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Transcript of Jason A. Janet, Ph.D.

Date: August 30, 2024

Case: Hesai Technology Co., Ltd. -v- Ouster, Inc. (PTAB)



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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

HESAI EX1034, P.1

Ouster Exhibit 2019
IPR2023-01456 page 1

Transcript of Jason A. Janet, Ph.D.
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<p>5</p> <p>1 PROCEEDINGS</p> <p>2</p> <p>3 JASON ANDRE JANÉT, PH.D.,</p> <p>4 being first duly sworn or affirmed by the Notary,</p> <p>5 testifies as follows:</p> <p>6 EXAMINATION</p> <p>7 BY MR. HAGIZ:</p> <p>8 Q Good morning, Dr. Janét. My name is Ron</p> <p>9 Hagiz. I am counsel for Hesai in this proceeding.</p> <p>10 Have you been deposed before?</p> <p>11 A Yes, I have.</p> <p>12 Q And roughly how many times?</p> <p>13 A I think it's close to 50. It might be --</p> <p>14 might be more than 50.</p> <p>15 Q Okay. So you know how it works. I'll</p> <p>16 just kind of briefly reiterate the procedure, just</p> <p>17 for the record.</p> <p>18 So you understand I'll be asking you</p> <p>19 questions today and you'll provide answers to my</p> <p>20 questions?</p> <p>21 A Yes, sir.</p> <p>22 Q And your counsel may object from time to</p>	<p>7</p> <p>1 Q And I'll just ask other than</p> <p>2 communications on the record -- sorry, other than</p> <p>3 communications in the Zoom itself while we are on</p> <p>4 the record, you don't kind of separately communicate</p> <p>5 with your counsel, or with anyone else, for that</p> <p>6 matter. Is that okay?</p> <p>7 A Yes, sir.</p> <p>8 Q Okay. Is there any reason why you can't</p> <p>9 provide complete and honest testimony today?</p> <p>10 A No, sir.</p> <p>11 Q One last thing, I'll try to take a break</p> <p>12 probably every hour or so. If you need a break</p> <p>13 earlier than that, let me know. I'll just ask if</p> <p>14 there's a question pending, that you answer the</p> <p>15 question before we take a break.</p> <p>16 Is that okay?</p> <p>17 A Yes, sir.</p> <p>18 Q So let's get started.</p> <p>19 I'm going to upload into the chat what has</p> <p>20 been marked -- here we go. So I've uploaded into</p> <p>21 the chat what was marked as Exhibit 1010, which is</p> <p>22 the corrected Janét declaration. Let me know when</p>
<p>6</p> <p>1 time. But unless you're instructed not to answer,</p> <p>2 you should still answer my question after the</p> <p>3 objection.</p> <p>4 Do you understand?</p> <p>5 A Yes, sir.</p> <p>6 Q I'll try my best not to talk over you so</p> <p>7 that our court reporter can get a clear record.</p> <p>8 I'll just ask that you do the same and wait for me</p> <p>9 to finish my question before you begin your answer.</p> <p>10 Is that okay?</p> <p>11 A Absolutely.</p> <p>12 Q Because we're doing things remotely via</p> <p>13 Zoom, I just want to double-check a few things.</p> <p>14 Do you have any materials in front of you</p> <p>15 that you're referring to or plan to be referring to</p> <p>16 during the deposition?</p> <p>17 A No. I just have my computer up and</p> <p>18 running and my email.</p> <p>19 Q Okay. And do you have any kind of</p> <p>20 communications, whether it's email or chat or</p> <p>21 instant message, open with your counsel right now?</p> <p>22 A No.</p>	<p>8</p> <p>1 you've had a chance to download it and open it up.</p> <p>2 A Sorry. I'm setting up a folder on my</p> <p>3 desktop for that.</p> <p>4 Q Sure.</p> <p>5 A Okay. I have that.</p> <p>6 Q And this is the declaration that you</p> <p>7 submitted in this proceeding relating to the '405</p> <p>8 patent?</p> <p>9 A Yes, sir.</p> <p>10 Q And are the -- are there any errors</p> <p>11 anywhere in your declaration that you feel you need</p> <p>12 to correct?</p> <p>13 MR. LAUPPE: Object to form.</p> <p>14 A I don't know the full extent. I'm aware</p> <p>15 of a couple of grammatical errors here and there.</p> <p>16 But nothing substantive that I can recall. We may</p> <p>17 discover something as we're talking today, and if a</p> <p>18 correction is needed, we'll certainly put that in</p> <p>19 the errata.</p> <p>20 Q Sounds good.</p> <p>21 I want to ask a little bit about some of</p> <p>22 your background and work experience. If you could</p>

Conducted on August 30, 2024

<p>9</p> <p>1 turn to your -- your CV, which is on PDF page 103 of</p> <p>2 your declaration. Let me know when you're there.</p> <p>3 A I'm there.</p> <p>4 Q So let me just start with your</p> <p>5 undergraduate is in mechanical engineering. Is that</p> <p>6 right?</p> <p>7 A Yes, sir.</p> <p>8 Q Do you have a particular focus or</p> <p>9 specialization?</p> <p>10 A It would have probably been on -- well,</p> <p>11 there was no particular concentration. I would say</p> <p>12 it was a good cross-section of mechanical</p> <p>13 engineering, everything from thermodynamics to</p> <p>14 vibrations, controls, electronics, to the extent</p> <p>15 of -- to a limited extent, to the extent of what</p> <p>16 would be in a Bachelor of Science mechanical</p> <p>17 engineering curriculum, I think just a couple of</p> <p>18 classes on electronics. And then, let's see,</p> <p>19 probably a fair amount on the sensors is where I</p> <p>20 would have put an emphasis during that time.</p> <p>21 Q And what types of sensors were you -- did</p> <p>22 you put an emphasis with during your undergraduate</p>	<p>11</p> <p>1 the curriculum, were the courses you took focusing</p> <p>2 on how to build or design those types of sensors, or</p> <p>3 how to use or apply those types of sensors?</p> <p>4 MR. LAUPPE: Object to form.</p> <p>5 A Well, initially it would be how to use</p> <p>6 them, and usually in the process of using them or</p> <p>7 applying them, you would find limitations.</p> <p>8 And as an adjunct to my Bachelor of</p> <p>9 Science curriculum, I was also a machinist. I</p> <p>10 wouldn't put myself in the master machinist</p> <p>11 category, probably more in the journeyman level, but</p> <p>12 or at least a machinist, and so I was really</p> <p>13 unafraid to take things apart and build them.</p> <p>14 But I also had some great mentors that had</p> <p>15 a similar dauntless approach to -- and they taught</p> <p>16 myself and others in these practical classes that we</p> <p>17 took, practical meaning that they were very lab</p> <p>18 intensive. We would set up everything from</p> <p>19 thermocouples to, you know, accelerometers to optics</p> <p>20 to, you know, when we could get our hands on them in</p> <p>21 those days, laser systems. And if we didn't find</p> <p>22 that it was working the way we needed it to, and</p>
<p>10</p> <p>1 curriculum?</p> <p>2 MR. LAUPPE: Object to form.</p> <p>3 A I would not consider this limiting as I</p> <p>4 describe it. But sensors included, you know, type</p> <p>5 of sensors that could be used for detecting strain</p> <p>6 and stress and vibrations, optical sensors that</p> <p>7 would be used for ranging and proximity sensing,</p> <p>8 tactile sensors, gate sensors.</p> <p>9 I realized towards the end of my Bachelor</p> <p>10 of Science degree that I was -- I was discovering an</p> <p>11 interest in robotics and automation and -- and so</p> <p>12 it's -- I guess it's a -- this is just the way</p> <p>13 things go sometimes, you find out, you know, in the</p> <p>14 last maybe year and a half of your curriculum what</p> <p>15 you really are passionate about. And so that last</p> <p>16 year and a half, two years, that's where I threw</p> <p>17 myself into sensors and kinematics and stuff like</p> <p>18 that.</p> <p>19 Q I understand that. That's how I ended up</p> <p>20 in law school, so.</p> <p>21 When you say -- the different sensors that</p> <p>22 you mentioned that kind of was part of the focus of</p>	<p>12</p> <p>1 sometimes these things were part of the lab, we</p> <p>2 would take them apart, understand the anatomy of</p> <p>3 them, and switch out parts, and in a couple of cases</p> <p>4 before I finished my undergrad, building from the</p> <p>5 ground up.</p> <p>6 Q Let me ask a little more specifically.</p> <p>7 You mentioned optical sensors before. As part of</p> <p>8 your -- as part of the work that you just mentioned</p> <p>9 during your undergraduate curriculum, did you build</p> <p>10 or take apart any optical sensors?</p> <p>11 MR. LAUPPE: Object to form.</p> <p>12 THE WITNESS: Sorry, did I cut you off,</p> <p>13 Patrick?</p> <p>14 MR. LAUPPE: All good. It registered on</p> <p>15 the realtime.</p> <p>16 THE WITNESS: Okay.</p> <p>17 A Yes. One of probably half a dozen</p> <p>18 examples was we used a laser to evaluate how</p> <p>19 different things at a distance would vibrate. And</p> <p>20 I'm picturing, among other things, we had this</p> <p>21 elaborate fluid control thermal control system on a</p> <p>22 wall, it was a very big practical lab, if you will,</p>

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HESAI EX1034, P.4

<p>13</p> <p>1 and we wanted to see how fluid that was passing 2 through these passageways would cause vibration in 3 the conduits.</p> <p>4 And we had a couple of ways of evaluating 5 that. One was with accelerometers. Another one was 6 just simple acoustic sensors. And the third was 7 with an optic sensor that we would set it up, and as 8 it vibrated even in imperceptible ways, we could see 9 the deflection as the light was either hitting a 10 sensor that was directly on it, or when we did it 11 remotely and tried to -- tried to get some distance 12 between us and the -- and the system, we would also 13 notice the flutter as the light pattern returned.</p> <p>14 Q So how did that involve building or taking 15 apart an optical sensor?</p> <p>16 MR. LAUPPE: Object to form.</p> <p>17 A Well, we had to put the right lensing in 18 there to filter out the noisy elements and ambient 19 light. Sometimes it took the shade on the window to 20 just be partly open a sliver and it would affect the 21 readings. So we wanted to tune right into the -- in 22 that situation I think we were using a visible red</p>	<p>15</p> <p>1 robotics. I just wasn't sure what major discipline 2 of robotics I wanted to focus on.</p> <p>3 So when I had the option of going to grad 4 school, I explored a couple of different places. 5 And when I spoke with folks at NC State, obviously 6 one option was mechanical engineering, the other was 7 electrical engineering, I should say a third was 8 computer science, and then a fourth was the 9 integrated manufacturing systems.</p> <p>10 And to me, IMSEI was a good middle ground, 11 it gave me the option of working in a 12 multidisciplinary field and in a multidisciplinary 13 academic program to then decide where I really 14 wanted to focus. And my concentration during that 15 time was mobile robot motion planning, sensing, 16 perception, and self-localization.</p> <p>17 Q All right. Let me -- let me just go 18 through each of those.</p> <p>19 What is mobile robot motion planning?</p> <p>20 A Mobile robot motion planning relates to 21 mobile robots being able to plan their trajectories 22 through space. I think at the time I mostly just</p>
<p>14</p> <p>1 laser, and so we had to get into some optical 2 filters, started with cellophane, you know, the 3 colored cellophane, but graduated to, you know, 4 other types of glass-like or plastic-like filters.</p> <p>5 And, again, we were just looking for very minor 6 deflections in what was being returned. But we 7 wanted to amplify that so then we would also have 8 optics that would do a visual amplification and then 9 we could use a camera. In some cases it was pretty 10 crude, we would literally stand there with a pen and 11 we would look at the peak and valley and make a 12 mark. But when we could use a video camera, and, 13 you know, again, this was using kind of crude VHS 14 type of recording mechanisms back then, we did it 15 for that.</p> <p>16 Q Let me move on to your master's degree. 17 That said it's in integrated manufacturing systems 18 engineering. What is that exactly?</p> <p>19 A Well, the Integrated Manufacturing Systems 20 Engineering Institute, or IMSEI, is a program at 21 North Carolina State University that is 22 multidisciplinary. I knew I was interested in</p>	<p>16</p> <p>1 focused on ground vehicles. So planning motion 2 around obstacles both known and unknown, static and 3 moving.</p> <p>4 Q And when you said -- when you said sensing 5 among the things that you focused on during your 6 master's, what -- what kind of sensing?</p> <p>7 MR. LAUPPE: Object to form.</p> <p>8 A That's a very long list, because, as you 9 can imagine again, robotics is inherently a 10 multidisciplinary field. I can list a few sensors 11 but they're not going to be exhaustive. But the 12 sensors included the very early stage commercial 13 LiDAR systems like from SICK, tactile sensors like 14 whiskers and impact sensors, date sensors, acoustic 15 sensors, ranging sensors like infrared, proximity 16 sensors, computer vision.</p> <p>17 I'm sure there are other things I'm 18 leaving off, but that's a decent example set of the 19 types of sensors I dealt with.</p> <p>20 Q Were you building any of these sensors 21 yourself, or were you kind of purchasing or 22 acquiring off-the-shelf components?</p>

Conducted on August 30, 2024

<p>1 MR. LAUPPE: Object to form.</p> <p>2 A The -- it really was a mixture of both.</p> <p>3 If we couldn't get -- if I couldn't get a sensor off</p> <p>4 the shelf, which, unfortunately, was more times the</p> <p>5 case than I had wanted, but you're talking about the</p> <p>6 early '90s, early to mid '90s, then I would endeavor</p> <p>7 to build it or to get the core components and do an</p> <p>8 assembly and build the support circuitry and the</p> <p>9 signal processing and -- signal processing on the</p> <p>10 back end and the front end, and then ingesting that</p> <p>11 information and putting that into some sort of</p> <p>12 actionable format. For example, the maps that would</p> <p>13 be created for motion planning, or the algorithms</p> <p>14 that would be used for motion planning, or the</p> <p>15 algorithms that would be used for self-localization,</p> <p>16 just to say figuring out where you are in the</p> <p>17 environment, oftentimes building a map.</p> <p>18 Q You mentioned perception as one of the</p> <p>19 other focuses during your master's degree. What</p> <p>20 does that refer to?</p> <p>21 MR. LAUPPE: Object to form.</p> <p>22 A That really goes hand in hand with the</p>	<p>17</p> <p>19</p> <p>1 very, very sensor intensive.</p> <p>2 Q In any of the work or research that you</p> <p>3 did both in your undergraduate career and your</p> <p>4 master's career, did any of that involve designing</p> <p>5 or building LiDAR systems?</p> <p>6 MR. LAUPPE: Object to form.</p> <p>7 A Not in my undergrad. My master's and</p> <p>8 Ph.D. overlapped, so it's difficult for me to</p> <p>9 remember exactly the specific time frame when I</p> <p>10 started getting my hands dirty with building a LiDAR</p> <p>11 type of system.</p> <p>12 One of the things that we noticed with the</p> <p>13 SICK LiDAR system was it was strictly a 2-D plane,</p> <p>14 the refresh rate or the scan cycle wasn't always</p> <p>15 very quick, had a very limited field of view, and it</p> <p>16 was highly susceptible to ambient light. And so put</p> <p>17 a couple of -- well, put a single motor with an</p> <p>18 encoder, had it controlled by I think an HC11 at the</p> <p>19 time and a grabbed -- fortunately, I didn't have to</p> <p>20 buy a brand new laser, for this, we had several</p> <p>21 already in the center. And it was a bit bulky, I</p> <p>22 would say it was very bulky.</p>
<p>18</p> <p>1 sensing. Perception is -- it really is hand in hand</p> <p>2 with -- with sensing. Just I would say it's more</p> <p>3 fundamental, you're kind of at the transducer level</p> <p>4 oftentimes, but you will -- you know, perception is</p> <p>5 also from the perspective of the, in my situation,</p> <p>6 the mobile robots, can they perceive the environment</p> <p>7 and extract important information and fulfill some</p> <p>8 sort of mission on the basis of that information and</p> <p>9 preferably do it in realtime.</p> <p>10 Q And the last one you had mentioned was</p> <p>11 self-localization. What is that?</p> <p>12 MR. LAUPPE: Object to form.</p> <p>13 A Self-localization is -- and, by the way,</p> <p>14 I'll put self-referencing in with that bucket. But</p> <p>15 self-referencing is -- is being able to use features</p> <p>16 of the environment to figure out where you are, and</p> <p>17 localization is essentially the same thing. I think</p> <p>18 some people would look at it as having a more</p> <p>19 precise I'm at this position and at this</p> <p>20 orientation, sometimes referred to as pose.</p> <p>21 And self-localization is not a simple</p> <p>22 process, it continues to be a challenge, but it's</p>	<p>20</p> <p>1 And then we set up a couple of photocells,</p> <p>2 I think we started with the cadmium sulfides and</p> <p>3 then we graduated to photodiodes, and I believe we</p> <p>4 had avalanche photodiodes around that time, if I'm</p> <p>5 not mistaken. Anyway, we tried several different</p> <p>6 photo sensors.</p> <p>7 I think one of the biggest challenges that</p> <p>8 we had was the timing of it all. The HC11 wasn't a</p> <p>9 fast enough processor. So then we graduated to a --</p> <p>10 well, let me just say the HC11 was not fast enough</p> <p>11 for doing time of flight for light.</p> <p>12 We could -- we could do a couple of other</p> <p>13 things with it. We could -- not with the HC11</p> <p>14 necessarily processing, but we could come up with a</p> <p>15 structured light approach where we would look at</p> <p>16 triangulation or how the projected signal would get</p> <p>17 distorted. We tried to slow, obviously, the light</p> <p>18 down a little bit with the optics, and but -- then</p> <p>19 we had to use a digital signal processor, which was</p> <p>20 very power intensive, and I can't remember -- it's</p> <p>21 right on the tip of my tongue -- the specific DSP</p> <p>22 suite that we used. And ultimately, I don't think</p>

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HESAI EX1034, P.6

<p style="text-align: right;">21</p> <p>1 we ever got to a point where we could do time of 2 flight, but we did sort of a triangulation approach. 3 Q And you mentioned -- one of the problems 4 that you mentioned with the SICK sensor that led to 5 the work you described was that it had -- it was 6 highly susceptible to ambient light. Was that a 7 problem that you were able to solve in your design? 8 MR. LAUPPE: Object to form, scope. 9 A I don't know that we ever fully solved it. 10 I think that we were able to make it less 11 susceptible to ambient light. If we were indoors, 12 the windows were shut, and when I say shut, I mean 13 light tight, you know, nothing was getting in. The 14 SICK was fine. And that was our baseline. And so, 15 you know, and we got our stuff to be -- to be fine 16 at that level, and then we would basically let open 17 these covers that we put over the windows to just 18 see how the performance degraded. 19 So I feel like at some -- and I wouldn't 20 consider this production grade or product grade. 21 But at a fundamental research level, it looked 22 encouraging at the time.</p>	<p style="text-align: right;">23</p> <p>1 room to room doing certain tasks, and we were very 2 hopeful that -- that the LiDAR systems could 3 complement the suite of sensors. 4 At the end of the day, even though we had 5 encouraging results, to my previous point, we just 6 had to not use the LiDAR systems, whether it was our 7 home-brewed system or the SICK, and -- and went 8 instead to computer vision with a structured laser 9 light grid projected onto the floor or, you know, 10 kind of in front of the robot. 11 Q Got it. And the project you were just 12 describing involving building a LiDAR system during 13 your master's Ph.D., that would have been in the mid 14 to late 1990s. Is that right? 15 MR. LAUPPE: Object to form. 16 THE WITNESS: Sorry, I didn't mean to talk 17 over you, Patrick. 18 A Yes, that would have been in the '96 to 19 '98 time frame, maybe '95 -- 20 Q And do you recall -- sorry, go ahead. 21 A Maybe '95 to '98. 22 Q Do you recall roughly how much time you</p>
<p style="text-align: right;">22</p> <p>1 I think the thing to remember is that when 2 you're in the robotics and automation space, because 3 it's multidisciplinary, and because rarely do you 4 find something commercial off-the-shelf that you can 5 just plug and play and it worked seamlessly the way 6 that you need it to, you get into a mode where you 7 anticipate having to tear things down, modify them 8 or build them from scratch. 9 And by the way, that's beyond the sensors, 10 I've built many robotic limbs and actuators and 11 mobile vehicles from scratch as well. 12 So the overarching point of that is to 13 build a system that does a particular task, does a 14 particular set of tasks. And in that endeavor, 15 particularly related to the LiDAR system, we were 16 preparing for a couple of competitions. One of them 17 was the name is IJCAI, but I think it's I-J-C-A-I. 18 And, gosh, I'm trying to remember a couple of the 19 other organizations. But we needed to have the 20 ability to figure out, for the robot to be able to 21 figure out autonomously where it is in the 22 environment, try and map that environment, going</p>	<p style="text-align: right;">24</p> <p>1 spent building that LiDAR device? 2 MR. LAUPPE: Object to form, scope. 3 A I couldn't tell you precisely how many 4 man-hours were put into it. 5 I can tell you this. I didn't have a 6 social life when I was doing my grad school. So 7 I -- we had a machine shop and electronics assembly 8 shop, the -- the electronics inventory. And I had a 9 very large center with open space all in one area in 10 a place called Daniels Hall at North Carolina State 11 University, and I also had a cot and a refrigerator 12 and a microwave. And you can ask people I went to 13 school with and they'll tell you I was pretty much 14 around the clock there. 15 Q Well, setting aside the specific 16 man-hours, do you know if that LiDAR design or LiDAR 17 building project, was that something you worked on 18 over the span of weeks? Months? Years? 19 MR. LAUPPE: Object to form, scope. 20 A I would say it spanned at least a year. I 21 don't know if it crossed the two-year threshold at 22 that point.</p>

Conducted on August 30, 2024

<p>25</p> <p>1 Q Other than that project, is there anything</p> <p>2 else during your education, whether it's bachelor's,</p> <p>3 master's or Ph.D., where you were building or</p> <p>4 designing a LiDAR system?</p> <p>5 MR. LAUPPE: Object to form.</p> <p>6 A That example is the one that stands out</p> <p>7 the most.</p> <p>8 I was very motivated during that time</p> <p>9 and -- and dove into various technologies on an</p> <p>10 as-needed basis. And I'm not sure that I remember</p> <p>11 everything, but I would say that's the one that</p> <p>12 stands out the most.</p> <p>13 Q And there's no other project specifically</p> <p>14 that comes to mind right now?</p> <p>15 MR. LAUPPE: Object to form.</p> <p>16 A Not at this point. That doesn't mean it</p> <p>17 didn't happen, but not at this point.</p> <p>18 Q Let's shift to kind of your post --</p> <p>19 post-Ph.D. work and professional work. And I think</p> <p>20 you discussed some of that in paragraphs 4 through</p> <p>21 22, I think, in your declaration. Is that right?</p> <p>22 MR. LAUPPE: Object to form.</p>	<p>27</p> <p>1 discussed in paragraph 17 of your declaration, is</p> <p>2 there any other work that you did in your employment</p> <p>3 or professional career involving LiDAR devices?</p> <p>4 MR. LAUPPE: Object to form.</p> <p>5 A Well, if you'll notice, I was an adjunct</p> <p>6 professor both at Duke University and at North</p> <p>7 Carolina State University for a couple of decades,</p> <p>8 and during the time that I served as an adjunct</p> <p>9 professor there, I taught various classes mostly in</p> <p>10 the engineering technology space, and for that</p> <p>11 matter, mostly in the controls, robotics and</p> <p>12 automation space, and LiDAR is a common sensor in</p> <p>13 the mobile robotics world. And, you know, it</p> <p>14 started to really kind of take off in the -- I want</p> <p>15 to say in the, I don't know, 2010-ish time frame,</p> <p>16 2012-ish time frame.</p> <p>17 But not everything is listed of the</p> <p>18 projects that I oversaw. But you may notice under</p> <p>19 Duke University and possibly at NC State University</p> <p>20 it's listed. But at both places the courses that I</p> <p>21 taught were project intensive, building, operating,</p> <p>22 utilizing in some way, shape or form robotics, and</p>
<p>26</p> <p>1 A You're referring to the section in my</p> <p>2 declaration Background and Qualifications. Is that</p> <p>3 correct?</p> <p>4 Q That's right.</p> <p>5 A Okay. I'm there.</p> <p>6 Q So reading through this section, I see in</p> <p>7 paragraph 17 you refer to some work that you did</p> <p>8 with LiDAR systems when you were at Teledyne</p> <p>9 Technologies. Do you see that?</p> <p>10 A Which paragraph did you say? 17?</p> <p>11 Q 17.</p> <p>12 A Yes.</p> <p>13 Q And just before -- before we talk about</p> <p>14 that, is there anything else, any other kind of</p> <p>15 position work that you did post-Ph.D. where you were</p> <p>16 working with LiDAR systems specifically?</p> <p>17 MR. LAUPPE: Object to form.</p> <p>18 A Could you ask your question again? Are</p> <p>19 you -- did you refer to work or are you referring to</p> <p>20 academia?</p> <p>21 Q So post -- post-academia, after your</p> <p>22 Ph.D., other than the work at Teledyne Technologies</p>	<p>28</p> <p>1 that included, I would say, a good portion of those</p> <p>2 were mobile robots and a good portion of those</p> <p>3 mobile robots had LiDAR systems on them of various</p> <p>4 types. Again, some were your bigger kind of</p> <p>5 off-the-shelf systems that came along I would say</p> <p>6 later in the 2010s time frame. Some of them were</p> <p>7 just early stage laser range finder bolted on</p> <p>8 something that scans and try to extract meaningful</p> <p>9 information from it.</p> <p>10 But I would -- I would just say that given</p> <p>11 that you're simply asking me post my Ph.D., I just</p> <p>12 noticed that I taught both at Duke and at NC State</p> <p>13 University, and a lot of those projects involved</p> <p>14 LiDAR systems.</p> <p>15 At Nekton I would probably -- I can't</p> <p>16 really recall anything specific with LiDAR systems</p> <p>17 while was at Nekton, which later became iRobot.</p> <p>18 While at Vortex HC, which was a spinout</p> <p>19 from Avionic Instruments post-acquisition by</p> <p>20 TransDigm, we built a lot of mobile robotic systems.</p> <p>21 The hook, I guess, for our company was a wall</p> <p>22 climbing technology based on something referred to</p>

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HESAI EX1034, P.8

Conducted on August 30, 2024

<p>29</p> <p>1 as vortex regenerative air movement or aqueous 2 movement, it enabled robots to attract to surfaces 3 so that they could climb walls, and if they're under 4 water, you got even more attraction. 5 And so our wheeled systems when they were 6 navigating were supposed to do a variety of things. 7 We didn't get very far using lasers under water, I'm 8 sure you can imagine, particularly in saltwater. 9 But I just remembered something about 10 Nekton. But let me -- let me continue with Vortex. 11 So, again, we tried to utilize a real simple 12 lightweight laser range finders to enable the robots 13 as they're maneuvering up the surfaces to know the 14 best path to take. At that point, if they were 15 operating in the air on a wall or a ceiling, it 16 sounds cool, and it is, but it didn't take a whole 17 lot for the attractor to get disrupted, take 18 something, you know, a protrusion at about a 19 centimeter if it crossed a wide -- if it crossed the 20 width of the robot, and so it could traverse over 21 that, but it sort of disrupted the vortex, and it 22 wouldn't fall off the wall necessarily, but the</p>	<p>31</p> <p>1 was an applied research program, and we used a 2 blue-green type of laser for tracking multiple 3 vehicles that swam in a formation, and we tried to 4 use that also so that they could triangulate off of 5 each other and that they could communicate with each 6 other. Highly directional, I'm sure you can 7 imagine. 8 And but it was -- we were motivated to do 9 it for a variety of reasons. One, we needed to stay 10 quiet, and you're talking about an array formation 11 that could change its shape to vary the aperture in 12 a passive acoustic way to prevent what was referred 13 to at the time as close encounters of the unexpected 14 kind. 15 So the front end of a sub does a really 16 bad job of scanning, just very difficult for it to 17 scan where it's going. They can see things beside 18 it really well. They used to have towed arrays like 19 TB29s and what have you. But it couldn't really 20 tell what was in front of it very well. 21 So the idea was that a larger unmanned 22 underwater vehicle or uncrewed underwater vehicle</p>
<p>30</p> <p>1 ideal situation was to avoid those sort of things. 2 And so we had a really basic laser range 3 finder which made it so that we didn't have to do 4 image processing. So it minimized the burden on the 5 processor, this vehicle -- I don't think I have one 6 with me, but the vehicle is -- was only about maybe 7 10 inches wide and about 8 inches in length, and, 8 you know, about 3 or 4 inches high. And so you can 9 imagine it's battery-operated and size, weight and 10 power per swap was a really big deal. So the laser 11 range finder put in sometimes a static position, but 12 sometimes in a sweeping position. We did have a pan 13 and tilt unit on there. So that's where we used it. 14 Let me go back to Nekton, if I could. Let 15 me see if I can find the specific project. So some 16 of these things were classified and I don't know 17 that I can talk about them at all. But let me just 18 find -- okay. It is on here, I think. 19 The I guess second bullet down under 20 Principal Investigator and Program Manager says 21 "DARPA Distributed Micro-Robotics Swimming Arrays 22 for Anti-Submarine Warfare," we -- we used a -- this</p>	<p>32</p> <p>1 would be deployed, in some cases two of them would 2 be deployed, and these larger UUVs being able to go 3 in and out of the submarine were actually validated, 4 and I think in that situation the contractor for 5 that was Northrop Grumman. 6 But inside those larger UUVs would be our 7 smaller UUVs, and the UUVs would have to swim in a 8 formation, and they had to swim in a pretty tight 9 formation so that they could control the -- the, you 10 know, the spectral range, again, varying the 11 collective aperture, and you can do array 12 beamforming, that sort of thing. But we were using 13 a blue-green laser variant, I say a green laser 14 variant because that penetrated the water really 15 well. 16 Q Let me ask a little more simply, during 17 your academic career at -- during your academic 18 career at Duke and NC State, was there any work or 19 research that you personally were involved in that 20 included building or designing a LiDAR device or 21 system? 22 MR. LAUPPE: Object to form.</p>

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HESAI EX1034, P.9

<p>33</p> <p>1 A I would have to take some time to generate</p> <p>2 a comprehensive list.</p> <p>3 But among other things, we participated in</p> <p>4 the DARPA Grand and Urban Challenge, challenges</p> <p>5 plural I should say. And I believe the first one</p> <p>6 that we participated in the Grand Challenge we</p> <p>7 didn't really have a commercial off-the-shelf LiDAR</p> <p>8 option. But subsequent challenges, especially and</p> <p>9 including the Urban Challenge, we did. When we</p> <p>10 could buy them off-the-shelf we did, so it was more</p> <p>11 of an integration and an application and a</p> <p>12 post-signal processing effort, not necessarily</p> <p>13 working at the optics and emitter detector level.</p> <p>14 But when we were looking at fielding both</p> <p>15 of the red team vehicles for the Grand Challenge,</p> <p>16 the first Grand Challenge, we fitted one with a</p> <p>17 radar system and we made efforts to fit the other</p> <p>18 with a LiDAR variant. And I'm trying to remember</p> <p>19 what was around at the time, I think it was called</p> <p>20 Regal. I could have the name wrong. And but -- but</p> <p>21 didn't get great results from that.</p> <p>22 So once again, you know, blew the dust off</p>	<p>35</p> <p>1 options that we were aware of didn't work. And so,</p> <p>2 again, you know, being a machinist and having the</p> <p>3 equipment there and having, you know, a budget,</p> <p>4 which oftentimes came out of my pocket, but that's</p> <p>5 where I got more hands-on with the intended</p> <p>6 replacement option.</p> <p>7 I will say that's not the only sensor that</p> <p>8 we evaluated and in some cases built or modified</p> <p>9 significantly that didn't get deployed in the</p> <p>10 ultimate competition. Just kind of how that works,</p> <p>11 you funnel down.</p> <p>12 Q Any other projects in your academic career</p> <p>13 where you were personally involved with building or</p> <p>14 designing a LiDAR system?</p> <p>15 MR. LAUPPE: Object to form.</p> <p>16 A I wouldn't say no. You know, I could</p> <p>17 certainly think more on other examples. I've been</p> <p>18 pretty blessed with opportunities and passion and</p> <p>19 skills to tackle these things, so they start to</p> <p>20 stack up after a while, and some become easier to</p> <p>21 remember than others.</p> <p>22 Q How much time across your academic and</p>
<p>34</p> <p>1 of the getting some laser. You can imagine we had</p> <p>2 some in-house expertise that helped us on the</p> <p>3 optics. At the end of the day, we didn't feel like</p> <p>4 we could put that on the vehicle to operate in the</p> <p>5 desert, and so it just wasn't fielded.</p> <p>6 Q You referred to "we" just now. Who does</p> <p>7 that include?</p> <p>8 MR. LAUPPE: Object to form, scope.</p> <p>9 A "We" would be myself and the students, and</p> <p>10 then our partners in that situation, which would</p> <p>11 have been Carnegie Mellon, and I want to say there</p> <p>12 might have been another partner. We deployed two</p> <p>13 Hummers or Humvee vehicles.</p> <p>14 Q I guess let me be a little more specific.</p> <p>15 As part of the DARPA Grand -- the DARPA Grand</p> <p>16 Challenge that you were discussing, were you</p> <p>17 personally involved in building or designing any</p> <p>18 LiDAR devices or systems?</p> <p>19 MR. LAUPPE: Object to form.</p> <p>20 THE WITNESS: Sorry, Patrick.</p> <p>21 MR. LAUPPE: That's fine.</p> <p>22 A I got involved hands-on when our -- the</p>	<p>36</p> <p>1 professional career, how much time would you say you</p> <p>2 spent building or designing LiDAR systems?</p> <p>3 MR. LAUPPE: Object to form.</p> <p>4 A I couldn't tell you the specific amount of</p> <p>5 time. And I don't know that we got to all of the</p> <p>6 other postgraduate work either that involved LiDAR</p> <p>7 systems, including at Teledyne. But I would say if</p> <p>8 you add it all up, I wouldn't be surprised if it's</p> <p>9 in the -- I wouldn't be surprised if it's in the</p> <p>10 thousands of hours.</p> <p>11 It's just one of those sensors that a lot</p> <p>12 of times we try to design around and you realize</p> <p>13 that you -- you just can't, the computer vision,</p> <p>14 best of intentions, and we've had so many great</p> <p>15 successes over the years, myself and various teams,</p> <p>16 teammates with computer vision.</p> <p>17 But at the end of the day, the LiDAR</p> <p>18 system is a low-powered, robust ranging system for</p> <p>19 building point clouds that is very difficult to</p> <p>20 operate without. So I would be surprised if it's</p> <p>21 less than a couple thousand hours, man-hours.</p> <p>22 Q And are there any projects, whether in</p>

Conducted on August 30, 2024

<p>37</p> <p>1 your academic or professional career, where you were</p> <p>2 involved in designing or building a production grade</p> <p>3 or commercial grade LiDAR system?</p> <p>4 MR. LAUPPE: Object to form.</p> <p>5 A I guess that depends on your definition of</p> <p>6 production grade and commercial grade. Every LiDAR</p> <p>7 system I've had my hands on has been embedded in</p> <p>8 a -- in some other system. So it hasn't really been</p> <p>9 sold as a stand-alone ranging point cloud-generating</p> <p>10 type of system. It's been more of an essential</p> <p>11 building block to a larger system that was deployed.</p> <p>12 And so, yes, there were, you know, the</p> <p>13 VMRP was a deployed system that had the range, the</p> <p>14 laser ranging capability on it with the pan tilt,</p> <p>15 the micro UAVs have been deployed.</p> <p>16 And, you know, I would have to think hard</p> <p>17 about a couple of other systems, but -- oh, well,</p> <p>18 when I was at DeltaFive, we had -- and the company</p> <p>19 still exists. I just left as CEO in 2018, I</p> <p>20 believe. But the major intent of that company was</p> <p>21 to have automated systems to enhance the hospitality</p> <p>22 space, not from an entertainment perspective, but</p>	<p>39</p> <p>1 had gotten better and so did slip rings and a few</p> <p>2 other things that enabled the full rotation, and on</p> <p>3 that robot we had -- we had LiDAR systems.</p> <p>4 Q And were you -- did you design and build</p> <p>5 that LiDAR system at the optics and emitter detector</p> <p>6 level?</p> <p>7 MR. LAUPPE: Object to form.</p> <p>8 A I -- first of all, I wouldn't be able to</p> <p>9 claim personal credit for everything. But in that</p> <p>10 situation it's, unfortunately, a repeated and</p> <p>11 classic example of hoping that something commercial</p> <p>12 off-the-shelf would do the trick, hoping that</p> <p>13 computer vision would do the trick.</p> <p>14 And computer vision went a very long way</p> <p>15 in the types of environments these robots operated</p> <p>16 in. You know, it's indoor, it's structured, it's</p> <p>17 repetitive in a lot of ways. You could tell what</p> <p>18 room you're in just by looking at the door.</p> <p>19 But, once again, the LiDAR systems just</p> <p>20 didn't do the trick. And so in that situation,</p> <p>21 we -- gosh, we bought so many different ones and</p> <p>22 took them apart and reassembled and played with the</p>
<p>38</p> <p>1 from a back-end operations and maintenance</p> <p>2 perspective. At the end of the day trying to make</p> <p>3 sure that guests would have a good experience but</p> <p>4 not -- but be kind of oblivious as to how.</p> <p>5 And so DeltaFive, the five elements -- and</p> <p>6 I'm probably going to forget one, but there are two</p> <p>7 different types of cleanliness, there's inventory</p> <p>8 and there's positioning, and I'm blanking on the</p> <p>9 fifth one. But, anyway, there were five major</p> <p>10 things.</p> <p>11 So we had robots that would enter rooms,</p> <p>12 and sometimes referred to as cobots, would work</p> <p>13 alongside the housekeeping staff or sometimes alone</p> <p>14 and monitor for cleanliness and all these other</p> <p>15 things, is the lamp working, is the picture hung on</p> <p>16 the wall properly, is everything made, are there</p> <p>17 enough towels. And we used LiDAR systems on that</p> <p>18 vehicle and we had to do a home brew with those</p> <p>19 because at that point there was a cost threshold</p> <p>20 above which it just didn't make economic sense to</p> <p>21 purchase the robot or deploy that robot. And so we</p> <p>22 -- we took -- fortunately, the laser range finders</p>	<p>40</p> <p>1 optics and played with integrating SPADs. But, you</p> <p>2 know, among others we looked at, at the inexpensive</p> <p>3 range, we looked at one from a company I think</p> <p>4 called Neato, but that was a single line type of</p> <p>5 sensor. Now, it had a good refresh rate, I want to</p> <p>6 say it was somewhere in 4, 5 hertz, but I could be</p> <p>7 wrong. It might have been closer to 2 hertz. And,</p> <p>8 you know, generally pretty good ratings.</p> <p>9 But we needed to be able to speed up the</p> <p>10 refresh or the suite, and so we used the basic</p> <p>11 actuation and then tried to put our own optics, and</p> <p>12 started with APDs and then dabbled a little bit in</p> <p>13 SPADs. And then we tried to change it from a single</p> <p>14 line to a three line suite. And so in that regard,</p> <p>15 yes, I was very hands-on at that.</p> <p>16 MR. HAGIZ: All right. Why don't we take</p> <p>17 our first break.</p> <p>18 (Recess 10:00 a.m. - 10:13 a.m.)</p> <p>19 BY MR. HAGIZ:</p> <p>20 Q So, Doctor, I want to turn to your</p> <p>21 opinions on the Hall, Borowski, Spector combination,</p> <p>22 and that starts in page 63 of your declaration,</p>

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HESAI EX1034, P.11

<p>41</p> <p>1 paragraph 123. Just let me know when you're there.</p> <p>2 A Okay.</p> <p>3 Q And I want to focus on the Hall, Spector</p> <p>4 part of the combination and make sure I understand</p> <p>5 your opinions there.</p> <p>6 So your understanding is that in the Hall</p> <p>7 and Spector combinations specifically, Spector's</p> <p>8 arrayed micro-optics and aperture array would be</p> <p>9 incorporated into Hall's system. Is that right?</p> <p>10 MR. LAUPPE: Object to form and scope.</p> <p>11 Q And for reference, I'm looking at</p> <p>12 paragraph 124 of your declaration.</p> <p>13 MR. LAUPPE: Same objections.</p> <p>14 A So what was your question again?</p> <p>15 Q I want to make sure I understand your</p> <p>16 understanding of the proposed combination of Hall</p> <p>17 and Spector is that Spector's arrayed micro-optics</p> <p>18 and aperture array would be incorporated into Hall's</p> <p>19 system. Is that right?</p> <p>20 MR. LAUPPE: And again, object to form and</p> <p>21 scope.</p> <p>22 A It's my understanding that Dr. Shanley</p>	<p>43</p> <p>1 motivation essentially for better power management</p> <p>2 and high levels of imaging resolution and range.</p> <p>3 Dr. Shanley goes on to say that "Borowski</p> <p>4 teaches that its SPAD arrays can provide detection</p> <p>5 at lower light intensities because SPADs 'provide</p> <p>6 significant carrier amplification.'"</p> <p>7 And Dr. Shanley concludes in this</p> <p>8 paragraph that a person of ordinary skill would have</p> <p>9 been motivated to incorporate the SPAD arrays into</p> <p>10 Hall's LiDAR sensor for the benefits of SPADs, and</p> <p>11 more specifically, that they address a problem</p> <p>12 identified by Hall.</p> <p>13 The next paragraph refers to -- or the</p> <p>14 next paragraph in Dr. Shanley's declaration goes on</p> <p>15 to say that a person of ordinary skill would have</p> <p>16 been motivated to combine Hall and Spector to</p> <p>17 incorporate the arrayed micro-optic at Hall's light</p> <p>18 emission module, and an aperture array at Hall's</p> <p>19 light detection module.</p> <p>20 So to your question, I believe I am simply</p> <p>21 quoting in that paragraph Dr. Shanley's declaration.</p> <p>22 Q Well, what you say in your declaration in</p>
<p>42</p> <p>1 states that it would have been obvious to</p> <p>2 incorporate the SPADs, or single photon avalanche</p> <p>3 detectors, from Borowski into Hall's spinning LiDAR</p> <p>4 system, and to incorporate Spector's arrayed</p> <p>5 micro-optics at the -- well, into Hall, and an</p> <p>6 aperture array from Spector and Hall's light</p> <p>7 detection module.</p> <p>8 And I wonder if it's possible to bring up,</p> <p>9 just to kind of ground through this, I believe this</p> <p>10 is Dr. Shanley's report, Exhibit 1003.</p> <p>11 Q Let me just upload that to the chat. So</p> <p>12 that's -- okay. I've uploaded and you should now</p> <p>13 have accessible Exhibit 1003, which is Dr. Shanley's</p> <p>14 declaration.</p> <p>15 Let me know if you need me to repeat the</p> <p>16 question. It seemed like you were still working on</p> <p>17 your answer.</p> <p>18 A So just quoting from Dr. Shanley's</p> <p>19 declaration, starting at paragraph 190 he writes</p> <p>20 that Borowski's -- or Borowski's SPAD arrays address</p> <p>21 a problem identified in Hall, specifically, that</p> <p>22 they rely on laser pulse intensity, and there's a</p>	<p>44</p> <p>1 paragraph 124 is that "Dr. Shanley asserts that it</p> <p>2 would have been obvious to incorporate the SPADs</p> <p>3 disclosed by Borowski into Hall's spinning LiDAR</p> <p>4 system, and to incorporate Spector's arrayed</p> <p>5 micro-optics at the light emission module of Hall</p> <p>6 and an aperture array from Spector at Hall's light</p> <p>7 detection module."</p> <p>8 Did I read that correctly?</p> <p>9 A You read that correctly, yes, sir.</p> <p>10 Q And in paragraph 191 of -- of Dr.</p> <p>11 Shanley's declaration, he does not use the phrase</p> <p>12 "Spector's arrayed micro-optics" or "an aperture</p> <p>13 array from Spector," right?</p> <p>14 MR. LAUPPE: Object to form.</p> <p>15 A Well, in paragraph 191 he does mention</p> <p>16 Spector's arrayed micro-optic and aperture layer.</p> <p>17 And then goes to say that the implementation of</p> <p>18 which displays and spacial separation used by Hall,</p> <p>19 and at the same time reduce cross-talk.</p> <p>20 Q I just want to be clear because I heard</p> <p>21 you say that you were quoting Dr. Shanley, and I</p> <p>22 just wanted to be sure we're on the same page.</p>

Conducted on August 30, 2024

<p>45</p> <p>1 The language that you use in paragraph 124</p> <p>2 of your declaration, that's not a direct quote from</p> <p>3 paragraph 191 of Dr. Shanley's declaration, right?</p> <p>4 MR. LAUPPE: Object to form.</p> <p>5 A It's a citation to paragraphs 190, 191,</p> <p>6 and I agree, it's not a verbatim quote. It's</p> <p>7 intended to summarize.</p> <p>8 Q Okay. And again, I just want to make sure</p> <p>9 that I understand how you're reading Dr. Shanley's</p> <p>10 declaration. Your understanding is that Dr. Shanley</p> <p>11 is proposing taking the specific arrayed micro-optic</p> <p>12 and aperture array from Spector and inserting them</p> <p>13 into Hall's light emission module and light</p> <p>14 detection module respectively. Is that right?</p> <p>15 MR. LAUPPE: Object to form and scope.</p> <p>16 A I -- I'm not sure how else to describe</p> <p>17 this other than how it's written, and, you know, my</p> <p>18 interpretation of what Dr. Shanley had written.</p> <p>19 I understand that -- that there were</p> <p>20 aspects, I believe, of Spector that were presumed to</p> <p>21 not be included. However, I think, at a minimum,</p> <p>22 the receiving optoelectronics from Spector was</p>	<p>47</p> <p>1 Q Okay. In paragraph 1 -- let me turn next</p> <p>2 -- let's turn next to paragraph 145 in your</p> <p>3 declaration. Let me know when you're there.</p> <p>4 A You said 135?</p> <p>5 Q 145.</p> <p>6 A Oh, 145. I'm sorry. Yeah. Okay. I'm</p> <p>7 there.</p> <p>8 Q And in paragraph 145 you're referring to</p> <p>9 an article by someone named Sergey Vinogradov.</p> <p>10 A You say that name more fluidly than I do.</p> <p>11 Yes.</p> <p>12 Q I could be butchering it, but I'm trying</p> <p>13 my best. So let me just have it available while</p> <p>14 we're talking about it. Let me upload this to the</p> <p>15 chat, this was Exhibit 2014, and let me know when</p> <p>16 you have that available.</p> <p>17 A Okay.</p> <p>18 Q The Vinogradov article, I'm just going to</p> <p>19 refer to it as Exhibit 2014 so I don't have to keep</p> <p>20 saying that name. Exhibit 2014, is that a document</p> <p>21 that you were familiar with or had come across</p> <p>22 before your work on this proceeding?</p>
<p>46</p> <p>1 envisioned or proffered by Dr. Shanley as being</p> <p>2 placed on Hall. Otherwise the gimbal, if I</p> <p>3 understand correctly, was presumed I believe by the</p> <p>4 PTAB as to not being used, and I'm not entirely sure</p> <p>5 that -- that Dr. Shanley was pushing for the gimbal</p> <p>6 itself.</p> <p>7 Q I just want to make sure I understand.</p> <p>8 With respect to the receiving electronics, or more</p> <p>9 specifically, the aperture array, your understanding</p> <p>10 is that Dr. Shanley is proposing taking the specific</p> <p>11 aperture array in Spector and inserting that into</p> <p>12 Hall's light detection module. Is that right?</p> <p>13 MR. LAUPPE: Object to form, scope, and</p> <p>14 asked and answered.</p> <p>15 A Yeah, I'm just not sure how else to state</p> <p>16 what's in that paragraph. I'm hesitant to go off</p> <p>17 the rails or try to redescribe it.</p> <p>18 Again, there's some ambiguity as to what</p> <p>19 exactly is being advocated, or at least the extent</p> <p>20 to which it's being advocated by Dr. Shanley. But,</p> <p>21 you know, I kind of feel that the paragraph speaks</p> <p>22 for itself.</p>	<p>48</p> <p>1 MR. LAUPPE: Object to form and scope.</p> <p>2 A I actually had seen, whether it was this</p> <p>3 specific one or something else from him in the --</p> <p>4 during the time when I was at DeltaFive, because, as</p> <p>5 I mentioned, we were trying to integrate SPADs, and</p> <p>6 just having a devil of a time with the circuitry to</p> <p>7 support the quenching and just the sequencing</p> <p>8 basically that each one of those sensor arrays</p> <p>9 needed. And so this was -- this and/or something</p> <p>10 very similar to this I had seen somewhere in the</p> <p>11 2017-ish, 2018-ish time frame.</p> <p>12 Q And do you know who Sergey Vinogradov is?</p> <p>13 MR. LAUPPE: Object to form and scope.</p> <p>14 A Well, I mean, as it says here, he -- well,</p> <p>15 my understanding is that he's with the -- I'm</p> <p>16 probably not going to say this very fluidly either</p> <p>17 -- the Lebedev Physical Institute, Russian Academy</p> <p>18 of Sciences, and I don't remember much else about</p> <p>19 his credentials. But in below the title there are</p> <p>20 footnotes associated with his name and the other</p> <p>21 co-authors, including -- no, I'm sorry, it was just</p> <p>22 him, yeah.</p>

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HESAI EX1034, P.13

Conducted on August 30, 2024

<p>49</p> <p>1 Q So other than what's referenced in Exhibit</p> <p>2 2014 itself, do you have any understanding of Sergey</p> <p>3 Vinogradov's background or experience with LiDAR</p> <p>4 systems?</p> <p>5 MR. LAUPPE: Object to form and scope.</p> <p>6 A Did you say 2014?</p> <p>7 Q Exhibit 2014 is the exhibit number. Other</p> <p>8 than what's described or included in Exhibit 2014,</p> <p>9 you don't have any -- any other knowledge or</p> <p>10 understanding of Sergey Vinogradov's background or</p> <p>11 experience with LiDAR systems?</p> <p>12 MR. LAUPPE: And same objections.</p> <p>13 A I know that I've seen the name. I've not</p> <p>14 met him in person. But I would say that if you had</p> <p>15 asked me this in the 2018 time frame, I probably</p> <p>16 would have a better memory of his credentials.</p> <p>17 But -- but, anyway, you know, beyond that, I -- it</p> <p>18 would take me a little time, I think, to recall the</p> <p>19 specifics of my familiarity with him.</p> <p>20 Q Sitting here today, you can't recall</p> <p>21 anything about him beyond what was indicated in</p> <p>22 Exhibit 2014 itself?</p>	<p>51</p> <p>1 in the bracketed numbers 20 to 21, 22, 23 and 24.</p> <p>2 Do you see that?</p> <p>3 A Yes, sir, I pulled those over, yes.</p> <p>4 Q And if you turn to the last page of</p> <p>5 Exhibit 2014, that includes the authors and titles</p> <p>6 of those papers numbers 20 to 24. Do you see that?</p> <p>7 A Yes. The references?</p> <p>8 Q That's right.</p> <p>9 A Yes.</p> <p>10 Q And so my question is did you read or</p> <p>11 review those five references numbered 20 to 24 in</p> <p>12 Exhibit 2014 in preparing your declaration?</p> <p>13 MR. LAUPPE: Object to form and scope.</p> <p>14 A The reference from Zappa from SPIE, I</p> <p>15 don't recall the extent to which and how deep I went</p> <p>16 into that reference. From Frach looks familiar,</p> <p>17 because around that time and prior to that time I</p> <p>18 was also doing work for -- well, we were delivering</p> <p>19 products to GE Nuclear Hitachi -- GE Hitachi</p> <p>20 Nuclear, Framatome and Areva, and so those are the</p> <p>21 most familiar ones as I look at those.</p> <p>22 You know, if you were to ask me to recite</p>
<p>50</p> <p>1 MR. LAUPPE: Object to form and scope.</p> <p>2 A I would have to go back and look at some</p> <p>3 notes from that time frame to be sure.</p> <p>4 Q My question is sitting here today, you</p> <p>5 can't recall anything specific about him beyond</p> <p>6 what's indicated in Exhibit 2014. Is that fair?</p> <p>7 MR. LAUPPE: Same objections and asked and</p> <p>8 answered.</p> <p>9 A The only thing that I can recall is that I</p> <p>10 gave credence to his research and reporting at the</p> <p>11 time, and that I would have to go back and take a</p> <p>12 look at my notes to have more details.</p> <p>13 Q And in -- in paragraphs 145 and 146 of</p> <p>14 your declaration, you quote from some passages in</p> <p>15 the Vinogradov paper Exhibit 2014 on pages 3 and 4.</p> <p>16 Do you see that?</p> <p>17 A Yes.</p> <p>18 Q And specifically -- let me start that</p> <p>19 over.</p> <p>20 The portions of Exhibit 2014 that you</p> <p>21 quote in paragraphs 145 and 146, those include</p> <p>22 citations to several other papers that are indicated</p>	<p>52</p> <p>1 for you the specifics of those documents, I would</p> <p>2 have to go back and do some homework, but -- and</p> <p>3 then the others may or may not have drilled down</p> <p>4 that deep. But, you know, again, I gave credence to</p> <p>5 the author that the research was done in a proper</p> <p>6 manner.</p> <p>7 Q I'm not sure I understood your answer.</p> <p>8 Let me -- let me see if I can clarify.</p> <p>9 You mentioned some of these papers look</p> <p>10 familiar. Let me take them one by one.</p> <p>11 Did you review the Zappa paper reference</p> <p>12 number 20 in Exhibit 2014, did you review that when</p> <p>13 you were preparing your declaration in this</p> <p>14 proceeding?</p> <p>15 MR. LAUPPE: Object to form and scope.</p> <p>16 A As I was writing this -- well, let me just</p> <p>17 I guess kind of say at the outset, I'm not really</p> <p>18 sure as it relates to fill factor and integration of</p> <p>19 SPADs that Dr. Shanley put forth anything specific</p> <p>20 to fill factor. So the, you know, the depth of</p> <p>21 research into teaching references, or references</p> <p>22 that give a perspective of a person of ordinary</p>

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HESAI EX1034, P.14

<p>53</p> <p>1 skill at or around that time, particularly one that 2 had credibility, you know, probably dictated what 3 might have been a perceived need to drill down. 4 But that being said, again, those 5 references look familiar to me. During the 6 composition of my declaration, I may or may not have 7 glanced at them. But -- but I believe historically 8 I did at least to the extent to make sure that they 9 squared with the authors' positions. 10 Q I didn't hear a clear answer there. 11 Do you not recall whether you reviewed the 12 Zappa reference, reference number 20 in Exhibit 13 2014, specifically for the purposes of preparing 14 your declaration Exhibit 2010? 15 MR. LAUPPE: Object to form and scope. 16 A I try to be a good steward of listing the 17 materials that I utilized, and I'll defer to that. 18 Whether I went back and looked at it during the 19 composition, I don't exactly recall. But, again, 20 looks familiar from at least prior review. 21 Q When you say you try to be a good steward 22 of listing the materials that you utilized, do you</p>	<p>55</p> <p>1 of reviewing the Zappa reference, which is reference 2 number 20 to Exhibit 2014, when you were preparing 3 your declaration in this action? 4 MR. LAUPPE: Object to form, scope, and 5 asked and answered. 6 A I would not rule it out. Recognize Zappa 7 and the other one that I mentioned, exactly when I 8 last looked at them is not really coming to mind 9 right now. Again, it's a reference within a 10 reference, and it's included, and, you know, I'll 11 just kind of restate here, I just don't recall, and 12 I'm happy to look at it if he did, where Dr. Shanley 13 put forth anything related to fill factor 14 modification. 15 Q My question was just you do not 16 specifically recall reviewing the Zappa reference 17 when you were preparing your declaration in this 18 action. Is that right? 19 MR. LAUPPE: Object to form, scope, and 20 asked and answered. 21 A With respect, my answer will be the same. 22 I can't rule it out. I look at a lot of things when</p>
<p>54</p> <p>1 mean if you relied on particular materials, you 2 would have identified it in your declaration? 3 A I do make that effort. That doesn't mean 4 it's -- 5 MR. LAUPPE: Just object to form and 6 scope. 7 You can proceed. I'm sorry to interrupt 8 you. 9 THE WITNESS: No. I apologize. 10 A I do make that effort. It doesn't mean 11 that things are always included to the nth degree. 12 In this situation it's a reference that's included 13 in a reference. And so if it's not listed, it 14 doesn't mean I didn't necessarily glance at it, or 15 didn't necessarily remember it to any particular 16 extent. 17 But I -- as I'm here today, I can't recall 18 the extent to which I went back and looked at the 19 citations in the Vinogradov reference while 20 composing this declaration. 21 Q All right. Let me -- let me ask more 22 specifically, do you have any specific recollection</p>	<p>56</p> <p>1 I put together declarations. If it's a significant 2 reference, or if it's a stand-alone reference, which 3 is to say not included in another citation, then I 4 make the effort to be a good steward and list it. 5 If it's included by reference, then, again, I can't 6 rule it out that I reviewed that at least in part or 7 as a refresher, if only to refresh my memory that 8 that's the same reference I looked at in the late 9 2010s time frame. That's really as far as I would 10 go. I can't rule it out. I can't say definitively. 11 Q And so that's my question, you don't have 12 a specific recollection that you did review the 13 Zappa reference in Exhibit 2014? I'm not asking if 14 you can rule it out or not. I'm asking do you have 15 a specific recollection that you reviewed that 16 reference in preparing your declaration in this 17 action? 18 MR. LAUPPE: And again, object to form, 19 scope, asked and answered. 20 A It's entirely possible that I looked at it 21 if only briefly to refresh my memory of that 22 particular reference --</p>

Conducted on August 30, 2024

<p>57</p> <p>1 (Simultaneous speaking.)</p> <p>2 Q I'm not asking -- Doctor, I need an answer</p> <p>3 to my question. I'm not asking if it's possible.</p> <p>4 I'm asking do you have a specific</p> <p>5 recollection of reviewing the Zappa reference when</p> <p>6 you prepared your declaration?</p> <p>7 MR. LAUPPE: Again, object to form, scope,</p> <p>8 asked and answered. Also, I would just -- if you</p> <p>9 could keep from interrupting the witness, please,</p> <p>10 Ron.</p> <p>11 MR. HAGIZ: I need -- I need an answer to</p> <p>12 my question, so I'm going to make sure that I get</p> <p>13 it.</p> <p>14 BY MR. HAGIZ:</p> <p>15 Q Doctor, do you have a specific</p> <p>16 recollection of reviewing the reference -- the Zappa</p> <p>17 reference when you were preparing your declaration?</p> <p>18 MR. LAUPPE: Same objections. And also, I</p> <p>19 mean, if you want an answer, you need to stop</p> <p>20 interrupting the witness.</p> <p>21 MR. HAGIZ: We don't need the colloquy on</p> <p>22 the record.</p>	<p>59</p> <p>1 things sometimes ever so briefly just to make sure</p> <p>2 that it's what I thought it was to ground truth it.</p> <p>3 That one is -- is I can only say less clear than the</p> <p>4 Zappa reference.</p> <p>5 Q Okay. But my question is not about ruling</p> <p>6 out. You don't have an affirmative recollection</p> <p>7 that you reviewed the Durini reference when you</p> <p>8 prepared your declaration. Is that right?</p> <p>9 MR. LAUPPE: Object to form and scope.</p> <p>10 A I would not go that far. I would have to</p> <p>11 go back and look at my notes.</p> <p>12 Q Okay. So you can tell me sitting here</p> <p>13 right now that you reviewed the Durini reference</p> <p>14 when you were preparing your declaration. Is that</p> <p>15 your testimony today?</p> <p>16 MR. LAUPPE: Object to form and scope.</p> <p>17 A I would have to go back and look at my</p> <p>18 notes.</p> <p>19 Q So you don't recall?</p> <p>20 MR. LAUPPE: Object to form and scope.</p> <p>21 A Is this a memory test or, you know, would</p> <p>22 I be able to go back and look at my notes?</p>
<p>58</p> <p>1 Q Doctor, can you answer my question?</p> <p>2 A With respect, Counsel, I would say it the</p> <p>3 exact same way. I can't rule out the possibility.</p> <p>4 I do recall looking at that reference somewhat</p> <p>5 recently, whether that was while working on the IPR</p> <p>6 or just refreshing my memory on other matters, I</p> <p>7 can't say exactly. But it's fairly recent that I</p> <p>8 looked at it, and I would have to go back and see if</p> <p>9 I have some notes specific to that.</p> <p>10 Q What is fairly recent? Is that in the</p> <p>11 past year?</p> <p>12 MR. LAUPPE: Object to form.</p> <p>13 A Well, I would say definitely within the</p> <p>14 past year. But which specific month, I would have</p> <p>15 to go back and look at my notes.</p> <p>16 Q But with respect to the Durini reference,</p> <p>17 reference 21 in Exhibit 2014, did you have a</p> <p>18 specific recollection of reviewing that in preparing</p> <p>19 your declaration in this proceeding?</p> <p>20 MR. LAUPPE: Object to form and scope.</p> <p>21 A That one is less clear to me. Again, I'm</p> <p>22 sorry, but I can't rule it out. I look at a lot of</p>	<p>60</p> <p>1 Q I'm asking if you recall whether you</p> <p>2 reviewed the Durini reference when you were</p> <p>3 preparing your declaration. That's my question.</p> <p>4 Can you answer that question?</p> <p>5 MR. LAUPPE: Same objections.</p> <p>6 A Yeah, I would have to go back and look at</p> <p>7 my notes.</p> <p>8 Q Do you have an affirmative recollection of</p> <p>9 reviewing the Zou reference, reference 22 cited in</p> <p>10 the Vinogradov paper Exhibit 2014, when you were</p> <p>11 preparing your declaration in this proceeding?</p> <p>12 MR. LAUPPE: Object to form and scope.</p> <p>13 A That fits into the Zappa category, that</p> <p>14 seems more fresh to me. I have a -- you know, a</p> <p>15 similarly -- a similar recollection of looking at it</p> <p>16 to ground truth. But as with all of these, I would</p> <p>17 have to go back and look at my notes.</p> <p>18 Q Do you have an affirmative recollection of</p> <p>19 reviewing the first Frach reference, reference</p> <p>20 number 23 cited in the Vinogradov article Exhibit</p> <p>21 2014, when you were preparing your declaration in</p> <p>22 this proceeding?</p>

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HESAI EX1034, P.16

Conducted on August 30, 2024

<p>61</p> <p>1 MR. LAUPPE: Object to form and scope.</p> <p>2 A That I would put in the same category as</p> <p>3 the Durini reference, I believe. But again, I would</p> <p>4 have to go back and look at my records.</p> <p>5 Q And same question, do you have an</p> <p>6 affirmative recollection of reviewing the second</p> <p>7 Frach reference, reference number 24 cited in the</p> <p>8 Vinogradov article Exhibit 2014, when you were</p> <p>9 preparing your declaration for this proceeding?</p> <p>10 MR. LAUPPE: Object to form and scope.</p> <p>11 A That fits into the category of the Durini</p> <p>12 one, where it's less clear to me. But with respect,</p> <p>13 I would probably have to go back and look at my</p> <p>14 records to see the last time I took a look at those.</p> <p>15 MR. HAGIZ: Okay. I think I'm almost</p> <p>16 done. Why don't we take a five-minute break, let me</p> <p>17 just collect my notes and see if we can wrap this</p> <p>18 up.</p> <p>19 MR. LAUPPE: Thanks, Ron.</p> <p>20 (Recess 10:49 a.m. - 10:52 a.m.)</p> <p>21 MR. HAGIZ: Thanks for your time today,</p> <p>22 Dr. Janet. That's all the questions I have for you.</p>	<p>63</p> <p>1 CERTIFICATE OF CERTIFIED SHORTHAND REPORTER</p> <p>2 NOTARY PUBLIC</p> <p>3</p> <p>4 I, MONIQUE VOUTHOURIS, Certified Court Reporter</p> <p>5 and Notary Public within and for the State of New</p> <p>6 Jersey, do hereby certify:</p> <p>7 That JASON A. JANÉT, PH.D., the witness whose</p> <p>8 remote deposition is hereinbefore set forth, was</p> <p>9 duly sworn by me before the commencement of such</p> <p>10 deposition, and that such deposition was taken</p> <p>11 before me and is a true record of the testimony</p> <p>12 given by such witness.</p> <p>13 I further certify that the adverse party,</p> <p>14 OUSTER, INC., was represented by counsel at the</p> <p>15 deposition.</p> <p>16 I further certify that the remote deposition of</p> <p>17 JASON A. JANÉT, PH.D. occurred on Friday, August 30,</p> <p>18 2024, commencing at 9:02 a.m. to 10:52 a.m.</p> <p>19 I further certify that I am not related to any</p> <p>20 of the parties to this action by blood or marriage,</p> <p>21 I am not employed by or an attorney to any of the</p> <p>22 parties to this action, and that I am in no way</p>
<p>62</p> <p>1 MR. LAUPPE: And no questions from me at</p> <p>2 this point.</p> <p>3 (Time noted: 10:52 a.m.)</p> <p>4</p> <p>5 *****</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p>	<p>64</p> <p>1 interested, financially or otherwise, in the outcome</p> <p>2 of this matter.</p> <p>3 IN WITNESS WHEREOF, I have hereunto set my hand</p> <p>4 this 4th day of September 2024.</p> <p>5</p> <p>6</p> <p>7</p> <p>8 </p> <p>9 Monique Vouthouris, CCR, RPR, CRR</p> <p>10 Notary Public of the State of New Jersey</p> <p>11 My commission expires: April 8, 2029</p> <p>12</p> <p>13</p> <p>14</p> <p>15</p> <p>16</p> <p>17</p> <p>18</p> <p>19</p> <p>20</p> <p>21</p> <p>22</p>

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HESAI EX1034, P.17

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ability 22:20	actually 32:3, 48:2	all 12:14, 15:17, 20:8, 24:9, 30:17, 36:5, 36:8, 38:14, 39:8, 40:16, 54:21, 60:16, 61:22	56:3
able 15:21, 18:15, 21:7, 21:10, 22:20, 32:2, 39:8, 40:9, 59:22	actuation 40:11	almost 61:15	answer 6:1, 6:2, 6:9, 7:14, 42:17, 52:7, 53:10, 55:21, 57:2, 57:11, 57:19, 58:1, 60:4
about 8:21, 10:15, 17:5, 26:13, 29:9, 29:18, 30:6, 30:7, 30:8, 30:17, 31:10, 37:17, 47:14, 48:18, 49:21, 50:5, 59:5	address 42:20, 43:11	alone 38:13	answered 46:14, 50:8, 55:5, 55:20, 56:19, 57:8
above 38:20	adjunct 11:8, 27:5, 27:8	along 28:5	answers 5:19
absolutely 6:11	adverse 63:13	alongside 38:13	anti-submarine 30:22
academia 26:20	advocated 46:19, 46:20	already 19:21	anticipate 22:7
academic 15:13, 32:17, 35:12, 35:22, 37:1	affect 13:20	also 11:9, 11:14, 13:12, 14:7, 18:5, 24:11, 31:4, 51:18, 57:8, 57:18	any 6:14, 6:19, 7:8, 8:10, 12:10, 16:20, 19:2, 19:4, 26:14, 27:2, 32:18, 34:17, 35:12, 36:22, 49:2, 49:9, 54:15, 54:22, 63:19, 63:21
academy 48:17	affirmative 59:6, 60:8, 60:18, 61:6	alto 3:15	anyone 7:5
accelerometers 11:19, 13:5	affirmed 5:4	always 19:14, 54:11	anything 25:1, 26:14, 28:16, 49:21, 50:5, 52:19, 55:13
accessible 42:13	after 6:2, 26:21, 35:20	ambient 13:18, 19:16, 21:6, 21:11	anyway 20:5, 38:9, 49:17
acoustic 13:6, 16:14, 31:12	again 14:5, 14:13, 16:9, 26:18, 28:4, 29:11, 32:10, 33:22, 35:2, 39:19, 41:14, 41:20, 45:8, 46:18, 52:4, 53:4, 53:19, 55:9, 56:5, 56:18, 57:7, 58:21, 61:3	ambiguity 46:18	anywhere 8:11
acquiring 16:22	agree 45:6	among 12:20, 16:5, 33:3, 40:2	apart 11:13, 12:2, 12:10, 13:15, 39:22
across 35:22, 47:21	ahead 23:20	amount 9:19, 36:4	apds 40:12
action 55:3, 55:18, 56:17, 63:20, 63:22	air 29:1, 29:15	amplification 14:8, 43:6	aperture 31:11, 32:11,
actionable 17:12	algorithms 17:13, 17:15	amplify 14:7	
		anatomy 12:2	
		andre 5:3	
		another 13:5, 34:12,	

41:8, 41:18, 42:6, 43:18, 44:6, 44:12, 44:16, 45:12, 46:9, 46:11 apologize 54:9 appeal 1:2 application 33:11 applied 31:1 apply 11:3 applying 11:7 approach 11:15, 20:15, 21:2 april 64:11 aqueous 29:1 area 24:9 areva 51:20 around 16:2, 20:4, 24:14, 33:19, 36:12, 51:17, 53:1 array 31:10, 32:11, 41:8, 41:18, 42:6, 43:18, 44:6, 44:13, 45:12, 46:9, 46:11 arrayed 41:8, 41:17, 42:4, 43:17, 44:4, 44:12, 44:16, 45:11 arrays 30:21, 31:18, 42:20, 43:4,	43:9, 48:8 article 47:9, 47:18, 60:20, 61:8 as-needed 25:10 aside 24:15 asked 46:14, 49:15, 50:7, 55:5, 55:20, 56:19, 57:8 asking 5:18, 28:11, 56:13, 56:14, 57:2, 57:3, 57:4, 60:1 aspects 45:20 assembly 17:8, 24:7 asserts 44:1 associated 48:20 attorney 63:21 attract 29:2 attraction 29:4 attractor 29:17 august 1:15, 63:17 author 52:5 authors 51:5, 53:9 automated 37:21 automation 10:11, 22:2, 27:12 autonomously 22:21 available 47:13, 47:16	avalanche 20:4, 42:2 avenue 3:7 avionic 28:19 avoid 30:1 aware 8:14, 35:1 <hr/> B <hr/> bachelor 9:16, 10:9, 11:8 bachelor's 25:2 back 14:14, 17:10, 30:14, 50:2, 50:11, 52:2, 53:18, 54:18, 58:8, 58:15, 59:11, 59:17, 59:22, 60:6, 60:17, 61:4, 61:13 back-end 38:1 background 8:22, 26:2, 49:3, 49:10 bad 31:16 based 28:22 baseline 21:14 basic 30:2, 40:10 basically 21:16, 48:8 basis 18:8, 25:10 battery-operated 30:9 beamforming 32:12	became 28:17 because 6:12, 16:8, 22:2, 22:3, 32:14, 38:19, 43:5, 44:20, 48:4, 51:17 become 35:20 been 5:10, 7:20, 9:10, 23:13, 23:18, 34:11, 34:12, 35:17, 37:7, 37:8, 37:10, 37:15, 40:7, 42:1, 43:9, 43:16, 44:2, 53:3 before 1:2, 2:6, 5:10, 6:9, 7:15, 12:4, 12:7, 26:13, 47:22, 63:9, 63:11 begin 6:9 behalf 3:3, 3:11 being 5:4, 14:6, 15:21, 18:15, 32:2, 35:2, 46:1, 46:4, 46:19, 46:20, 53:4 believe 20:3, 33:5, 37:20, 42:9, 43:20, 45:20, 46:3, 53:7, 61:3 below 48:19 benefits 43:10 beside 31:17
---	---	---	--

best 6:6, 29:14, 36:14, 47:13 better 39:1, 43:1, 49:16 between 13:12 beyond 22:9, 49:17, 49:21, 50:5 big 12:22, 30:10 bigger 28:4 biggest 20:7 bit 8:21, 19:21, 20:18, 40:12 blanking 38:8 blessed 35:18 blew 33:22 block 37:11 blood 63:20 blue-green 31:2, 32:13 board 1:2 bolted 28:7 borowski 40:21, 42:3, 43:3, 44:3 borowski's 42:20 both 16:2, 17:2, 19:3, 27:6, 27:20, 28:12, 33:14 bought 39:21	bracketed 51:1 brand 19:20 break 7:11, 7:12, 7:15, 40:17, 61:16 brew 38:18 briefly 5:16, 56:21, 59:1 bring 42:8 bucket 18:14 budget 35:3 build 11:2, 11:13, 12:9, 17:7, 17:8, 22:8, 22:13, 39:4 building 12:4, 13:14, 16:20, 17:17, 19:5, 19:10, 23:12, 24:1, 24:17, 25:3, 27:21, 32:20, 34:17, 35:13, 36:2, 36:19, 37:2, 37:11 built 22:10, 28:20, 35:8 bulky 19:21, 19:22 bullet 30:19 burden 30:4 butchering 47:12 buy 19:20, 33:10 <hr/> C <hr/> cadmium 20:2	california 3:15 called 24:10, 33:19, 40:4 came 28:5, 35:4 camera 14:9, 14:12 can't 7:8, 20:20, 28:15, 36:13, 49:20, 50:5, 54:17, 55:22, 56:5, 56:10, 58:3, 58:7, 58:22 capability 37:14 career 19:3, 19:4, 27:3, 32:17, 32:18, 35:12, 36:1, 37:1 carnegie 34:11 carolina 14:21, 24:10, 27:7 carrier 43:6 case 1:10, 17:5 cases 12:3, 14:9, 32:1, 35:8 category 11:11, 60:13, 61:2, 61:11 cause 13:2 ccr 1:21, 64:9 ceiling 29:15 cellophane 14:2, 14:3 center 19:21, 24:9	centimeter 29:19 ceo 37:19 certain 23:1 certainly 8:18, 35:17 certificate 63:1 certified 2:7, 2:8, 63:1, 63:4 certify 63:6, 63:13, 63:16, 63:19 challenge 18:22, 33:4, 33:6, 33:9, 33:15, 33:16, 34:16 challenges 20:7, 33:4, 33:8 chance 8:1 change 31:11, 40:13 chat 6:20, 7:19, 7:21, 42:11, 47:15 circuitry 17:8, 48:6 citation 45:5, 56:3 citations 50:22, 54:19 cited 60:9, 60:20, 61:7 claim 39:9 clarify 52:8 classes 9:18, 11:16, 27:9
---	--	---	---

classic 39:11 classified 30:16 cleanliness 38:7, 38:14 clear 6:7, 44:20, 53:10, 58:21, 59:3, 61:12 climb 29:3 climbing 28:22 clock 24:14 close 5:13, 31:13 closer 40:7 cloud-generating 37:9 clouds 36:19 co-authors 48:21 cobots 38:12 collect 61:17 collective 32:11 colloquy 57:21 colored 14:3 combination 40:21, 41:4, 41:16 combinations 41:7 combine 43:16 come 20:14, 47:21 comes 25:14 coming 55:8	commencement 63:9 commencing 63:18 commercial 16:12, 22:4, 33:7, 37:3, 37:6, 39:11 commission 64:11 common 27:12 communicate 7:4, 31:5 communications 6:20, 7:2, 7:3 company 28:21, 37:18, 37:20, 40:3 competition 35:10 competitions 22:16 complement 23:3 complete 7:9 components 16:22, 17:7 composing 54:20 composition 53:6, 53:19 comprehensive 33:2 computer 6:17, 15:8, 16:16, 23:8, 36:13, 36:16, 39:13, 39:14 concentration 9:11, 15:14 concludes 43:7 conducted 1:14, 2:5 conduits 13:3	consider 10:3, 21:20 continue 29:10 continues 18:22 contractor 32:4 control 12:21, 32:9 controlled 19:18 controls 9:14, 27:11 cool 29:16 cooley 3:13 core 17:7 correct 8:12, 26:3 corrected 4:11, 7:22 correction 8:18 correctly 44:8, 44:9, 46:3 cost 38:19 cot 24:11 could 8:22, 10:5, 11:20, 13:8, 14:9, 14:12, 20:12, 20:13, 20:14, 21:1, 23:2, 26:18, 29:3, 29:20, 30:14, 31:4, 31:5, 31:11, 32:9, 33:10, 33:20, 34:4, 35:16, 39:17, 40:6, 47:12, 57:9	couldn't 17:3, 24:3, 31:19, 36:4 counsel 5:9, 5:22, 6:21, 7:5, 58:2, 63:14 couple 8:15, 9:17, 12:3, 13:4, 15:4, 19:17, 20:1, 20:12, 22:16, 22:18, 27:7, 36:21, 37:17 courses 11:1, 27:20 court 2:7, 6:7, 63:4 covers 21:17 created 17:13 credence 50:10, 52:4 credentials 48:19, 49:16 credibility 53:2 credit 39:9 cross-section 9:12 cross-talk 44:19 crossed 24:21, 29:19 crr 1:21, 64:9 crude 14:10, 14:13 curriculum 9:17, 10:1, 10:14, 11:1, 11:9, 12:9 cut 12:12 cv 9:1
--	--	---	---

cycle 19:14	58:19, 59:8, 59:14, 60:3, 60:11, 60:21, 61:9	describe 10:4, 45:16	direct 45:2
D		described 21:5, 49:8	directional 31:6
dabbled 40:12	declarations 56:1	describing 23:12	directly 13:10
daniels 24:10	deep 51:15, 52:4	desert 34:5	dirty 19:10
darpa 30:21, 33:4, 34:15	defer 53:17	design 11:2, 21:7, 24:16, 36:12, 39:4	discipline 15:1
date 16:14	definitely 58:13	designing 19:4, 25:4, 32:20, 34:17, 35:14, 36:2, 37:2	disclosed 44:3
dauntless 11:15	definition 37:5	desktop 8:3	discover 8:17
day 23:4, 34:3, 36:17, 38:2, 64:4	definitively 56:10	details 50:12	discovering 10:10
days 11:21	deflection 13:9	detecting 10:5	discussed 25:20, 27:1
deal 30:10	deflections 14:6	detector 33:13, 39:5	discussing 34:16
dealt 16:19	degraded 21:18	detectors 42:3	displays 44:18
decades 27:7	degree 10:10, 14:16, 17:19, 54:11	detection 42:7, 43:4, 43:19, 44:7, 45:14, 46:12	disrupted 29:17, 29:21
decent 16:18	delivering 51:18	device 24:1, 32:20	distance 12:19, 13:11
decide 15:13	deltafive 37:18, 38:5, 48:4	devices 27:3, 34:18	distorted 20:17
declaration 4:10, 4:11, 7:22, 8:6, 8:11, 9:2, 25:21, 26:2, 27:1, 40:22, 41:12, 42:14, 42:19, 43:14, 43:21, 43:22, 44:11, 45:2, 45:3, 45:10, 47:3, 50:14, 51:12, 52:13, 53:6, 53:14, 54:2, 54:20, 55:3, 55:17, 56:16, 57:6, 57:17,	depends 37:5	devil 48:6	distributed 30:21
	deploy 38:21	dictated 53:2	doctor 40:20, 57:2, 57:15, 58:1
	deployed 32:1, 32:2, 34:12, 35:9, 37:11, 37:13, 37:15	different 10:21, 12:19, 15:4, 20:5, 38:7, 39:21	document 47:20
	deposed 5:10	difficult 19:8, 31:16, 36:19	documents 52:1
	deposition 1:13, 2:4, 6:16, 63:8, 63:10, 63:15, 63:16	digital 20:19	doing 6:12, 20:11, 23:1, 24:6, 51:18
	depth 52:20		done 52:5, 61:16
			door 39:18
			double-check 6:13
			dove 25:9

down 20:18, 22:7, 30:19, 35:11, 52:3, 53:3 download 8:1 dozen 12:17 dr 5:8, 41:22, 42:10, 42:13, 42:18, 43:3, 43:7, 43:14, 43:21, 44:1, 44:10, 44:21, 45:3, 45:9, 45:10, 45:18, 46:1, 46:5, 46:10, 46:20, 52:19, 55:12, 61:22 drill 53:3 drilled 52:3 dsp 20:21 duke 27:6, 27:19, 28:12, 32:18 duly 5:4, 63:9 during 6:16, 9:20, 9:22, 12:9, 15:14, 16:5, 17:19, 23:12, 25:2, 25:8, 27:8, 32:16, 32:17, 48:4, 53:5, 53:18 durini 58:16, 59:7, 59:13, 60:2, 61:3, 61:11 dust 33:22 <hr/> E <hr/> each 15:18, 31:5,	48:8 earlier 7:13 early 16:12, 17:6, 28:7 easier 35:20 economic 38:20 edt 1:16 education 25:2 effort 33:12, 54:3, 54:10, 56:4 efforts 33:17 either 13:9, 36:6, 48:16 elaborate 12:21 electrical 15:7 electronics 9:14, 9:18, 24:7, 24:8, 46:8 elements 13:18, 38:5 else 7:5, 25:2, 26:14, 45:16, 46:15, 48:3, 48:18 email 6:18, 6:20 emanuel 3:6 embedded 37:7 emission 43:18, 44:5, 45:13 emitter 33:13, 39:5 emphasis 9:20, 9:22	employed 63:21 employment 27:2 enable 29:12 enabled 29:2, 39:2 encoder 19:18 encounters 31:13 encouraging 21:22, 23:5 end 10:9, 17:10, 23:4, 31:15, 34:3, 36:17, 38:2 endeavor 17:6, 22:14 ended 10:19 engineering 9:5, 9:13, 9:17, 14:18, 14:20, 15:6, 15:7, 27:10 enhance 37:21 enough 20:9, 20:10, 38:17 enter 38:11 entertainment 37:22 entirely 46:4, 56:20 environment 17:17, 18:6, 18:16, 22:22 environments 39:15 envisioned 46:1 equipment 35:3	errata 8:19 errors 8:10, 8:15 especially 33:8 esq 3:5, 3:12 essential 37:10 essentially 18:17, 43:1 evaluate 12:18 evaluated 35:8 evaluating 13:4 even 13:8, 23:4, 29:4 ever 21:1, 21:9, 59:1 every 7:12, 37:6 everything 9:13, 11:18, 25:11, 27:17, 38:16, 39:9 exact 58:3 exactly 14:18, 19:9, 46:19, 53:19, 55:7, 58:7 examination 4:2, 5:6 example 16:18, 17:12, 25:6, 39:11 examples 12:18, 35:17 exhaustive 16:11 exhibit 4:10, 4:11, 4:13, 7:21,
--	--	---	--

42:10, 42:13, 47:15, 47:19, 47:20, 49:1, 49:7, 49:8, 49:22, 50:6, 50:15, 50:20, 51:5, 51:12, 52:12, 53:12, 53:14, 55:2, 56:13, 58:17, 60:10, 60:20, 61:8 exhibits 4:9 exists 37:19 experience 8:22, 38:3, 49:3, 49:11 expertise 34:2 expires 64:11 explored 15:4 extent 8:14, 9:14, 9:15, 46:19, 51:15, 53:8, 54:16, 54:18 extract 18:7, 28:8	far 29:7, 56:9, 59:10 fast 20:9, 20:10 features 18:15 feel 8:11, 21:19, 34:3, 46:21 few 6:13, 16:10, 39:1 field 15:12, 16:10, 19:15 fielded 34:5 fielding 33:14 fifth 38:9 figure 18:16, 22:20, 22:21 figuring 17:16 fill 52:18, 52:20, 55:13 filter 13:18 filters 14:2, 14:4 financially 64:1 find 10:13, 11:7, 11:21, 22:4, 30:15, 30:18 finder 28:7, 30:3, 30:11 finders 29:12, 38:22 fine 21:14, 21:15, 34:21	finish 6:9 finished 12:4 first 5:4, 33:5, 33:16, 39:8, 40:17, 60:19 fit 33:17 fits 60:13, 61:11 fitted 33:16 five 38:5, 38:9, 51:11 five-minute 61:16 flight 20:11, 21:2 floor 3:7, 23:9 fluid 12:21, 13:1 fluidly 47:10, 48:16 flutter 13:13 focus 9:8, 10:22, 15:2, 15:14, 41:3 focused 16:1, 16:5 focuses 17:19 focusing 11:1 folder 8:2 folks 15:5 follows 5:5 footnotes 48:20 forget 38:6	form 8:13, 10:2, 11:4, 12:11, 13:16, 16:7, 17:1, 17:21, 18:12, 19:6, 21:8, 23:15, 24:2, 24:19, 25:5, 25:15, 25:22, 26:17, 27:4, 27:22, 32:22, 34:8, 34:19, 35:15, 36:3, 37:4, 39:7, 41:10, 41:20, 44:14, 45:4, 45:15, 46:13, 48:1, 48:13, 49:5, 50:1, 51:13, 52:15, 53:15, 54:5, 55:4, 55:19, 56:18, 57:7, 58:12, 58:20, 59:9, 59:16, 59:20, 60:12, 61:1, 61:10 format 17:12 formation 31:3, 31:10, 32:8, 32:9 forth 52:19, 55:13, 63:8 fortunately 19:19, 38:22 fourth 15:8 frach 51:16, 60:19, 61:7 framatome 51:20 frame 19:9, 23:19, 27:15, 27:16,
F			
factor 52:18, 52:20, 55:13 fair 9:19, 50:6 fairly 58:7, 58:10 fall 29:22 familiar 47:21, 51:16, 51:21, 52:10, 53:5, 53:20 familiarity 49:19			

28:6, 48:11, 49:15, 50:3, 56:9 fresh 60:14 friday 1:15, 63:17 front 6:14, 17:10, 23:10, 31:15, 31:20 fulfill 18:7 full 8:14, 39:2 fully 21:9 fundamental 18:3, 21:21 funnel 35:11 further 63:13, 63:16, 63:19	glanced 53:7 glass-like 14:4 go 7:20, 10:13, 15:17, 23:20, 30:14, 32:2, 46:16, 50:2, 50:11, 52:2, 56:10, 58:8, 58:15, 59:10, 59:11, 59:17, 59:22, 60:6, 60:17, 61:4, 61:13 goes 17:22, 43:3, 43:14, 44:17 going 7:19, 15:3, 16:11, 22:22, 31:17, 38:6, 47:18, 48:16, 57:12 good 5:8, 8:20, 9:12, 12:14, 15:10, 28:1, 28:2, 38:3, 40:5, 40:8, 53:16, 53:21, 56:4 gosh 22:18, 39:21 gotten 39:1 grabbed 19:19 grad 15:3, 24:6 grade 21:20, 37:2, 37:3, 37:6 graduated 14:3, 20:3, 20:9 grammatical 8:15	grand 33:4, 33:6, 33:15, 33:16, 34:15 great 11:14, 33:21, 36:14 green 32:13 grid 23:9 ground 12:5, 15:10, 16:1, 42:9, 59:2, 60:16 grumman 32:5 guess 10:12, 28:21, 30:19, 34:14, 37:5, 52:17 guests 38:3	hand 17:22, 18:1, 64:3 hands 11:20, 19:10, 37:7 hands-on 34:22, 35:5, 40:15 hanover 3:14 happen 25:17 happy 55:12 hard 37:16 hc 19:18, 20:8, 20:10, 20:13, 28:18 hear 53:10 heard 44:20 helped 34:2 here 7:20, 8:15, 30:18, 48:14, 49:20, 50:4, 54:17, 55:11, 59:12 hereby 63:6 hereinbefore 63:8 hereunto 64:3 hertz 40:6, 40:7 hesai 1:4, 3:4, 5:9 hesitant 46:16 high 30:8, 43:2 highly 19:16, 21:6,
G		H	
gate 10:8 gave 15:11, 50:10, 52:4 ge 51:19 generally 40:8 generate 33:1 getting 19:10, 21:13, 34:1 gimbal 46:2, 46:5 give 52:22 given 28:10, 63:12 glance 54:14		hagiz 3:5, 4:3, 5:7, 5:9, 40:16, 40:19, 57:11, 57:14, 57:21, 61:15, 61:21 half 10:14, 10:16, 12:17 hall 24:10, 40:21, 41:3, 41:6, 41:16, 42:5, 42:21, 43:12, 43:16, 44:5, 44:18, 46:2 hall's 41:9, 41:18, 42:3, 42:6, 43:10, 43:17, 43:18, 44:3, 44:6, 45:13, 46:12	

31:6 historically 53:7 hitachi 51:19 hitting 13:9 home 38:18 home-brewed 23:7 homework 52:2 honest 7:9 hook 28:21 hopeful 23:2 hoping 39:11, 39:12 hospitality 37:21 hour 7:12 hours 36:10, 36:21 housekeeping 38:13 however 45:21 hummers 34:13 humvee 34:13 hung 38:15	ijcai 22:17 image 30:4 imagine 16:9, 29:8, 30:9, 31:7, 34:1 imaging 43:2 impact 16:14 imperceptible 13:8 implementation 44:17 important 18:7 imsei 14:20, 15:10 in-house 34:2 inc 1:7, 3:11, 63:14 inches 30:7, 30:8 include 34:7, 50:21 included 10:4, 16:12, 28:1, 32:20, 45:21, 49:8, 54:11, 54:12, 55:10, 56:3, 56:5 includes 51:5 including 33:9, 36:7, 48:21 incorporate 42:2, 42:4, 43:9, 43:17, 44:2, 44:4 incorporated 41:9, 41:18 indicated 49:21, 50:6,	50:22 indoor 39:16 indoors 21:11 inexpensive 40:2 information 17:11, 18:7, 18:8, 28:9 infrared 16:15 ingesting 17:10 inherently 16:9 initially 11:5 inserting 45:12, 46:11 inside 32:6 instant 6:21 instead 23:8 institute 14:20, 48:17 instructed 6:1 instruments 28:19 integrate 48:5 integrated 14:17, 14:19, 15:9 integrating 40:1 integration 33:11, 52:18 intended 35:5, 45:7 intensities 43:5 intensity 42:22 intensive 11:18, 19:1,	20:20, 27:21 intent 37:20 intentions 36:14 interest 10:11 interested 14:22, 64:1 interpretation 45:18 interrupt 54:7 interrupting 57:9, 57:20 inventory 24:8, 38:7 investigator 30:20 involve 13:14, 19:4 involved 28:13, 32:19, 34:17, 34:22, 35:13, 36:6, 37:2 involving 23:12, 27:3 ipr 1:10, 58:5 irobot 28:17 ish 27:15, 27:16, 48:11 itself 7:3, 46:6, 46:22, 49:2, 49:22
<hr/> I <hr/>			<hr/> J <hr/>
i-j-c-a-i 22:17 idea 31:21 ideal 30:1 identified 42:21, 43:12, 54:2			james 4:10 janet 1:13, 2:4, 4:2, 4:12, 5:3, 5:8, 7:22, 61:22, 63:7, 63:17

jason 1:13, 2:4, 4:2, 4:12, 5:3, 63:7, 63:17	40:8, 41:1, 42:15, 45:17, 46:21, 47:3, 47:15, 48:12, 49:13, 49:17, 51:22, 52:4, 52:20, 53:2, 55:10, 59:21, 60:14	10:2, 11:4, 12:11, 12:14, 13:16, 16:7, 17:1, 17:21, 18:12, 19:6, 21:8, 23:15, 24:2, 24:19, 25:5, 25:15, 25:22, 26:17, 27:4, 32:22, 34:8, 34:19, 34:21, 35:15, 36:3, 37:4, 39:7, 41:10, 41:13, 41:20, 44:14, 45:4, 45:15, 46:13, 48:1, 48:13, 49:5, 49:12, 50:1, 50:7, 51:13, 52:15, 53:15, 54:5, 55:4, 55:19, 56:18, 57:7, 57:18, 58:12, 58:20, 59:9, 59:16, 59:20, 60:5, 60:12, 61:1, 61:10, 61:19, 62:1	lensing 13:17 less 21:10, 36:21, 58:21, 59:3, 61:12 let's 7:18, 9:18, 25:18, 47:2 level 11:11, 18:3, 21:16, 21:21, 33:13, 39:6 levels 43:2 lidar 16:13, 19:5, 19:10, 19:13, 22:15, 23:2, 23:6, 23:12, 24:1, 24:16, 25:4, 26:8, 26:16, 27:3, 27:12, 28:3, 28:14, 28:16, 32:20, 33:7, 33:18, 34:18, 35:14, 36:2, 36:6, 36:17, 37:3, 37:6, 38:17, 39:3, 39:5, 39:19, 42:3, 43:10, 44:3, 49:3, 49:11 life 24:6 light 13:9, 13:13, 13:19, 19:16, 20:11, 20:15, 20:17, 21:6, 21:11, 21:13, 23:9, 42:6, 43:5, 43:17, 43:19, 44:5, 44:6, 45:13, 46:12
jersey 2:9, 63:6, 64:10	knowledge 49:9		
job 1:19, 31:16	known 16:2		
journeyman 11:11			
K	L		
keep 47:19, 57:9	lab 11:17, 12:1, 12:22		
kind 5:16, 6:19, 7:4, 10:22, 14:13, 16:6, 16:21, 18:3, 23:10, 25:18, 26:14, 27:14, 28:4, 31:14, 35:10, 38:4, 42:9, 46:21, 52:17, 55:11	lamp 38:15 language 45:1 large 24:9 larger 31:21, 32:2, 32:6, 37:11 laser 11:21, 12:18, 14:1, 19:20, 23:8, 28:7, 29:12, 30:2, 30:10, 31:2, 32:13, 34:1, 37:14, 38:22, 42:22 lasers 29:7 last 7:11, 10:14, 10:15, 18:10, 51:4, 55:8, 61:14 late 23:14, 56:8 later 28:6, 28:17 lauppe 3:12, 8:13,		
kinematics 10:17			
knew 14:22			
know 5:15, 7:13, 7:22, 8:14, 9:2, 10:4, 10:13, 11:19, 11:20, 14:2, 14:3, 14:13, 18:4, 21:9, 21:13, 21:15, 23:9, 24:16, 24:21, 27:13, 27:15, 29:13, 29:18, 30:8, 30:16, 32:10, 33:22, 35:2, 35:3, 35:16, 36:5, 37:12, 37:16, 39:16, 40:2,		law 10:20 layer 44:16 least 11:12, 24:20, 46:19, 53:8, 53:20, 56:6 leaving 16:18 lebedev 48:17 led 21:4 left 37:19 length 30:7	

lightweight 29:12 limbs 22:10 limitations 11:7 limited 9:15, 19:15 limiting 10:3 line 40:4, 40:14 list 16:8, 16:10, 33:2, 56:4 listed 27:17, 27:20, 54:13 listing 53:16, 53:22 literally 14:10 little 8:21, 12:6, 20:18, 32:16, 34:14, 40:12, 49:18 llp 3:6, 3:13 localization 18:17 long 16:8, 39:14 look 14:11, 18:18, 20:15, 50:2, 50:12, 51:21, 52:9, 53:5, 55:12, 55:22, 58:15, 58:22, 59:11, 59:17, 59:22, 60:6, 60:17, 61:4, 61:13, 61:14 looked 21:21, 40:2, 40:3, 53:18, 54:18, 55:8,	56:8, 56:20, 58:8 looking 14:5, 33:14, 39:18, 41:11, 58:4, 60:15 looks 51:16, 53:20 lot 28:13, 28:20, 29:17, 36:11, 39:17, 55:22, 58:22 low-powered 36:18 lower 43:5 <hr/> M <hr/> machine 24:7 machinist 11:9, 11:10, 11:12, 35:2 made 30:3, 33:17, 38:16 madison 3:7 maintenance 38:1 major 15:1, 37:20, 38:9 make 14:11, 21:10, 38:2, 38:20, 41:4, 41:15, 45:8, 46:7, 53:8, 54:3, 54:10, 56:4, 57:12, 59:1 man-hours 24:4, 24:16, 36:21 management 43:1 manager 30:20	maneuvering 29:13 manner 52:6 manufacturing 14:17, 14:19, 15:9 many 5:12, 22:10, 24:3, 36:14, 39:21 map 17:17, 22:22 maps 17:12 mark 14:12 marked 4:9, 7:20, 7:21 marriage 63:20 master 11:10 master's 14:16, 16:6, 17:19, 19:4, 19:7, 23:13, 25:3 materials 6:14, 53:17, 53:22, 54:1 matter 7:6, 27:11, 64:2 matters 58:6 maybe 10:14, 23:19, 23:21, 30:6 mean 21:12, 23:16, 25:16, 48:14, 54:1, 54:3, 54:10, 54:14, 57:19 meaning 11:17 meaningful 28:8	mechanical 9:5, 9:12, 9:16, 15:6 mechanisms 14:14 mellon 34:11 memory 49:16, 56:7, 56:21, 58:6, 59:21 mention 44:15 mentioned 10:22, 12:7, 12:8, 17:18, 18:10, 21:3, 21:4, 48:5, 52:9, 55:7 mentors 11:14 message 6:21 met 49:14 micro 37:15 micro-optic 43:17, 44:16, 45:11 micro-optics 41:8, 41:17, 42:5, 44:5, 44:12 micro-robotics 30:21 microwave 24:12 mid 17:6, 23:13 middle 15:10 might 5:13, 5:14, 34:12, 40:7, 53:3 mind 25:14, 55:8
---	---	---	--

minimized 30:4 minimum 45:21 minor 14:5 mission 18:8 mistaken 20:5 mixture 17:2 mobile 15:15, 15:19, 15:20, 15:21, 18:6, 22:11, 27:13, 28:2, 28:3, 28:20 mode 22:6 modification 55:14 modified 35:8 modify 22:7 module 42:7, 43:18, 43:19, 44:5, 44:7, 45:13, 45:14, 46:12 monique 1:21, 2:6, 63:4, 64:9 monitor 38:14 month 58:14 months 24:18 more 5:14, 11:11, 12:6, 17:4, 18:2, 18:18, 29:4, 32:16, 33:10, 34:14, 35:5, 35:17, 37:10, 43:11,	46:8, 47:10, 50:12, 54:21, 60:14 morning 5:8 most 25:7, 25:12, 51:21 mostly 15:22, 27:9, 27:11 motion 15:15, 15:19, 15:20, 16:1, 17:13, 17:14 motivated 25:8, 31:8, 43:9, 43:16 motivation 43:1 motor 19:17 move 14:16 movement 29:1, 29:2 moving 16:3 much 23:22, 24:13, 35:22, 36:1, 48:18 multidisciplinary 14:22, 15:12, 16:10, 22:3 multiple 31:2 myself 10:17, 11:10, 11:16, 34:9, 36:15 <hr/> N <hr/> name 5:8, 22:17, 33:20, 47:10, 47:20, 48:20, 49:13	named 47:9 navigating 29:6 nc 15:5, 27:19, 28:12, 32:18 nd 3:7 neato 40:4 necessarily 20:14, 29:22, 33:12, 54:14, 54:15 need 7:12, 8:11, 22:6, 42:15, 53:3, 57:2, 57:11, 57:19, 57:21 needed 8:18, 11:22, 22:19, 31:9, 40:9, 48:9 nekton 28:15, 28:17, 29:10, 30:14 new 2:9, 2:10, 3:8, 19:20, 63:5, 64:10 next 43:13, 43:14, 47:1, 47:2 noisy 13:18 north 14:21, 24:10, 27:6 northrop 32:5 notary 2:8, 5:4, 63:2, 63:5, 64:10 noted 62:3 notes 50:3, 50:12,	58:9, 58:15, 59:11, 59:18, 59:22, 60:7, 60:17, 61:17 nothing 8:16, 21:13 notice 2:5, 13:13, 27:5, 27:18 noticed 19:12, 28:12 nth 54:11 nuclear 51:19, 51:20 number 49:7, 52:12, 53:12, 55:2, 60:20, 61:7 numbered 51:11 numbers 51:1, 51:6 <hr/> O <hr/> object 5:22, 8:13, 10:2, 11:4, 12:11, 13:16, 16:7, 17:1, 17:21, 18:12, 19:6, 21:8, 23:15, 24:2, 24:19, 25:5, 25:15, 25:22, 26:17, 27:4, 32:22, 34:8, 34:19, 35:15, 36:3, 37:4, 39:7, 41:10, 41:20, 44:14, 45:4, 45:15, 46:13, 48:1, 48:13, 49:5, 50:1, 51:13, 52:15, 53:15, 54:5, 55:4, 55:19, 56:18,
--	---	---	--

<p>57:7, 58:12, 58:20, 59:9, 59:16, 59:20, 60:12, 61:1, 61:10 objection 6:3 objections 41:13, 49:12, 50:7, 57:18, 60:5 oblivious 38:4 obstacles 16:2 obvious 42:1, 44:2 obviously 15:5, 20:17 occurred 63:17 off-the-shelf 16:22, 22:4, 28:5, 33:7, 33:10, 39:12 office 1:1 oftentimes 17:17, 18:4, 35:4 oh 37:17, 47:6 okay 5:15, 6:10, 6:19, 7:6, 7:8, 7:16, 8:5, 12:16, 26:5, 30:18, 41:2, 42:12, 45:8, 47:1, 47:6, 47:17, 59:5, 59:12, 61:15 once 33:22, 39:19 one 7:11, 12:17, 13:5, 15:6, 17:18, 18:10,</p>	<p>19:12, 20:7, 21:3, 22:16, 24:9, 25:6, 25:11, 30:5, 31:9, 33:5, 33:16, 36:11, 38:6, 38:9, 40:3, 48:3, 48:8, 52:10, 53:1, 55:7, 58:21, 59:3, 61:12 ones 39:21, 51:21 only 30:6, 35:7, 50:9, 56:7, 56:21, 59:3 open 6:21, 8:1, 13:20, 21:16, 24:9 operate 34:4, 36:20 operated 39:15 operating 27:21, 29:15 operations 38:1 opinions 40:21, 41:5 opportunities 35:18 optic 13:7 optical 10:6, 12:7, 12:10, 13:15, 14:1 optics 11:19, 14:8, 20:18, 33:13, 34:3, 39:5, 40:1, 40:11 option 15:3, 15:6, 15:11, 33:8,</p>	<p>35:6 options 35:1 optoelectronics 45:22 ordinary 43:8, 43:15, 52:22 organizations 22:19 orientation 18:20 other 7:1, 7:2, 12:20, 14:4, 15:6, 16:17, 17:19, 20:12, 22:19, 25:1, 25:13, 26:14, 26:22, 27:2, 31:5, 31:6, 33:3, 33:17, 35:12, 35:17, 36:6, 37:8, 37:17, 38:14, 39:2, 45:17, 48:20, 49:1, 49:7, 49:9, 50:22, 55:7, 58:6 others 11:16, 35:21, 40:2, 52:3 otherwise 46:2, 64:1 ouster 1:7, 3:11, 63:14 out 10:13, 12:3, 13:18, 17:16, 18:16, 22:20, 22:21, 25:6, 25:12, 32:3, 35:4, 55:6, 55:22, 56:6, 56:10, 56:14, 58:3, 58:22,</p>	<p>59:6 outcome 64:1 outset 52:17 over 6:6, 21:17, 23:17, 24:18, 29:20, 36:15, 50:19, 51:3 overarching 22:12 overlapped 19:8 oversaw 27:18 own 40:11 owner 1:8, 3:11</p> <hr/> <p style="text-align: center;">P</p> <hr/> <p>page 4:2, 9:1, 40:22, 44:22, 51:4 pages 1:20, 50:15 palo 3:15 pan 30:12, 37:14 paper 4:13, 50:15, 52:11, 60:10 papers 50:22, 51:6, 52:9 paragraph 26:7, 26:10, 27:1, 41:1, 41:12, 42:19, 43:8, 43:13, 43:14, 43:21, 44:1, 44:10, 44:15, 45:1, 45:3, 46:16, 46:21, 47:1,</p>
---	---	---	--

<p>47:2, 47:8 paragraphs 25:20, 45:5, 50:13, 50:21 part 10:22, 12:1, 12:7, 12:8, 34:15, 41:4, 56:6 participated 33:3, 33:6 particular 9:8, 9:11, 22:13, 22:14, 54:1, 54:15, 56:22 particularly 22:15, 29:8, 53:1 parties 63:20, 63:22 partly 13:20 partner 34:12 partners 34:10 parts 12:3 party 63:13 passages 50:14 passageways 13:2 passing 13:1 passion 35:18 passionate 10:15 passive 31:12 past 58:11, 58:14 patent 1:1, 1:2, 1:8, 1:11, 3:11, 8:8</p>	<p>path 29:14 patrick 3:12, 12:13, 23:17, 34:20 pattern 13:13 pdf 9:1 peak 14:11 pen 14:10 pending 7:14 penetrated 32:14 people 18:18, 24:12 perceive 18:6 perceived 53:3 perception 15:16, 17:18, 18:1, 18:4 performance 21:18 person 43:8, 43:15, 49:14, 52:22 personal 39:9 personally 32:19, 34:17, 35:13 perspective 18:5, 37:22, 38:2, 52:22 petitioner 1:5, 3:3 ph 1:13, 2:4, 4:2, 4:10, 4:12, 5:3, 19:8, 23:13, 25:3, 26:22, 28:11, 63:7, 63:17</p>	<p>photo 20:6 photocells 20:1 photodiodes 20:3, 20:4 photon 42:2 phrase 44:11 physical 48:17 picture 38:15 picturing 12:20 place 24:10 placed 46:2 places 15:4, 27:20 plan 6:15, 15:21 plane 19:13 planning 15:15, 15:19, 15:20, 16:1, 17:13, 17:14 plastic-like 14:4 play 22:5 played 39:22, 40:1 please 57:9 plug 22:5 plural 33:5 pocket 35:4 point 21:1, 22:12, 23:5, 24:22, 25:16, 25:17,</p>	<p>29:14, 36:19, 37:9, 38:19, 62:2 portion 28:1, 28:2 portions 50:20 pose 18:20 position 18:19, 26:15, 30:11, 30:12 positioning 38:8 positions 53:9 possibility 58:3 possible 42:8, 56:20, 57:3 possibly 27:19 post 25:18, 26:21, 28:11 post-academia 26:21 post-acquisition 28:19 post-ph 25:19, 26:15 post-signal 33:12 postgraduate 36:6 power 20:20, 30:10, 43:1 practical 11:16, 11:17, 12:22 precise 18:19 precisely 24:3 preferably 18:9</p>
--	---	---	--

<p>prepared 57:6, 59:8</p> <p>preparing 22:16, 51:12, 52:13, 53:13, 55:2, 55:17, 56:16, 57:17, 58:18, 59:14, 60:3, 60:11, 60:21, 61:9</p> <p>presumed 45:20, 46:3</p> <p>pretty 14:9, 24:13, 32:8, 35:18, 40:8</p> <p>prevent 31:12</p> <p>previous 23:5</p> <p>previously 4:9</p> <p>principal 30:20</p> <p>prior 51:17, 53:20</p> <p>probably 7:12, 9:10, 9:19, 11:11, 12:17, 28:15, 38:6, 48:16, 49:15, 53:2, 61:13</p> <p>problem 21:7, 42:21, 43:11</p> <p>problems 21:3</p> <p>procedure 5:16</p> <p>proceed 54:7</p> <p>proceeding 5:9, 8:7, 47:22, 52:14, 58:19, 60:11, 60:22, 61:9</p> <p>process 11:6, 18:22</p>	<p>processing 17:9, 20:14, 30:4, 33:12</p> <p>processor 20:9, 20:19, 30:5</p> <p>product 21:20</p> <p>production 21:20, 37:2, 37:6</p> <p>products 51:19</p> <p>professional 2:7, 25:19, 27:3, 36:1, 37:1</p> <p>professor 27:6, 27:9</p> <p>proffered 46:1</p> <p>program 14:20, 15:13, 30:20, 31:1</p> <p>project 23:11, 24:17, 25:1, 25:13, 27:21, 30:15</p> <p>projected 20:16, 23:9</p> <p>projects 27:18, 28:13, 35:12, 36:22</p> <p>proper 52:5</p> <p>properly 38:16</p> <p>proposed 41:16</p> <p>proposing 45:11, 46:10</p> <p>protrusion 29:18</p> <p>provide 5:19, 7:9, 43:4, 43:5</p> <p>proximity 10:7, 16:15</p> <p>ptab 46:4</p>	<p>public 2:9, 63:2, 63:5, 64:10</p> <p>pulled 51:3</p> <p>pulse 42:22</p> <p>purchase 38:21</p> <p>purchasing 16:21</p> <p>purposes 53:13</p> <p>pursuant 2:5</p> <p>pushing 46:5</p> <p>put 8:18, 9:20, 9:22, 11:10, 13:17, 18:14, 19:16, 19:17, 21:17, 24:4, 30:11, 34:4, 40:11, 52:19, 55:13, 56:1, 61:2</p> <p>putting 17:11</p> <hr/> <p>Q</p> <hr/> <p>qualifications 26:2</p> <p>quenching 48:7</p> <p>question 6:2, 6:9, 7:14, 7:15, 26:18, 41:14, 42:16, 43:20, 50:4, 51:10, 55:15, 56:11, 57:3, 57:12, 58:1, 59:5, 60:3, 60:4, 61:5</p> <p>questions 5:19, 5:20, 61:22, 62:1</p>	<p>quick 19:15</p> <p>quiet 31:10</p> <p>quinn 3:6</p> <p>quote 45:2, 45:6, 50:14, 50:21</p> <p>quoting 42:18, 43:21, 44:21</p> <hr/> <p>R</p> <hr/> <p>radar 33:17</p> <p>rails 46:17</p> <p>range 28:7, 29:12, 30:2, 30:11, 32:10, 37:13, 38:22, 40:3, 43:2</p> <p>ranging 10:7, 16:15, 36:18, 37:9, 37:14</p> <p>rarely 22:3</p> <p>rate 19:14, 40:5</p> <p>ratings 40:8</p> <p>read 44:8, 44:9, 51:10</p> <p>reading 26:6, 45:9</p> <p>readings 13:21</p> <p>real 29:11</p> <p>realize 36:12</p> <p>realized 10:9</p> <p>really 10:15, 11:12,</p>
--	---	--	---

15:13, 17:2, 17:22, 18:1, 27:14, 28:16, 30:2, 30:10, 31:15, 31:18, 31:19, 32:14, 33:7, 37:8, 52:17, 55:8, 56:9 realtime 2:8, 12:15, 18:9 reason 7:8 reasons 31:9 reassembled 39:22 recall 8:16, 23:20, 23:22, 28:16, 49:18, 49:20, 50:5, 50:9, 51:15, 53:11, 53:19, 54:17, 55:11, 55:16, 58:4, 59:19, 60:1 receiving 45:22, 46:8 recent 58:7, 58:10 recently 58:5 recess 40:18, 61:20 recite 51:22 recognize 55:6 recollection 54:22, 56:12, 56:15, 57:5, 57:16, 58:18, 59:6, 60:8, 60:15, 60:18, 61:6 record 5:17, 6:7, 7:2,	7:4, 57:22, 63:11 recording 14:14 records 61:4, 61:14 red 13:22, 33:15 redescribe 46:17 reduce 44:19 refer 17:20, 26:7, 26:19, 47:19 reference 41:11, 51:14, 51:16, 52:11, 53:12, 54:12, 54:13, 54:19, 55:1, 55:9, 55:10, 55:16, 56:2, 56:5, 56:8, 56:13, 56:16, 56:22, 57:5, 57:16, 57:17, 58:4, 58:16, 58:17, 59:4, 59:7, 59:13, 60:2, 60:9, 60:19, 61:3, 61:7 referenced 49:1 references 51:7, 51:11, 52:21, 53:5 referred 4:9, 18:20, 28:22, 31:12, 34:6, 38:12 referring 6:15, 26:1, 26:19, 47:8 refers 43:13 refresh 19:14, 40:5,	40:10, 56:7, 56:21 refresher 56:7 refreshing 58:6 refrigerator 24:11 regal 33:20 regard 40:14 regenerative 29:1 registered 2:7, 12:14 reiterate 5:16 related 22:15, 55:13, 63:19 relates 15:20, 52:18 relating 8:7 relied 54:1 rely 42:22 remember 19:9, 20:20, 22:1, 22:18, 25:10, 33:18, 35:21, 48:18, 54:15 remembered 29:9 remote 63:8, 63:16 remotely 6:12, 13:11 repeat 42:15 repeated 39:10 repetitive 39:17 replacement 35:6	report 42:10 reported 1:21 reporter 2:7, 2:8, 6:7, 63:1, 63:4 reporting 50:10 represented 63:14 research 19:2, 21:21, 31:1, 32:19, 50:10, 52:5, 52:21 resolution 43:2 respect 46:8, 55:21, 58:2, 58:16, 61:12 respectively 45:14 restate 55:11 results 23:5, 33:21 returned 13:13, 14:6 review 51:11, 52:11, 52:12, 53:20, 56:12 reviewed 53:11, 56:6, 56:15, 59:7, 59:13, 60:2 reviewing 55:1, 55:16, 57:5, 57:16, 58:18, 60:9, 60:19, 61:6 right 6:21, 9:6, 13:17, 13:21, 15:17, 20:21, 23:14, 25:14,
--	---	---	--

25:21, 26:4, 40:16, 41:9, 41:19, 44:13, 45:3, 45:14, 46:12, 51:8, 54:21, 55:9, 55:18, 59:8, 59:13 rings 39:1 robot 15:15, 15:19, 15:20, 22:20, 23:10, 29:20, 38:21, 39:3 robotic 22:10, 28:20 robotics 10:11, 15:1, 15:2, 16:9, 22:2, 27:11, 27:13, 27:22 robots 15:21, 18:6, 28:2, 28:3, 29:2, 29:12, 38:11, 39:15 robust 36:18 ron 3:5, 5:8, 57:10, 61:19 room 23:1, 39:18 rooms 38:11 rotation 39:2 roughly 5:12, 23:22 rpr 1:21, 64:9 rule 55:6, 55:22, 56:6, 56:10, 56:14, 58:3, 58:22 ruling 59:5	running 6:18 russian 48:17 <hr/> S <hr/> s 17:6 said 14:17, 16:4, 47:4, 53:4 saltwater 29:8 same 6:8, 18:17, 41:13, 44:19, 44:22, 49:12, 50:7, 55:21, 56:8, 57:18, 58:3, 60:5, 61:2, 61:5 say 9:11, 10:21, 15:7, 17:16, 18:2, 19:22, 20:10, 21:12, 24:20, 25:11, 26:10, 27:15, 28:1, 28:5, 28:10, 32:13, 33:5, 34:11, 35:7, 35:16, 36:1, 36:7, 40:6, 43:3, 43:15, 43:22, 44:17, 44:21, 47:10, 48:16, 49:6, 49:14, 52:17, 53:21, 56:3, 56:10, 58:2, 58:7, 58:13, 59:3 saying 47:20 says 30:20, 48:14 scan 19:14, 31:17	scanning 31:16 scans 28:8 school 10:20, 15:4, 24:6, 24:13 science 9:16, 10:10, 11:9, 15:8 sciences 48:18 scope 21:8, 24:2, 24:19, 34:8, 41:10, 41:21, 45:15, 46:13, 48:1, 48:13, 49:5, 50:1, 51:13, 52:15, 53:15, 54:6, 55:4, 55:19, 56:19, 57:7, 58:20, 59:9, 59:16, 59:20, 60:12, 61:1, 61:10 scratch 22:8, 22:11 seamlessly 22:5 second 30:19, 61:6 section 26:1, 26:6 see 9:18, 13:1, 13:8, 21:18, 26:6, 26:9, 30:15, 31:17, 50:16, 51:2, 51:6, 52:8, 58:8, 61:14, 61:17 seemed 42:16 seems 60:14	seen 48:2, 48:10, 49:13 self-localization 15:16, 17:15, 18:11, 18:13, 18:21 self-referencing 18:14, 18:15 sense 38:20 sensing 10:7, 15:15, 16:4, 16:6, 18:1, 18:2 sensor 13:7, 13:10, 13:15, 17:3, 19:1, 21:4, 27:12, 35:7, 40:5, 43:10, 48:8 sensors 9:19, 9:21, 10:4, 10:5, 10:6, 10:8, 10:17, 10:21, 11:2, 11:3, 12:7, 12:10, 13:6, 16:10, 16:12, 16:13, 16:14, 16:15, 16:16, 16:19, 16:20, 20:6, 22:9, 23:3, 36:11 separately 7:4 separation 44:18 september 64:4 sequencing 48:7 sergey 4:13, 47:9, 48:12, 49:2, 49:10
---	--	---	--

<p>served 27:8</p> <p>set 11:18, 13:7, 16:18, 20:1, 22:14, 63:8, 64:3</p> <p>setting 8:2, 24:15</p> <p>several 19:20, 20:5, 50:22</p> <p>shade 13:19</p> <p>shanley 4:10, 41:22, 43:3, 43:7, 44:1, 44:21, 45:10, 45:18, 46:1, 46:5, 46:10, 46:20, 52:19, 55:12</p> <p>shanley's 42:10, 42:13, 42:18, 43:14, 43:21, 44:11, 45:3, 45:9</p> <p>shape 27:22, 31:11</p> <p>shelf 17:4</p> <p>shift 25:18</p> <p>shop 24:7, 24:8</p> <p>shorthand 63:1</p> <p>should 6:2, 15:7, 33:5, 42:12</p> <p>shut 21:12</p> <p>sick 16:13, 19:13, 21:4, 21:14, 23:7</p> <p>signal 17:9, 20:16,</p>	<p>20:19</p> <p>signature-plkal 64:7</p> <p>significant 43:6, 56:1</p> <p>significantly 35:9</p> <p>similar 11:15, 48:10, 60:15</p> <p>similarly 60:15</p> <p>simple 13:6, 18:21, 29:11</p> <p>simply 28:11, 32:16, 43:20</p> <p>simultaneous 57:1</p> <p>single 19:17, 40:4, 40:13, 42:2</p> <p>sir 5:21, 6:5, 7:7, 7:10, 7:17, 8:9, 9:7, 44:9, 51:3</p> <p>sitting 49:20, 50:4, 59:12</p> <p>situation 13:22, 18:5, 30:1, 32:4, 34:10, 39:10, 39:20, 54:12</p> <p>size 30:9</p> <p>skill 43:8, 43:15, 53:1</p> <p>skills 35:19</p> <p>slip 39:1</p> <p>sliver 13:20</p> <p>slow 20:17</p>	<p>smaller 32:7</p> <p>social 24:6</p> <p>sold 37:9</p> <p>solve 21:7</p> <p>solved 21:9</p> <p>some 8:21, 11:14, 13:11, 14:1, 14:9, 17:11, 18:7, 18:18, 21:19, 25:20, 26:7, 27:22, 28:4, 28:6, 30:15, 32:1, 33:1, 34:1, 34:2, 35:8, 35:20, 37:8, 46:18, 50:2, 50:14, 52:2, 52:9, 58:9</p> <p>someone 47:9</p> <p>something 8:17, 22:4, 24:17, 28:8, 28:22, 29:9, 29:18, 39:11, 48:3, 48:9</p> <p>sometimes 10:13, 12:1, 13:19, 18:20, 30:11, 30:12, 38:12, 38:13, 59:1</p> <p>somewhat 58:4</p> <p>somewhere 40:6, 48:10</p> <p>sorry 7:2, 8:2, 12:12, 23:16, 23:20, 34:20, 47:6, 48:21,</p>	<p>54:7, 58:22</p> <p>sort 17:11, 18:8, 21:2, 29:21, 30:1, 32:12</p> <p>sounds 8:20, 29:16</p> <p>space 15:22, 22:2, 24:9, 27:10, 27:12, 37:22</p> <p>spacial 44:18</p> <p>spad 42:20, 43:4, 43:9</p> <p>spads 40:1, 40:13, 42:2, 43:5, 43:10, 44:2, 48:5, 52:19</p> <p>span 24:18</p> <p>spanned 24:20</p> <p>speaking 57:1</p> <p>speaks 46:21</p> <p>specialization 9:9</p> <p>specific 19:9, 20:21, 24:15, 28:16, 30:15, 34:14, 36:4, 45:11, 46:10, 48:3, 50:5, 52:19, 54:22, 56:12, 56:15, 57:4, 57:15, 58:9, 58:14, 58:18</p> <p>specifically 12:6, 25:13, 26:16, 41:7, 42:21, 43:11, 46:9, 50:18, 53:13, 54:22,</p>
--	---	---	---

55:16 specifics 49:19, 52:1 spector 40:21, 41:3, 41:7, 41:17, 42:6, 43:16, 44:6, 44:13, 45:12, 45:20, 45:22, 46:11 spector's 41:7, 41:17, 42:4, 44:4, 44:12, 44:16 spectral 32:10 speed 40:9 spent 24:1, 36:2 spie 51:14 spinning 42:3, 44:3 spinout 28:18 spoke 15:5 squared 53:9 stack 35:20 staff 38:13 stage 16:12, 28:7 stand 14:10 stand-alone 37:9, 56:2 stands 25:6, 25:12 start 9:4, 35:19, 50:18 started 7:18, 14:2, 19:10, 20:2,	27:14, 40:12 starting 42:19 starts 40:22 state 14:21, 15:5, 24:10, 27:7, 27:19, 28:12, 32:18, 46:15, 63:5, 64:10 states 1:1, 2:9, 42:1 static 16:2, 30:11 stay 31:9 steward 53:16, 53:21, 56:4 still 6:2, 37:19, 42:16 stop 57:19 strain 10:5 street 3:14 stress 10:6 strictly 19:13 structured 20:15, 23:8, 39:16 students 34:9 stuff 10:17, 21:15 sub 31:15 submarine 32:3 submitted 8:7 subsequent 33:8	substantive 8:16 successes 36:15 suite 20:22, 23:3, 40:10, 40:14 sulfides 20:2 sullivan 3:6 summarize 45:7 support 17:8, 48:7 supposed 29:6 sure 8:4, 15:1, 16:17, 25:10, 29:8, 31:6, 38:3, 41:4, 41:15, 44:22, 45:8, 45:16, 46:4, 46:7, 46:15, 50:3, 52:7, 52:18, 53:8, 57:12, 59:1 surfaces 29:2, 29:13 surprised 36:8, 36:9, 36:20 susceptible 19:16, 21:6, 21:11 swam 31:3 swap 30:10 sweeping 30:12 swim 32:7, 32:8 swimming 30:21 switch 12:3	sworn 5:4, 63:9 system 12:21, 13:12, 19:11, 19:13, 22:13, 22:15, 23:7, 23:12, 25:4, 32:21, 33:17, 35:14, 36:18, 37:3, 37:7, 37:8, 37:10, 37:11, 37:13, 39:5, 41:9, 41:19, 42:4, 44:4 systems 11:21, 14:17, 14:19, 15:9, 16:13, 19:5, 23:2, 23:6, 26:8, 26:16, 28:3, 28:5, 28:14, 28:16, 28:20, 29:5, 34:18, 36:2, 36:7, 37:17, 37:21, 38:17, 39:3, 39:19, 49:4, 49:11 <hr/> T <hr/> tackle 35:19 tactile 10:8, 16:13 take 7:11, 7:15, 11:13, 12:2, 12:10, 27:14, 29:14, 29:16, 29:17, 33:1, 40:16, 49:18, 50:11, 52:10, 61:16 taken 63:10 taking 13:14, 45:11,
---	---	---	---

46:10 talk 6:6, 23:16, 26:13, 30:17 talking 8:17, 17:5, 31:10, 47:14 task 22:13 tasks 22:14, 23:1 taught 11:15, 27:9, 27:21, 28:12 tbs 31:19 teaches 43:4 teaching 52:21 team 33:15 teammates 36:16 teams 36:15 tear 22:7 technologies 25:9, 26:9, 26:22 technology 1:4, 3:4, 27:10, 28:22 teledyne 26:8, 26:22, 36:7 tell 24:3, 24:5, 24:13, 31:20, 36:4, 39:17, 59:12 test 59:21 testifies 5:5 testimony 7:9, 59:15,	63:11 thanks 61:19, 61:21 thermal 12:21 thermocouples 11:19 thermodynamics 9:13 thing 7:11, 18:17, 22:1, 32:12, 50:9 things 6:12, 6:13, 10:13, 11:13, 12:1, 12:19, 12:20, 16:5, 16:17, 19:12, 20:13, 22:7, 29:6, 30:1, 30:16, 31:17, 33:3, 35:19, 38:10, 38:15, 39:2, 54:11, 55:22, 59:1 think 5:13, 9:17, 13:22, 15:22, 18:17, 19:18, 20:2, 20:7, 20:22, 21:10, 22:1, 22:17, 25:19, 25:21, 30:5, 30:18, 32:4, 33:19, 35:17, 37:16, 40:3, 45:21, 49:18, 61:15 third 13:6, 15:7 thought 59:2 thousand 36:21 thousands 36:10 three 40:14	threshold 24:21, 38:19 threw 10:16 through 13:2, 15:18, 15:22, 25:20, 26:6, 42:9 tight 21:13, 32:8 tilt 30:13, 37:14 time 5:22, 6:1, 9:20, 15:15, 15:22, 19:9, 19:19, 20:4, 20:11, 21:1, 21:22, 23:19, 23:22, 25:8, 27:8, 27:15, 27:16, 28:6, 31:13, 33:1, 33:19, 35:22, 36:1, 36:5, 44:19, 48:4, 48:6, 48:11, 49:15, 49:18, 50:3, 50:11, 51:17, 53:1, 56:9, 61:14, 61:21, 62:3 times 5:12, 17:4, 36:12 timing 20:8 tip 20:21 title 48:19 titles 51:5 today 5:19, 7:9, 8:17, 49:20, 50:4, 54:17, 59:15, 61:21	together 56:1 tongue 20:21 took 11:1, 11:17, 13:19, 38:22, 39:22, 61:14 towards 10:9 towed 31:18 towels 38:17 tracking 31:2 trademark 1:1 trajectories 15:21 transdigm 28:20 transducer 18:3 traverse 29:20 trial 1:2 triangulate 31:4 triangulation 20:16, 21:2 trick 39:12, 39:13, 39:20 tried 13:11, 20:5, 20:17, 29:11, 31:3, 40:11, 40:13 true 63:11 truth 59:2, 60:16 try 6:6, 7:11, 22:22, 28:8, 36:12, 46:17,
--	--	--	--

<p>53:16, 53:21 trying 22:18, 33:18, 38:2, 47:12, 48:5 tune 13:21 turn 9:1, 40:20, 47:1, 47:2, 51:4 two 10:16, 32:1, 34:12, 38:6 two-year 24:21 type 10:4, 14:14, 19:11, 31:2, 37:10, 40:4 types 9:21, 11:2, 11:3, 14:4, 16:19, 28:4, 38:7, 39:15</p> <hr/> <p>U</p> <p>ultimate 35:10 ultimately 20:22 unafraid 11:13 uncrewed 31:22 under 27:18, 29:3, 29:7, 30:19 undergrad 12:4, 19:7 undergraduate 9:5, 9:22, 12:9, 19:3 understand 5:18, 6:4, 10:19, 12:2, 41:4, 41:15, 45:9, 45:19, 46:3, 46:7</p>	<p>understanding 41:6, 41:16, 41:22, 45:10, 46:9, 48:15, 49:2, 49:10 understood 52:7 underwater 31:22 unexpected 31:13 unfortunately 17:4, 39:10 unit 30:13 united 1:1 university 14:21, 24:11, 27:6, 27:7, 27:19, 28:13 unknown 16:2 unless 6:1 unmanned 31:21 upload 7:19, 42:11, 47:14 uploaded 7:20, 42:12 urban 33:4, 33:9 urquhart 3:6 use 11:3, 11:5, 14:9, 14:12, 18:15, 20:19, 23:6, 31:4, 44:11, 45:1 using 11:6, 13:22, 14:13, 29:7, 32:12 usually 11:6</p>	<p>utilize 29:11 utilized 53:17, 53:22 utilizing 27:22 uuv 32:2, 32:6, 32:7, 37:15</p> <hr/> <p>V</p> <p>validated 32:3 valley 14:11 variant 32:13, 32:14, 33:18 variety 29:6, 31:9 various 25:9, 27:9, 28:3, 36:15 vary 31:11 varying 32:10 vehicle 30:5, 30:6, 31:22, 34:4, 38:18 vehicles 16:1, 22:11, 31:3, 33:15, 34:13 verbatim 45:6 vhs 14:13 via 2:5, 6:12 vibrate 12:19 vibrated 13:8 vibration 13:2 vibrations 9:14, 10:6</p>	<p>video 14:12 videoconference 2:6 view 19:15 vinogradov 4:13, 47:9, 47:18, 48:12, 50:15, 54:19, 60:10, 60:20, 61:8 vinogradov's 49:3, 49:10 virtually 1:14, 2:5 visible 13:22 vision 16:16, 23:8, 36:13, 36:16, 39:13, 39:14 visual 14:8 vmrp 37:13 vortex 28:18, 29:1, 29:10, 29:21 vouthouris 1:21, 2:6, 63:4, 64:9</p> <hr/> <p>W</p> <p>wait 6:8 wall 12:22, 28:21, 29:15, 29:22, 38:16 walls 29:3 want 6:13, 8:21, 27:14, 34:11, 40:5, 40:20, 41:3, 41:15, 44:20, 45:8,</p>
---	--	--	--

46:7, 57:19 wanted 13:1, 13:21, 14:7, 15:2, 15:14, 17:5, 44:22 warfare 30:22 water 29:4, 29:7, 32:14 way 10:12, 11:22, 18:13, 22:5, 22:9, 27:22, 31:12, 39:14, 58:3, 63:22 ways 13:4, 13:8, 39:17 we'll 8:18 we're 6:12, 8:17, 44:22, 47:14 we've 36:14 weeks 24:18 weight 30:9 went 23:7, 24:12, 39:14, 51:15, 53:18, 54:18 wheeled 29:5 whereof 64:3 whether 6:20, 23:6, 25:2, 36:22, 48:2, 53:11, 53:18, 58:5, 60:1 whiskers 16:14 whole 29:16	wide 29:19, 30:7 width 29:20 window 13:19 windows 21:12, 21:17 within 55:9, 58:13, 63:5 without 36:20 witness 12:12, 12:16, 23:16, 34:20, 54:9, 57:9, 57:20, 63:7, 63:12, 64:3 wonder 42:8 work 8:22, 12:8, 19:2, 21:5, 25:19, 26:7, 26:15, 26:19, 26:22, 27:2, 32:18, 35:1, 36:6, 38:12, 47:22, 51:18 worked 22:5, 24:17 working 11:22, 15:11, 26:16, 33:13, 38:15, 42:16, 58:5 works 5:15, 35:10 world 27:13 wouldn't 11:10, 21:19, 29:22, 35:16, 36:8, 36:9, 39:8 wrap 61:17 writes 42:19	writing 52:16 written 45:17, 45:18 wrong 33:20, 40:7 Y yeah 46:15, 47:6, 48:22, 60:6 year 10:14, 10:16, 24:20, 58:11, 58:14 years 10:16, 24:18, 36:15 york 2:10, 3:8 yourself 16:21 Z zappa 51:14, 52:11, 53:12, 55:1, 55:6, 55:16, 56:13, 57:5, 57:16, 59:4, 60:13 zoom 2:5, 6:13, 7:3 zou 60:9 . .5000 3:16 .7000 3:9 0 00 40:18 01421 1:10 02 1:16, 63:18	1 10 30:7, 40:18, 61:20, 62:3, 63:18 10010 3:8 1003 4:10, 42:10, 42:13 103 9:1 11 19:18, 20:8, 20:10, 20:13 11,175,405 1:11 1130 3:15 123 41:1 124 41:12, 44:1, 45:1 13 40:18 135 47:4 14 52:12, 55:2 145 47:2, 47:5, 47:6, 47:8, 50:13, 50:21 146 50:13, 50:21 17 26:7, 26:10, 26:11, 27:1 190 42:19, 45:5 191 44:10, 44:15, 45:3, 45:5 1990 23:14 2 2-d 19:13
---	--	--	--

20 51:1, 51:6, 51:11, 52:12, 53:12, 55:2 2010 4:11, 7:21, 27:15, 28:6, 53:14, 56:9 2012 27:16 2014 4:13, 47:15, 47:19, 47:20, 49:2, 49:6, 49:7, 49:8, 49:22, 50:6, 50:15, 50:20, 51:5, 51:12, 52:12, 53:13, 55:2, 56:13, 58:17, 60:10, 60:21, 61:8 2017 48:11 2018 37:19, 48:11, 49:15 2023 1:10 2024 1:15, 63:18, 64:4 2029 64:11 21 51:1, 58:17 212.849 3:9 22 3:7, 25:21, 51:1, 60:9 23 51:1, 60:20 24 51:1, 51:6, 51:11, 61:7 29 31:19	<div><div>3</div><div>30 1:15, 63:17 3175 3:14</div></div> <div><div>4</div><div>405 8:7 49 61:20 4th 64:4</div></div> <div><div>5</div><div>50 5:13, 5:14 51 3:7 52 61:20, 62:3, 63:18 551156 1:19</div></div> <div><div>6</div><div>63 40:22 64 1:20 650.843 3:16</div></div> <div><div>9</div><div>9 1:16, 63:18 90 17:6 94304 3:15 95 23:19, 23:21 96 23:18 98 23:19, 23:21</div></div>	
--	---	--