622 <GO>}

Great. That was a great presentation. Thanks, Kimberly. So I'll start it off with the first few questions and those -- for those investors on the digital conference website, please input your questions via the Ask A Question portal, and I'll get them in real time.

So first question, the NVIDIA team rolled out its next-generation compute acceleration platform in the middle of last year, the A100 platform. It's based on the Ampere architecture, leading-edge 7-nanometer silicon technology, been adopted by all of the top cloud and hyperscale titans in many of the high-performance computing initiatives, as you mentioned, the Cambridge 1 [ph] platform.

Last quarter, enterprise and end market verticals like healthcare represented more than 50% of the team's data center business. So maybe can you just give us a snapshot of your healthcare franchise?

How large is your healthcare franchise relative to the size of your overall data center segment? How many professional support the healthcare segment? And how fast has the business been growing over the past few years?

A - Kimberly Powell {BIO 22145194 <GO>}

Yes. Sure. Let me talk to you about it, Harlan. So number one, Ampere is absolutely the most incredible technology NVIDIA has ever brought to market. And it has brought us tremendous growth. It's an architecture that is a universal GPU. It serves all the computational domains that are needed.

Especially if you think about drug discovery, you need accelerated computing. You need artificial intelligence. You need data science. You need computer visualization. NVIDIA is world-class at those, and Ampere brings all of those, and we're world-class at it. So the growth at Ampere has been tremendous.

We don't break out our individual industry sizes. Hopefully, you can see from what I just shared that there is just a tremendous amount of effort growing in healthcare. Everything we've done for the last 10 years has really been in service to help, one, respond to the pandemic, but two, to imagine now a brand-new AI computer-driven drug discovery process.

As I said, understanding disease is the first thing we have to do and then discovering the therapy. These are the greatest endeavors of our time. And where they're -- as I said, there are not -- there are no equations to describe biology, but we're able to now digitize more and more biology, bringing that data together through computing platforms. This is going to be huge growth.

And as I've heard articulated, the bar for the minimum amount of compute needed in these discovery organizations, it doubled overnight because of these AI breakthroughs. And this tremendous focus on AI on a singular problem in 2020 like COVID-19, it really just showed us that with that tremendous focus, we could see every piece and parts that can benefit from artificial intelligence.

And what we've discovered over the last 12 months is only going to propel us further in the future. Everything we learn is applicable for every future drug discovery program there is. So the future is tremendously bright. Ampere is our most impressive architecture yet.

And now it's ubiquitous. And so we're fortunate that it's so ubiquitous that any researcher can get their hands on it, and we continue to enhance our software platforms to really recruit and hopefully delight more and more software developers, especially in the domain of healthcare.

A - Harlan Sur {BIO 6539622 <GO>}

And then from a product level perspective, beyond the DGX system and the NVIDIA-based high-performance compute cluster, like the Cambridge 1 [ph], for example, your team also leverages its entire portfolio like the Jetson [ph] platform for medical instrumentation, your EGX platforms for edge computing, describe how your team leverages this portfolio to increase your share of your customers wallet over time and maybe give us a few examples if you have them.

A - Kimberly Powell {BIO 22145194 <GO>}

Yes. Absolutely, I can. And I think, Harlan, you kind of just touched on it. Because we build on the shoulder of the giant core of NVIDIA, where we can -- that is our mission statement at NVIDIA to take the state of the art and bring it to the domain, we get to leverage everything that our company is well class at. Everything we learn in self-driving cars and robotics, we can now apply that into the healthcare industry.

And so the other fortunate position that NVIDIA has built ourselves into being an we have one architecture. We have one singular architecture that you can build your application once and you can deploy it wherever your business model feels it should be deployed.

If you would like to embed the GPU into your medical instruments and sell it that way, you can do that. If you would like to decouple compute and have your instrument at more like a sensor and augment it with the computer, we have edge computing for that. We have -- all of our platforms are available in the cloud.

So what this allows our customers to do is really take advantage of their software development in a way that they can scale it to fleets of or market segments that have completely different business models.

And you can reach different marketplaces. You can reach different economical -- the way people want to buy and consume CapEx, OpEx, you -- the business model in our completely change.

Software-defined, just like we've seen in the automotive industry, the Tesla model, if you will, right, where it continues to retain its value and get better over time, absolutely, every medical instrument should be this way. So we get to leverage our (inaudible).

Actually, Oxford Nanopore, which I just ended on, is a perfect example of a customer that has been able to leverage and innovate across different price sectors in their product. They have a handheld sequencer that cost $1,000 and requires no additional infrastructure.

This sequencer can go into the fire fields and jungles and faraway places that otherwise would never have genomic sequencing accessible to it. And that's because artificial intelligence algorithms allow them to shrink the compute and able to still deliver what's needed for information out of those sequencers.

And the same application can go into a desktop into the very ultra-high end and high throughput device that we just talked about. So they're a perfect example of how we can see that. You can innovate. You can -- you penetrate in the market. You can access new customer bases altogether by leveraging a single architecture and compute platform like NVIDIA.

A - Harlan Sur {BIO 6539622 <GO>}

Great. Well we're just about out of time, Kimberly. I want to thank you for the -- we could -- I could go on and on with you about healthcare. It's such a fascinating part of NVIDIA. But I want to thank you for the insights today. Thanks to you and the rest of the NVIDIA team for your critical efforts in the healthcare sector. We hope to have you back next year.

A - Kimberly Powell {BIO 22145194 <GO>}

Harlan, I appreciate it as always. Thank you, so much for having me.

A - Harlan Sur {BIO 6539622 <GO>}

Thank you.