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Hi everyone, welcome to another episode of For Your Innovation by Arc Invest, a podcast on all things related to disruptive technologies. I'm Andrew Kim, research associate covering consumer internet and fintech, and I'm joined by Nick Gruess, associate portfolio manager. Today we have the great privilege of speaking with Daniel Sturman, CTO of Roblox. Hi Daniel, thanks so much for your time today.
My pleasure to be here.
We love it. If you can just tell us a little bit more about yourself or our listeners and let us know how you ended up where you are today.
Great. Yeah, so as you mentioned, I'm the CTO at Roblox. That means I oversee the technical team here in the company. That's about 1,500 folks, so the majority and majority of Roblox are technical contributors. I've come here through a non-typical path. I never worked in 3D graphics or animation before. My background has all been systems. I worked for a range of systems and scale out companies before Roblox. I was a company called Cloud Era, which did big data software. I spent about eight years at Google, about a decade at IBM before that. Great. Daniel, we're very curious about the Roblox platform. Could you give us a brief background on what Roblox is, how it's positioned in the gaming space, and then we're going to dive very deep on the technical side with you, especially in AI. We'd love to just get your kind of overview on Roblox, the platform, where it is today, and then we'll go further.
Sounds good. Roblox, we keep it in term platform, and that's really important. It is a platform. At Roblox, we try very hard not to create any of our own content. The John idea behind Roblox, it was one of bringing 3D simulation to people and letting them create whatever they wanted out of that. We, for example, will provide all the engine and physics rules that you need. We provide the backend cloud, we provide things like translation, but our creators come and they create the content. We have millions of creators on the platform, and over 60 million daily active users come and consume that data or that content. The two tend to go back and forth. We're seeing more and more that people are passionate about using the platform, become creators. Actually, as the platform is evolving, we're lowering the barriers to creation. The line between a user and a creator is becoming increasingly thin. It's a platform. It runs on as many devices as we possibly can. Today, that is iPhone, Android, Mac, Windows, Xbox, but we're always looking at more so that you can consume this content wherever you are at, and it doesn't have to be one place or another. We just announced our bid on MetaQuest, for example, as another format. It's really about universal consumability. We're worldwide. We have people in most countries around the globe, and a growing audience across the globe. The majority of our traffic is international at this

point. That's what Roblox is a nutshell. What do people build? Yes, there are games, but there are music concerts. There are shopping experiences and fashion experiences. There are brand experiences
with large brands coming and building experiences on Roblox so that their fans can come and engage
in a 3D immersive way with their content. There's a really exploding set of ways people are using this technology and what they're doing with it. Thank you for that great overview of Roblox.
I guess just diving a little bit deeper into generative AI, because that seems to be all the buzz, and Roblox is in the spotlight of all that buzz. In your presentation at Morgan Stanley in June, I believe, you showed a demo in which a developer was able to generate and manipulate 3D assets using a voice-powered AI assistant. We were blown away by this, how context-aware this AI system was, and how generally helpful it was. I was just wondering if you can maybe talk about the model training process that allowed the AI assistant to be so context-aware and helpful, and what challenges you faced in the fine-tuning process, and what challenges
remain for the AI products that are live today, namely the material generator and code assistant?
Yeah, so let's unpack that a bit. First, the demo we showed, as I stated in that presentation, was very, very early. That was not a system we built per se by training data. We basically was all built using prompt engineering to connect a reasonably good AI up to what was possible in studio, and using a lot of our existing studio features, like semantic search and so on, that allowed that to just run very well. But as you kind of see from some of the lives in there, that was not trained end-to-end. That's our next step on that. We're working on a much more Roblox specific version with kind of properly sized and domain-specific AIs behind everything we're doing there. So that still has a ways to go, but we're excited about that, and I thought the prototype illustrated the promise of doing something like that, and it's just going to get better as we better understand the capabilities of the platform and tie those pieces together. You would also, I think, ask just changing gears a bit about our existing products with General AI, Material Generator, and Code Assist. Those are going quite well. We're seeing a lot of uptake on the uses. We're seeing some really incredible things, like with Code Assist. It's cutting keystrokes by creators using about like 35%, so it's really helping them code faster.
With Material Generation, we've seen uptick of additional 50% of folks who are using PBR materials, which is what that is around, creating these really rich, physically-based rendering materials on the platform. We're starting to see evidence that it's democratizing these sorts of things, like PBR materials before were at the limit of someone with pretty strong technical graphics type skills, and now I can create a PBR material. I absolutely don't have those skills at all, right? So I think that's going quite well. Similarly with coding, the stronger that platform gets, the easier it will be for someone to make an entree into scripting on the platform, and we there's a lot of problems on that. I want to take a step back here and just ask you your general thoughts on AI in gaming. What will it mean to the space? And then specifically on the Roblox platform, what do you think this does for content creators? Because Roblox has, as you mentioned before, extended beyond gaming. So I'm very curious, when you look at this space overall, what is AI going to do to content creation in the digital world and in gaming and on Roblox?
Right. So step back, I'm always looking at this from what does general AI need for the creation space? Because I think gaming is a little bit different. It's very similar, but it's a little

bit more narrow and also tends to traditionally be built by full-time people doing full-time things around kind of a marketing effort, right, which is a game. On Roblox, since we're allowing anyone to come and create, it's a little bit different. You have a very wide range of skill sets. And I think general AI is extremely helpful on both helping people who don't bring the same amount of technical skill to the platform, but also helping them grow those technical skills as they, if you build these products right, they kind of teach as they go, right? And I think that's extremely powerful. You look at the breadth of experiences on Roblox and we do have some full-time studios that look like game studios that are building on the platform. But we also have things like advertising teams who want to build a brand experience coming into the platform. And they're looking for ways to make this much more accessible. They can contract with someone today, usually an independent contractor, but just the ability to speed and iterate and move that sort of process closer to the person with the creative idea is extremely important. And I expect like long-term, you look at some of the things with music, there's no reason why every new hit shouldn't have kind of a 3D immersive equivalent of a music video, right, on the platform. And that sort of creations just can become more frequent, more common. And the ability to quickly build worlds out to start to describe behavior you should want, avatars to have or the world to have and so on is all absolutely within the domain of generative AI. You can see it from the existing launch that we made, just kind of like the proof points. And so I think it's just going to allow all this to explode. It's all heading in a direction for us that, like I said, blurring this line between user and creator. And generative AI enables a much more casual creation experience versus kind of a formal, I'm sitting down and I'm creating now, but it can be intertwined with the use of an experience, whether you are as simple as maybe you're in a music experience and you create a new dance on the spot, right? And we already have a version of that in studio. There's no reason that couldn't roll into general roadblocks as a whole. I just think the potential is unlimited start to blur that line. It's amazing. I think it's clear from the metrics you shared regarding material generator and code assist that these teams are getting a lot more productive, right? Can you share, like maybe from a time saved perspective, how much on teams you think are saving on average? And also how our teams themselves evolving, right? As like the barriers to entry for certain functions are kind of declining, are artists becoming engineers and engineers becoming artists. Yeah, so I think it's still very early days. Folks are still playing, we're all doing this. We're all playing around with these tools and trying to figure out how they fit into our workflow, while also working through some careful considerations about what data might give you access to and so on, right? And that's something roadblocks has been very thoughtful on. We put a lot of focus and attention to our creator community. So for example, all this training data on roadblocks is all opted as an example. We're not taking stuff that we assume we have the rights to or anything like that. We're just making sure creators are giving us their data. As for productivity, I think since people are still learning, we don't have the final word on that at all. I do see that there's supposed to be more of a blur. It's not that artists becoming engineers or engineering becoming artists, but you don't necessarily have to stop as soon. You can kind of go further with your own ideas in either domain and not have to wait on finding a team member or a partner to start to create these. So I think you'll see even individual creators can go a lot further on the platform with this sort of technology. And then even once they're in larger teams, prototyping and blurning of roles may happen.

The ability to give a concept of what you're looking for will probably get far better. And then I think for in any given domain, whether you're an engineer or an artist, you'll be able to do your craft faster. Like I mentioned, with 35% pure keystrokes for folks using our coding assist, you're going to see the same on the outside. People just be able to do their job better and faster. Got it. And you're primarily kind of working with open source models today, right? Can you talk about the puts and takes that roadblocks had to address when considering open source versus like commercial APIs? Yeah. So something we're very focused on is we always say roadblocks, we ought to take the long view. And where do we need to go with this? Well, it's one thing just to use existing models, but we have some very unique data that we think is going to be essential to realize the full power of this. So for example, we have a very large number of 3D models, right? 3D models that actually have actual behavior in the system. So imagine we don't just have images of cars or even 3D meshes of cars. We have cars with turning wheels and steering wheels and scripts around that can break and so on. We have doors and windows and, you know, fence gates that open. We have then more static things like trees, but all these things, they're much more complex than just here's a bunch of meshes, here's a bunch of creative pieces, and then someone else comes around and scripts it. So we want to start looking at what does it take to build real 3D objects? Well, that's not something commercial models necessarily going to go towards. I mean, we have a very unique
need here. So our bias has always been towards the open source and advancing the open source ecosystem. So for example, there's the star coder model, which you can find on Hugging Face. It's generally somewhere in the leaderboard on LLMs. That's something Roblox was very involved in building thanks to a collaboration with Arjun Guha, who's a Roblox researcher and a visiting professor from Northeastern University. So we're actively engaged not just in using these models, but in contributing back to them and making them stronger. And we're looking actively at then how we take them, make them stronger and apply some of our unique datasets. Got it. And maybe we can just dive a little deeper into what it means to train 3D asset generation models. Because as you've mentioned, it needs to be context-aware, it needs to be dynamic, segmented. A car needs to move in a certain way. If I wanted wheels on a rubber duck, then I would want those wheels to turn as well. I'm just wondering if you can explain to a lay person what that model training process would entail. Yeah. So first of all, I have to say that that is kind of a grand challenge. Like I don't think anyone knows how to do it. We work very closely with the top academics. And this is an open problem, as they say. I think there's a few steps. The first is just getting us to much better 3D generation, either from a prompt or a 2D image. And this is something we're working closely on. A lot of folks are working on it. No one has really solved this well. We have some early prototypes, for example, in how we do avatar generation from prompt or photo to avatar. And they're really rough. I'll be honest, where we are today, I expect in six months these will look a lot better. But that's the simple act of just creating what looks like a good 3D mesh. From there, we also have an effort on how do we take a 3D mesh of an avatar and turn it into a moving, living, breathing avatar. We want things like arm movement. We want in general, realistic movement of body parts. We want now facial movement, which is now live on the platform, where it lip syncs along with you, your eyebrows can move, and your head can move, and so on. So all that has to be built out. We're starting with something, what I'll call simple, like avatars.

Not that avatars are simple, but they tend to fall into a particular domain, a typical class, typical sort of thing. They tend to be bipedal and have heads and things like this.
So it's a little bit easier to train the models. But overall, what we expect to do, and I think we've seen this with where these large models have gone, you can over time apply techniques where you just the large volume of capabilities as you learn to describe them. The hard thing is being able to describe to the model all the capabilities that you want it to have. And that's something we're just going to keep pushing on. And we think that the path has been shown more generally around language, but we have to extend that into things around, I mentioned 3D generation, but another big one is we capture kind of real time avatar human behavior
on the platform every single month. So how do we kind of, I think it's like five billion hours of avatar activity every month. How do we capture that? How do you encode that? How do you put informant that's efficient? And then how do you start training a model around all that so you could build a really great, either MPC simulator or maybe your doppelganger for when you want to be in the experience, but you can't be in the experience or something like that. So all these sorts of things, I think the big challenge will be how do you translate these new data types into something a model can interpret? How do you score results? What is a good result? What's a bad result? And then the size, the advantage of using size on these things has been very, very clear. And that's something we will be very focused on. Got it. Would you say that, I mean, I think the breadth and volume of data that Roblox has is like immense by no question, right? But would you consider like this setup of the model and like the training process to be a bigger challenge? Or would you consider like the data cleaning and collection process to figure out what is trainable in the first place? Would that be a bigger challenge?
Yeah, I think there's always a challenge around making sure your data is clean. But I think that's one that's relatively well understood. Like there's not a, I don't think we need a scientific breakthrough to make that happen. For me, it's more, the biggest challenge we see is how do you just set these things up to understand the sort of data and be able to do smart things with it? I think there will be, for some of these use cases, have to be novel architectures or use of existing architectures, for example. We've seen, you know, with a lot of the alum work, a lot of it has been around the training technique, which is kind of key. But also, you know, all this kind of started with transformers and BERT models, which were almost incredible in their simplicity, but scaled really, really well. And then just to be made, that's what allowed us to make these really big. There may be an equivalent of that for the 3D space. Like it's not clear one way or another to me whether this tech gets us there, or we have to do something special. I definitely think the way like encoding decoding happens in these models will have to be very something new, because I don't think we're yet seeing that work as well as we'd like.
Could you elaborate on that front? What do you mean?
Yeah, it's just like these models aren't today built to understand 3D data. Like take diffusion models, they've all pretty much focused into 2D creation, prompt to 2D. We've seen that work really, really well. But it's what we do know is you can't just take that naively, apply that to 3D imagery and get what you want, right? So something's going to have to change there. It has to be some sort of breakthrough. Part of it may be the training set, which we have, but even based on our experience with that so far, that's not sufficient. There's going to be,

need to be more breakthroughs if you want these to run both well and efficiently. And efficient is important. At the scale we're operating at, if we want everyone to be able to create, let's say, a custom avatar from a photo and a text prompt, that's got to be something that's computationally reasonable. Or you can just forget about the compute needs, like the lag time to get in line to get your avatar will just be too long, right? So we need to make this run really efficiently, really scaleably, so that everyone can be whoever they want to be on the platform. And that's just avatars. Then think of all the other creation you want to get into. Yeah, I want to build a custom house. What tools can be available to help you build a custom house? We have a lot of houses on the platform. We can do a lot of training there. It can learn a lot about that. But again, we got to develop what is a reputation for these sorts of objects? What are the key things the model's got to learn on? You can easily see a result where you get house-like things with no doors or windows, for example. That'd be very, very easy to have happen, right? So I think it's presenting, structuring the models so that you know what it means to consume and then score the results of all these experiments. Do you imagine that as you continue to roll out new AI features and content creation accelerates, that you'll have to then fight AI with AI from a moderation standpoint? Because, you know, Robox is an open platform everyone can create, but there are some things you obviously don't want shown to certain people on the platform or just not built specifically. So how do you manage the other side of this equation, which is the moderation?
I think that's a great question. So I mentioned two key datasets that were focused on 3D generation and kind of, you know, avatar behavior. The third big one, though, that we really have an extensive dataset on is safety data. Understand what's acceptable, not acceptable for different age categories of behavior. We get that both through things our own moderators have done, through comments and views reports from our community continually. And so that dataset is just getting richer and richer for us. It's one of the best datasets we have in the company. So what does that mean for the future of generated AI? Well, it means a few things. One, it means, and I'm going to move away from generative here and just talk about like large models because on the safety side, you're not really generating, you're evaluating, right? And if you think about the root for these large language models, it was all around natural language processing tasks. A lot of safety tasks look like that in some way, shape or form, where you're trying to understand the context or the content. For example, what is bullying is not something you can get through just understanding word patterns, simple word patterns, right? Like bullying is very contextual, as an example. And most, it turns out, you know, outside of just like poor language, most non-civil human behavior tends to be very, very contextual. And I think there's a place where these models have already started to show for us some incredible improvements. In fact, we'll be launching soon our first real-time voice moderation system. So we launched voice a number of quarters ago, but we kept it very small. And it was based on, safety was based on age of participants and kind of responsive moderation to abuse reports. In order to expand that, we need this to be automated. We need it to be real-time. So we have built a model that is starting to do a great job of understanding when using inappropriate language, when you're bullying, when you're making racist comments. There's a bunch of categories that it can feel directly into. And it can also give a user real-time feedback. We've seen with voice, for example, that people will, you know, kind of, you'll devolve to the lowest level. So if one person's behaving badly and encourages others to behave badly, you give them a little nudge. We've started

to see, oh, wait, yeah, oh, someone just called me on that behavior. And we don't even have to get to the extreme of like real moderation actions and so on. Eventually, this model will turn into that. Well, can if someone persists in bad behavior, will have high enough confidence that it can take action, turn your voice off, for example, or flag them in your country band or something like that. But I don't think we're going to get there. So it's one example of using as large language models, like to make the platform safer. In terms of AI driven generation, the other thing you can do is you can train safety directly into the models you're building. You can work to make sure things that you consider not appropriate just don't show up in the creation. So in a sense, these are an advantage over, let's say, former, much more manual generic tools where that's kind of almost impossible. You have to put it through a separate moderation step. With these sorts of generic tools, we can kind of make civil behavior in generation all in one because it comes down to how you train the model and how you build the model and what you're looking for as behavior. So I think there's a huge opportunity there as well to just make the platform more civil. And to do it, by the way, in a way that is age appropriate, like as I believe you're aware, we recently launched experience guidelines. You know, that was for 13 plus was the initial we're looking at 17 plus, which we've announced. And in doing those, these models, those general things will behave differently. There's different standards for those. And I expect long term, there'll be different standards around the globe. Right. I like to think of the dilemma of the beer can. Where is that appropriate? Well, it depends on age in a lot of places. But standards in the United States and Europe are going to be different. And standards between US and Europe and another part of the world might be very different
on how that's perceived. We need to understand all of that and take that account. I think these large models give us a great opportunity to really dial that in without a lot of human intervention. So it sounds like you can get much more granular with how you address moderation without incurring
too much overhead and costs because you're unable, you know, in essence, you're unable to embed a lot of this into the content generation, which is exactly right. Yeah, that's, that's really interesting. Maybe just on just taking a little higher level, how do you think generative AI will impact kind of just the Roblox platform generally, right? As in, do you expect more experiences? And do you expect like higher quality experiences on average? And like, how do those two kind of factors battle each other out, right? Because the higher quality experiences kind of have to get through the noise of more experiences on average, right?
That's also a great question. I expect both. I expect we lower the bar when it takes to create and forever will make it easier to create a more immersive experience, right? So you'll get both of those things. Going back to the demo that I showed with Morgan Stanley, you'd start to see how you don't need to know the catalog. The AI can go find stuff for you and can find the right thing, it can ask for your preferences, right? And you can start to just build something out very, very quickly with that. How do we differentiate the great experiences from the not so great experiences? Well, we've been investing for years on how we do recommendation or recommendation
system, our discovery system. I mentioned we have deployed semantic search which makes search across the platform much realer, much more accurate based on what you're trying to find.
But the same goes for our discovery systems where over time, I expect we'll be taking these millions

and millions of experiences and being able to understand each of us individually. Dan will get a different set of recommendations than Andrew, than Nick. We're just going to get different things based on what we've shown we'd like to do in these experiences. We're already starting to see the dividends from that. Our growth into 17 and up, you may not be aware, but that's our largest growing category at this point. And collectively 17 and 24 is our collectively largest age group at this point on the platform. I'd say if there was one thing that drove that, there's been many, many things, but the most important is differentiation on recommendations, helping people find the content on the platform that excites them. And I think we just have to keep going with that. And I'm very, very optimistic of the technology being there to help us understand very early that this experience has a spark and we need to promote it up for a certain class of person on the platform. Yeah, speaking of 17 plus experiences, I got to tinker around with, I think it's like a bar experience, where you're drinking liquor. I found it incredible to see other people purchase virtual alcohol within the experience. And it's really admirable how Roblox has really pioneered putting value into these digital assets and just encouraging users to purchase virtual goods as a form of self-expression. And one could imagine that it's going to get easier to create such goods with generative AI, both on a developer standpoint, but also for consumers. So I'm just wondering if you can maybe daydream with us on how you envision consumers interacting directly with generative AI on Roblox in the future.
Sure. If you don't mind, I want to just back up on a few things you said there. First, yeah, you were at Top Room, 17 plus experience. And one thing I'll call it's unique on Roblox, in order to be 17 plus there, you had to show ID, right? So one thing we're starting with, again, is safety and stability. You're not going to have someone under 17 casually walking in that experience because they found it on the platform, right? They have to have the government ID to get in. And we're being just really, really careful with all of that. And then, yeah, you end up in this Top Room experience, which is really just, if you look at what it really is at its core, it's a hangout for people who are over 17, who want to be with people who are over 17, who don't want to be with, it's a little bit of an adult swim sort of experience, right? Like, it's really just a space for people who are older on the platform to hang out. Then you can see the potential. If you walk around, they have a stage set up, right? You could imagine there being real-time gigs of various sorts on the platform with that, right? Or maybe pre-recorded gigs or whatever it is, but things that kind of fit into that whole genre of adults hanging out with adults, right?
So that's, I mean, even before we get to, like, what it means to be creating objects on the platform or, you know, consumer goods, I want to call out the opportunity with 17 Plus that it can be both incredibly safe for the folks who are not and then kind of give an outlet to people who are older. So now let's talk about consumer goods. I think we've already started to see an explosion there. I'm not sure if you checked out the band's experience, but the sort of immersion you can have with a product or a product line is unlike anything else. You're sitting there and you're playing with it. This is so much better than a webpage. You're sitting there, you're trying out a skateboard kind of, right? You're seeing how you look in a particular set of clothing. We've had incredible luck with Vans, with Gucci, throughout Floran. Like, these brands are all on the platform and they're just growing. We have more and more of them every day. It's an incredible way to connect in both directions. It's not an ad being forced upon you. It's a thing you're electing to go do and engage with because you're passionate about the products, right? In the same way,

kind
of, we all like for certain categories of things, we all have the stories we like to go in and just browse. We're not going into buy right now necessarily. We just want to check out what's hot, what's going on, what do I want to learn about. It's an educational experience to some degree. I could see then taking that into the general world where maybe ideas for customization. Let's say it's a handbag or a shirt or any other sort of clothing item, the ability to tweak it real time and get an idea what that might look like. You add to the fact that you're building your own avatar to go with that. So maybe when you're doing fashion, you want an avatar that looks incredibly like yourself. As opposed to another experience, you might want something that's a little bit more, you want to be someone else. You want to escape a little bit. That all becomes quite possible. That sort of flexibility on the platform. So I think the limits here, there are no limits here. It's limitless on where this could go. And we're starting to experiment with this, engaging more with brands. We have portal ads on the platform, which are completely new things, but complement these sorts of things very well. 17 plus experiences or age experience guidelines in general. So you can really tailor who you're talking to and who you're connecting with at a given time. And again, bringing that all back to keeping things civil, keeping things safe based on your age category and the country you're living in what's appropriate. I wanted to ask one question. Just playing all of this out, hearing all of this content creation acceleration, you had mentioned before the meta quest beta. And when you start to couple the environments and experiences that are available on Roblox with virtual reality, that's starting to get into the ready player one metaverse, fully immersed, buying digital assets that also may be tied to the real world. Is that kind of the end state here? Or do you still think that it's important to be content or platform agnostic? You mentioned all of the other platforms you're on. Or is it the VR is kind of the end goal? And you couple that with generative AI. I mean, it really starts to begin to take on a life of its own. And like, I just immediately go into the ready player one movie. And I'm like, that's, that's where all of this is headed in five years. And Roblox seems like they're leading the way on both the AI front and just being in all or on all of the platforms you'd want to be on. Yeah, so I think VR is a really interesting format for consuming 3D virtual worlds. But I think what we've seen is it's by far not the only way people most of the time want to consume content whenever they have the time in the place to do it. So I think VR is incredibly compelling way to consume 3D immersive content. But we're also seeing that there's just a strong driver for people to be able to consume content wherever and whenever they have the time, the energy, the inclination to do so. We've seen things can be incredibly compelling immersive on a phone. And we see that just by how many folks engage in Roblox with a phone. And then what's also cool is they can when they have the time take their VR headset and such as your headset you generally need a room. Like I don't know about you guys, but if the dog walks into the room when I'm using VR that doesn't go well, right? Like I could end up tripping over the dog.
You know, so you need that space, but it's just so immersive. It can be a huge amount of fun in a different way. And the great thing is Nick could be on with VR and I could be on my phone and we can be interacting in the same experience in our own ways as the way that's appropriate for us. So at least for now, I think that choice is going to be very, very important. And I think we'll see how people engage with VR and there's clearly a lot you can do with that. And I think we all believe AR is coming in some form and we have to see what that means. But at the same time, I

think
people are going to get a lot of pleasure out of the device you have in your back pocket, pulling it out and using it whenever you like, right? And be able to engage with some of this, you know, maybe you're thinking of going shopping, you want to engage with some of these brands before you go shopping, you're not at home with your VR headset, you just have your phone and that's how you're going to do it, right? So I think it kind of goes both ways. And
I think the future is bright in terms of new formats and new hardware platforms that are available. And I feel we're set up very well from a technical point of view to manage all the different platforms. I think just adding on to VR, I think voice and like a 3D spatial voice is kind of the dominant form of communication on Roblox today. I was just wondering how that kind of extends, does it extend just well to VR and how you would adjust for like private communications in VR versus, you know, a blast and how you're just thinking about
socialization overall within VR. So this is really interesting from just even a technical point of view. We're focused on all sound and Roblox at its root being spatial. So that means I'm closer to I hear you really well, I can even whisper in your ear, you can back up and you don't hear it as well or you don't hear it at all. And that of course translates very well into VR, but also just translate to anything where you're trying to do 3D. There will be things like, you know, group chats and so on, but we're in a sense going to mimic those through virtual headpieces and cell phones and so on where, you know, you're just like we are here, we can all each other clearly even though we're not near each other, right? And that's the way we're going to kind of build up the fundamentals in Roblox for not just voice, but all sound, it can be music, right? So imagine in a nightclub, there'll be loud parts, you can back away and go talk to someone, it'll be easier to hear. And we're very excited about that future from a from a sound point of view. I think it then you get into private communication, there's a few ways we're going to do that. I think for starts, just to get this right, private communication will be a more explicit flag. It won't be that you're accidentally in a corner or no one can come by because imagine you're in a virtual representation of Central Park in New York, you think it's private, but a nine-year-old wanders by like it's not okay, whatever language you're using when that happens, like nor would it be in real life. If you're sitting with your friend talking in very colorful language and nine-year-old comes by, their parents probably not going to be really thrilled about what their kid just heard even though they wandered into your space, right? So we're going to start probably with making it very explicit to share spaces in a private way and there the moderation rules will probably be very different, the content acceptability rules will probably be very different than when you're in a public space where it's kind of you have to assume anyone's around, just like the way you and I might talk in the middle of a shopping mall would be pretty different than if we were hanging out at one of our houses or something like that. That all goes into what civility means. So civility is who speaking, kind of what is their background, what are the laws of the country they're in, but also then is it private, is it public communication, right? And looking at all that as a fairly complicated matrix of what behavior is okay when, but then making that really obvious to everyone, it should mimic the real world pretty closely, which we think will make it fairly intuitive. I guess just on that Central Park example, in terms of moderation, do you think these AI models can get to a point in which it's actually a preemptive censorship as opposed to reducing the latency so much that it feels

almost instantaneous? Yeah, I absolutely think we can get there. So I mean, at the end of the day, do I think we can build a model that beeps things out that you don't want to hear? Absolutely, right? Or maybe even not beeps it up, substitutes words. So I think that's all within reach. Our models right now have a few seconds latency ranging from let's say five to 10 seconds on what we're seeing, but this is our first generation of it. And we're not even running it yet on your end device, which I think a great way if you want to protect yourself and you should be running a small version of the model that's that ultimate defense right on your end device, we may be doing more sophisticated
processing up in our cloud, but we can give you some of that direct control as well. There's a lot of possibility with getting this to be real time and that's good a few ways. We know with anything around nudging people towards stability real time makes a huge difference. So the sooner we can give a speaker feedback and the better we can protect you without you just having to be frustrated and complaining about it, the better everyone is. And that's absolutely I think the future. And Roblox is a global platform. So I assume if you can bleep out words and
in real time, you could probably also translate into different languages in real time as well, because that would be pretty incredible. And you'd extend the platform to different countries and geographies and you know, people would be forming friendships and in different languages, which is that is that also possible? Yeah, so today, voice because of moderation reasons restricted to English, we're going to roll that out as we get these languages built in multiple languages. But the interesting about language, unlike general, let's say type text, people
naturally in certain parts of the world switch languages mid sentence, even as they're talking, which makes this kind of exciting. But you're right overall, the long term vision of automatic translation we think is totally in reach. You can kind of think about what we're doing now is translating from, let's say, arbitrary English to safe English might be almost
and like the same sorts of approach long term can be used for real time translation. I think there's a ways to go like that would be extremely computationally expensive right now. And at the scale we've been doing voice today, that wouldn't be okay. But where this tech is going that seems totally within within bounds and insight, I think it's a really interesting technical problem to work on. Yeah, just moving back to your earlier example with fans world. I just remember with, I think Nike when the Pharrell Williams like human
sneakers first came out where you can customize the text on the sneakers. I thought that was like the most revolutionary thing in the world, right? Just giving the users some customization abilities. But it seems like with asset generation and material generation, a very near term possibility for consumers themselves, we can probably see a lot more custom assets being created in these branded environments, but also translated into like their physical counterparts, right? And I'm just wondering if you can kind of give a general timeline or maybe vision on when consumers can start working with assets directly when consumed or like environments, right? And like maybe entire experiences afterwards. How many years down the line do you think that is? Right, that's certainly a good question. So I think I can only speak to the what I'll call the Roblox end of that. Like I think the ability to start doing arbitrary generation as a user of different components or customization is a small number of years away. I don't know if it's one year, if it's two or three or something like that, but you know, it's not five, 10 years away. And I think when we do that, we can absolutely give signals back to creators that something is

being created and what it looks like. And you can even upload it to the, we've built all the APIs at this point where you could upload that to the permanent catalog at that point. Then there's the other part of the willingness, desire and the tech. If you are a clothing manufacturer to take that and turn that into a real object and ship it. I'm not particularly well qualified to talk about that into the supply chain and what that looks like. It feels like something that should be very doable based on some of the things you've seen emerge, but we have to wait and see or you'll have to find another person for a podcast to answer on like that into the supply chain and what that looks like. But we'll give them the ability to understand what it was, a 3D representation of it, a description
of the textures or the text or whatever is they've done to it and let them run with it.
Got it. Thank you. I guess we'd be remiss if we didn't mention that the Roblox developer conference is coming up. I think September 8th through 9th. We're super excited to see what you have in store. We know that as we've discussed material generation and code assist are now live, but can you give us a little sneak peek into what we can expect to see at RDC?
Yeah, so you're going to see a lot of cool stuff at RDC. It says, you know, our big event for the year and we like to talk about where we're going in the future with that. I don't want to give too much away because I want to leave it for RDC, but there will be a lot of conversation around generated AI. We'll be talking about where we're going with voice and some of the stuff around voice moderation. We'll be talking about the next generation of how you build avatars. We'll be talking about where coding assist and material generation go and then ultimately where things like the demo you saw with Morgan Stanley are going. So we'll be talking about all of that at RDC. I'll leave the specifics for early September and you can catch up with them there.
Awesome. We can't wait. Awesome. Well, thank you again so much, Daniel, for your time today and sharing Roblox's incredible work and vision with generative AI, the metaverse, and modern socialization overall. We're so excited to see what Roblox has in store at RDC this September, 8th through 9th. And if our listeners want to learn more about Roblox's latest technological feats, where should they go? They should just go to our website, our tech blog, and they can read all about what's going on there. Is the tech blog different from research.roblox.com?
It is. We have a research site that focuses on particularly research contributions, but we also have a tech blog that's a little bit broader and just highlights the latest interesting cool tech things we're doing. Well, both are cool, in my opinion. But okay, thank you again, Daniel, and yeah, speak again soon. My pleasure.