

UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

META PLATFORMS, INC.; INSTAGRAM)
INC.; WHATSAPP LLC; META)
PLATFORMS TECHNOLOGIES, LLC; AND)
GIPHY, INC.,)
Petitioners,)
v.)
VL COLLECTIVE IP LLC,) Case IPR2023-00924
Patent Owner,) U.S. Patent 7,436,980
_____)

DEPOSITION OF CHANDRAJIT BAJAJ, PH.D.

February 14, 2024

9:00 a.m. Central Standard Time

Reported by: Lori J. Goodin, RPR, CLR, CRR,
RSA, California CSR #13959

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1 WEDNESDAY, FEBRUARY 14, 2024, 9:00 a.m. CST

2 PROCEEDINGS

3 * * *

4 Whereupon,

5 CHANDRAJIT BAJAJ, PH.D.,

6 a witness called for examination, having been
7 first duly sworn, was examined and testified as
8 follows:

9 * * *

10 THE COURT REPORTER: Unless an
11 objection is heard at this time, all parties to
12 this deposition are appearing remotely and have
13 agreed to the witness being sworn i remotely.

14 MR. EKLEM: Good morning, Dr. Bajaj.

15 For the record, this is Philip Eklem
16 with Reichman Jorgensen Lehman and Feldberg, on
17 behalf of the patent owner.

18 Todd, would you like to make an
19 appearance?

20 MR. BAKER: Yes, thank you. Todd
21 Baker, and Yan-Xin Li, both of Kirkland & Ellis
22 on behalf of petitioner, Meta Platforms, et al.

1 EXAMINATION

2 BY MR. EKLEM:

3 Q. Okay. Good morning, Dr. Bajaj.
4 Would you please state your full name for the
5 record.

6 A. Chandrajit Bajaj.

7 Q. Thank you. And where are you
8 located today?

9 A. I am in the Kirkland Ellis office in
10 Austin, Texas.

11 Q. Okay. Is anybody in the room with
12 you there right now?

13 A. No.

14 Q. Okay. Do you have a cellphone in
15 the room with you?

16 A. I did. But I turned it off and it
17 is in my jacket.

18 Q. Okay. I appreciate that. Will you
19 agree to just leave it off and in your jacket
20 while we are on the record?

21 A. Yes.

22 Q. Okay. Do you have any other

1 electronic devices or like a laptop or anything
2 else in front of you right now?

3 A. No. There is nothing else in the
4 room.

5 Q. Okay. I see you have a few folders
6 of hard copy documents in front of you.

7 Could you just give me a, kind of a
8 summary of what is in those folders?

9 A. They are all of the -- they are
10 printed clean copies of the, you know, all of the
11 items on the exhibit list in my declaration and
12 also a copy of my declaration.

13 Q. Okay, great. I think -- I will be
14 introducing exhibits throughout the deposition.

15 But, you know, it would be great if
16 you could just use those paper copies and I will
17 just note for the record what exhibit number they
18 will be for the deposition. Okay. So, we can
19 proceed like that.

20 A. Okay.

21 Q. So, I am going to be asking you some
22 questions today and your counsel might object to

1 those questions.

2 But unless your counsel instructs
3 you not to answer my question, do you understand
4 that you must answer my question?

5 A. I do.

6 Q. If I ask you a question that you
7 don't understand or that you are unable to answer
8 for any reason, will you agree to let me know the
9 precise issue that you have with my question so
10 that I can try to ask it in a way that is
11 understandable or answerable for you?

12 A. Thank you. I shall.

13 Q. Okay. Thank you. So, I'm going to
14 stop for a break probably every hour or so. But
15 if you need to break sooner, just let me know and
16 I will try to get us to a stopping point. Is
17 that all right?

18 A. Thank you. I shall as well.

19 Q. Okay. I will just ask that any time
20 we break, that we get an answer to any pending
21 question before we break. Is that, is that all
22 right?

1 A. Yes, absolutely.

2 Q. Okay. So, you said you have a copy
3 of your expert declaration with you this morning.
4 Correct?

5 A. I do.

6 Q. Why don't you go ahead and pull that
7 out.

8 MR. EKLEM: I will note for the
9 record -- so, I'm going to go ahead and just
10 enter this as an exhibit. Let's see --

11 BY MR. EKLEM:

12 Q. So, the copy of your expert
13 declaration that you have in front of you, is
14 there a number in the bottom right corner that
15 says Meta 1004 on it?

16 A. Yes.

17 Q. Okay. And the title of the
18 document, does it say Declaration of Chandrajit
19 Bajaj Ph.D. In Support of Petition For Inter
20 Partes Review of U.S. Patent Number 7,436,980?

21 A. That's correct.

22 Q. And if you go to the very last page,

1 at the very bottom, do you see your signature at
2 the bottom of the last page?

3 A. Yes.

4 Q. Okay.

5 MR. EKLEM: So, let's go ahead and
6 mark for the record as Exhibit 1 to the
7 deposition the document that is in Box titled --
8 or that has the file name EX 1004, Declaration of
9 C. Bajaj ISO Petition For Inter Partes Review.

10 (Bajaj Exhibit 1 marked for
11 identification.)

12 BY MR. EKLEM:

13 Q. So, we marked your declaration as
14 Exhibit 1 to the deposition. But, for purposes
15 of our questions and answers today, if I refer to
16 your declaration as just your declaration, will
17 you understand that I am talking about what we
18 just entered as Exhibit 1?

19 A. Yes. Of course.

20 Q. Okay. Your declaration contains --
21 or, sorry.

22 Does your declaration contain the

1 opinions that you have provided in support of the
2 petition in this matter?

3 A. The declaration contains my
4 opinions.

5 Q. And those opinions you provided in
6 support of the petition in this matter; is that
7 right?

8 A. That's correct. It is at the
9 request of the petitioners.

10 Q. Okay. So, why don't you turn,
11 please, to Paragraph 24 of your declaration. And
12 just let me know when you are there.

13 A. I am there.

14 Q. Paragraph 24 of your declaration
15 says, "I understand that a claim is invalid if it
16 is anticipated or obvious."

17 Do you see that?

18 A. Yes.

19 Q. Okay. Paragraph 24 of your
20 declaration further states that, "Anticipation of
21 a claim requires that every element of a claim be
22 disclosed expressly or inherently in a single

1 prior art reference, arranged in the prior art
2 reference as arranged in the claim."

3 Do you see that as well?

4 A. Yes.

5 Q. Is that still your understanding of
6 what anticipation requires?

7 A. That's correct.

8 Q. Okay. So, can you turn to
9 Paragraph 32 of your declaration, please. Do you
10 have that?

11 A. Okay.

12 Q. Okay, thank you. Is Paragraph 32 of
13 your declaration a summary of the opinions that
14 you have provided in your declaration?

15 A. That's correct. Under four grounds.

16 Q. Are the four grounds numbered in a
17 table as Roman numerals, I through IV?

18 A. That is correct.

19 Q. Each of the grounds corresponding to
20 Grounds 1 through 4 in Paragraph 32 of your
21 declaration are based on obviousness; is that
22 correct?

1 A. That is correct.

2 Q. And your obviousness opinions are
3 fundamentally based on the Zhao, Steffens, Ozer
4 and TLP references; is that correct?

5 MR. BAKER: Objection to form.

6 THE WITNESS: So, the obviousness,
7 you know, as both part of the definition of how I
8 apply obviousness is summarized in the legal
9 standards that I used in, and the prior to art
10 that is part of those obviousness and the legal
11 standards includes Zhao, Steffens, Ozer and TLP.
12 BY MR. EKLEM:

13 Q. Okay. You did not opine in your
14 report that any of the challenged claims are
15 anticipated by Zhao, Steffens, Ozer or TLP,
16 correct?

17 A. No, I did not.

18 Q. So, you did not opine in your report
19 that Zhao, Steffens, Ozer or TLP alone discloses
20 every element of any of the asserted claims,
21 correct?

22 A. Using the legal standard of

1 anticipation, that they be in this prior art
2 reference and arranged in the prior art as
3 arranged in the claim.

4 Q. You presented no claim construction
5 opinions in your declaration; is that correct?

6 A. That's correct.

7 Q. Would you please turn to
8 Paragraph 47 of your declaration and let me know
9 when you are there.

10 A. I am there.

11 Q. At the top of Paragraph 47 in your
12 declaration, you state, "I understand that, in
13 parallel litigation between the parties, it
14 appears that patent owner may seek to construe
15 the term "spatio-temporal model." In patent
16 owner's opposition briefing to a motion to
17 dismiss under Section 101, I understand that
18 patent owner contended: 'The '980 patent's
19 spatio-temporal model is a graphical model with
20 nodes that correspond to each of the collection
21 of components and to the object'."

22 Do you see that?

1 A. I do.

2 Q. And then you state in the last
3 sentence of Paragraph 47, "Currently I present no
4 opinion on claim construction, as I believe the
5 challenged claims would have been obvious under
6 patent owner's contended construction."

7 Do you see that?

8 A. I see that.

9 Q. Did you apply what you call patent
10 owner's contended construction of spatio-temporal
11 model in rendering the opinions in your
12 declaration?

13 A. I did.

14 Q. Did you apply any other construction
15 or interpretation of spatio-temporal model in
16 your declaration?

17 A. No.

18 Q. So, anywhere that you did not apply
19 what you call the patent owner's contended
20 construction, you did not apply any other
21 particular interpretation or construction of
22 spatio-temporal model?

1 MR. BAKER: Objection, form.

2 THE WITNESS: As I stated, I
3 presented no claim construction opinion, because
4 I believe that all of the challenged claims would
5 have been obvious under the patent owner's
6 contended construction.

7 BY MR. EKLEM:

8 Q. Okay. I understand that you did not
9 provide claim construction opinions.

10 I think I am asking a slightly
11 different question. Did you -- here, I will ask
12 it another way.

13 So, in general, how did you
14 interpret the claims of the '980 patent in
15 rendering the opinions in your declaration?

16 A. So, under the obviousness legal
17 standards, which I have also summarized in my
18 declaration in Section 4, I applied those
19 standards for obviousness in interpreting the
20 claims and rendering my opinion.

21 Q. When interpreting the claims for
22 rendering your opinions, did you give the claims

1 their plain and ordinary meaning?

2 A. So, as I have stated in Paragraph 25
3 of my declaration, "A patent claim is invalid for
4 obviousness if the claimed invention would have
5 been obvious at the time the invention was made
6 to a person having ordinary skill in the art
7 (POSITA)."

8 And further, I understand that the
9 following factors are considered in any
10 obviousness analysis: The scope and content of
11 the prior art, the differences between the art
12 and the claim at issue, the level of ordinary
13 skill in the art at the time of the invention of
14 the asserted patent was made, and then objective
15 evidence of nonobviousness.

16 And, "In order to determine whether
17 the claim elements are found in the prior art, it
18 is necessary to compare the properly construed
19 claim language of the patent with the teachings
20 of the prior art."

21 Q. Did you compare the properly
22 construed claim language of the patent with the

1 teachings of the prior art in rendering your
2 opinions?

3 MR. BAKER: Objection, form.

4 THE WITNESS: I followed -- I
5 followed these legal standards, as I have stated
6 in Paragraphs 25, 26, in Section 4.

7 BY MR. EKLEM:

8 Q. Are you familiar with the concept of
9 interpreting claims by giving them their plain
10 and ordinary meaning?

11 A. Plain and ordinary meaning that
12 would have been obvious at the time the invention
13 was made to a person having ordinary skill in the
14 art, and that is what I applied.

15 Q. In order to interpret the claims of
16 the '980 patent in rendering your opinions, did
17 you read the claims in the context of the
18 specification and file history of the '980
19 patent?

20 A. I definitely looked at the
21 specification as well as the file history of
22 the '980 patent.

1 Q. Did you use the specification of
2 the '980 patent to inform your understanding of
3 the meaning of the claims of the '980 patent?

4 A. The claim elements are a part of the
5 patent and that is what is being claimed.

6 And the specification is something I
7 also look at to shed light to what the claim
8 elements, you know, could mean.

9 Q. Did you interpret the claim elements
10 of the '980 patent to be consistent with the
11 specification of the '980 patent?

12 A. While I had no opinion on claim
13 construction, as I have stated, I looked at the
14 claim elements and also the specification to shed
15 light on what was being claimed.

16 Q. Okay. Do you have a copy of
17 the '980 patent with you, Dr. Bajaj?

18 A. I do.

19 Q. Would you go ahead and put that in
20 front of you?

21 A. Yes, I have it in front of me.

22 Q. A copy of the '980 patent that you

1 have, does it have on the bottom right corner a
2 marking that says Meta 1001?

3 A. Yes.

4 MR. EKLEM: Okay. I'm going to go
5 ahead and introduce Exhibit 2 to the deposition,
6 which is U.S. Patent Number 7,436,980,
7 corresponding to Exhibit 1001 to the proceedings
8 IPR 2023-00924.

9 This is included in the Box. It is
10 identified as with the file name EX 1001
11 U.S. 7,436,980.

12 (Bajaj Exhibit 2 marked for
13 identification.)

14 BY MR. EKLEM:

15 Q. Dr. Bajaj, for our questions and
16 answers today, is it all right if we just refer
17 to what we just marked as Exhibit 2 to your
18 deposition, if we can refer to that as the '980
19 patent?

20 A. Yes, of course.

21 Q. Great. So, why don't you turn to
22 Column 1 of the '980 patent, please. And, you

1 can go to the top of Column 1, starting at
2 Line 4.

3 A. Okay. I am there.

4 Q. Okay. At Line 4 the patent says --
5 Line 4 of Column 1 of the '980 patent says, "This
6 application claims priority to U.S. Provisional
7 Application Serial Number 60/574,799, filed on
8 May 27, 2004, which is herein incorporated by
9 reference in its entirety."

10 Do you see that, Dr. Bajaj?

11 A. I do.

12 Q. Okay. Exhibit 1003 to your
13 declaration is the Provisional Patent
14 Application, 60/574,799, is that correct?

15 A. That is correct.

16 MR. EKLEM: All right. So, let's
17 just go ahead and get, let's just go ahead and
18 mark our third exhibit --

19 Well, actually, Dr. Bajaj, do you
20 have a copy of Exhibit 1003 with you? And if you
21 do, could you put it in front of you?

22 MR. BAKER: Dr. Bajaj, do you need

1 extra time to find Exhibit 1003, or are you okay?

2 THE WITNESS: Yeah, there is no copy
3 here that I could find. So, I would need a
4 printed copy of that, please.

5 MR. BAKER: Philip, would you like
6 for us to print or do you want to put it on the
7 screen?

8 MR. EKLEM: That is a good question.
9 I think it would be easier for Dr. Bajaj to have
10 a copy.

11 MR. BAKER: Okay.

12 MR. EKLEM: Do you have a sense of
13 how long it would take, because you --

14 MR. BAKER: It will be quick. We
15 have already made a request.

16 MR. EKLEM: All right. Then, let's
17 wait for that.

18 Do you mind if we go off the record
19 for a little bit until we get that copy? Because
20 I think we will probably need it pretty quick.

21 MR. BAKER: That will be fine, but I
22 expect it to be a minute or two, tops. But, we

1 can go off the record. That is fine.

2 MR. EKLEM: I am happy to have a few
3 questions, if it is just a few minutes here.

4 MR. BAKER: Okay.

5 BY MR. EKLEM:

6 Q. So, Dr. Bajaj, why don't you get --
7 why don't you put the '980 patent back in front
8 of you. I will have another -- just a follow-up
9 question on that.

10 A. Okay. Yeah, I'm sorry that it is
11 not here. That is the only one that seems to be
12 missing.

13 Q. That is okay. Yeah, no problem.
14 Yeah, if you have the '980 patent, let's just go
15 back to Column 1, Line 4, where we just were.

16 A. I am there.

17 Q. So, in Column 1, at Lines 4
18 through 6, the patent indicates that the
19 provisional patent application ending with 799 is
20 incorporated by reference in its entirety.

21 Do you see that?

22 A. I do.

1 Q. So, do you understand that the
2 content of the '799 provisional application is
3 incorporated by reference into the '980 patent
4 specification?

5 A. Yes.

6 Q. Okay. So, let's go to your
7 declaration and turn to Paragraph 35, please.

8 MR. EKLEM: And whenever that
9 Exhibit 3 just shows up, just let me know and I
10 will address it.

11 BY MR. EKLEM:

12 Q. Sir, do you have Paragraph 35 of
13 your report in front of you, Dr. Bajaj?

14 A. Oh, I thought you said to wait for
15 the 103. I have that in front of me. I'm sorry.
16 I, I thought you were asking me to wait for the
17 1003.

18 Q. That is okay. We may have to but
19 I'm just going to try to get us right up to the
20 edge here.

21 So, in Paragraph 35 of your
22 declaration you state the following, "According

1 to the intrinsic record of the '980 patent, known
2 methods for object detection included the use of
3 graphical models and belief propagation."

4 Do you see that?

5 A. I do.

6 Q. Okay. And in support of that
7 statement you cite Exhibit 1003 at Page 5, which
8 is Page 5 of the provisional application; is that
9 right?

10 A. That's correct.

11 Q. Okay. This is the part where we
12 would look at Page 5 at the provisional. In the
13 meantime, why don't I go ahead and put it up on
14 the screen.

15 MR. EKLEM: So, I guess we should
16 mark this as an exhibit.

17 So, Exhibit 3 to the deposition will
18 be Exhibit 1003 to the petition in
19 IPR 2023-00924, which is U.S. Provisional Patent
20 Application Serial Number 60/574,799.

21 It is identified in Box as EX 1003
22 980 provisional. Okay.

1 (Bajaj Exhibit 3 marked for
2 identification.)

3 BY MR. EKLEM:

4 Q. So, I'm going to put this up. Are
5 you able to see what is on my screen, Dr. Bajaj?

6 Let me try that again. Are you able
7 to see what I am projecting on the screen,
8 Dr. Bajaj?

9 A. I can, but it would be great if I
10 could get the printed copy.

11 MR. BAKER: It should be there
12 shortly.

13 BY MR. EKLEM:

14 Q. Okay. Let's just get some of the
15 pro forma stuff here done real quick then, I
16 guess.

17 I'm on Page 1 of what we just marked
18 as Exhibit 3 to the deposition. I'm scrolling
19 down to the bottom right corner of Page 1.

20 Dr. Bajaj, do you see the stamp that
21 says Meta 1003?

22 A. Uh-huh.

1 Q. Okay. Do you recognize this as
2 Exhibit 1003 to your declaration?

3 A. Yes, I have only seen the first
4 page, but it looks correct. It is 1003, which is
5 the provisional.

6 Q. Yes, let me scroll through for you.
7 I'm going to go kind of slow.

8 THE WITNESS: Thank you so much.

9 I have the copy now, yes.

10 BY MR. EKLEM:

11 Q. Okay. Great. Let me turn this off.
12 And why don't you take a look at the
13 printed copy that you were just handed and let me
14 know if you recognize that as Exhibit 3 to your
15 declaration -- Exhibit 1003 to your declaration.

16 A. Yes.

17 Q. And would you turn to Page 5 of the
18 provisional application. And by Page 5, I mean
19 the 5 that you see underneath Meta 1003 in the
20 bottom right corner.

21 A. Yes, I am there.

22 Q. Would you please review the second

1 full paragraph which starts with, "Here we
2 present a novel approach."

3 Would you mind just reviewing that
4 paragraph for a second, and then I'm going to ask
5 you a few questions about it.

6 A. I have reviewed it. Thank you.

7 Q. Okay. The first sentence of that
8 paragraph says, "Here we present a novel approach
9 to object detection and tracking that builds on
10 top of, improves and extends the standard ADA
11 boost."

12 Do you see that?

13 A. Yes.

14 Q. So, that sentence mentions both
15 object detection and tracking. Could you explain
16 what tracking means there?

17 A. Interpreting, you know, all of this,
18 we first go to the claims and look at what the
19 patent claims. And the elements of the claim are
20 then looked at in light of the specification.

21 So, is there a specific claim
22 element that you are considering? That is what I

1 did when I analyzed the patent and showed
2 obviousness.

3 Q. I understand. I'm just asking you
4 about what is in the Provisional Application at
5 the moment. We are not talking about a specific
6 claim.

7 I'm just going to ask you a few
8 questions about what the Provisional Application
9 describes here.

10 So, I will ask the question again.
11 So, in the first sentence of the second full
12 paragraph on Page 5 of the Provisional
13 Application, it mentions detection and tracking.

14 Do you understand what tracking
15 means in that context?

16 MR. BAKER: Objection, outside of
17 the scope of direct.

18 THE WITNESS: So, that sentence
19 talks about object detection and tracking that
20 builds on top of and improves and extends the
21 Reference 7.

22 So, to put it in proper context, you

1 know, one would need to go to Reference 7 and
2 also see in what context the object detection and
3 tracking is being referred to.

4 And that is why it is better if you
5 were to consider it in terms of the claim
6 elements which is where we start and look at
7 this.

8 BY MR. EKLEM:

9 Q. Dr. Bajaj, I'm going to ask you
10 please to answer the questions that I ask you.
11 I'm not asking a question about the claims at the
12 moment. I'm asking a question to understand what
13 you understand about what is described in the
14 Provisional Application.

15 Okay. So, are you able to do that?
16 Are you able to answer my questions about what
17 the provisional says?

18 A. I am. But, you know, we are talking
19 about general terms and why we have to be very
20 specific about what the patent is claiming.

21 And that is what I am trying to
22 bring attention to it. It has to be in the

1 context of the claims and not just broadly
2 considered.

3 Q. Did you review -- did you read the
4 provisional application in the process of
5 rendering your opinions in your expert report?

6 A. I did.

7 Q. And in Paragraph 35, you cite to
8 this very page, Page 5 of the provisional
9 application. Is that correct?

10 A. I cite to the fact that
11 spatio-temporal graphical models are well known
12 as indicated by this provisional application as
13 well.

14 Q. Okay. So, you read Page 5 of the
15 provisional application in rendering your
16 opinions, correct?

17 A. I read the -- I read Page 5, yes.

18 Q. Okay. And the sentence on Page 5
19 that I'm asking about says, "Here we present a
20 novel approach to object detection and tracking
21 that builds on top of, improves and extends the
22 standard in data boost."

1 Do you have an understanding of what
2 tracking means?

3 A. The tracking is a broad term. And
4 so that is why I was wanting you to consider it
5 in light of the claim elements. And in light of
6 those claim elements, there is the notion of
7 looking at an object in video and detecting the
8 object in image frames in the video, and so on.

9 And that is one aspect of tracking.
10 There can be many others. And that is why it is
11 best if you look at it in terms of both the claim
12 elements and the '980 patent.

13 Q. Do you believe the word, tracking,
14 is in the claims of the '980 patent?

15 MR. BAKER: Objection, form.

16 THE WITNESS: Exactly my point. I
17 am saying -- you know, you are asking me
18 questions about generalities. And I am saying it
19 should be specific to the claim elements. And
20 let's look at the claim elements and see what the
21 context is.

22 BY MR. EKLEM:

1 Q. Dr. Bajaj, I'm not -- at the moment
2 I'm not asking about the claim elements. We are
3 going to talk about those.

4 But you said that tracking is a
5 broad term. Why do you think tracking is a broad
6 term?

7 A. Tracking is an English word. When
8 we are looking at technical matters, we have to
9 be very specific as to what technical aspect is
10 being considered. And that is why I am saying
11 let's go to the specificity of what the claim
12 elements are looking for or claiming. And that
13 is --

14 Q. Dr. Bajaj, do you not know what
15 tracking means?

16 A. I am a native English speaker. I
17 know the word, tracking.

18 Q. Does tracking have a meaning to the
19 person of ordinary skill in the art in the
20 context of object detection?

21 MR. BAKER: Objection, outside the
22 scope of direct.

1 THE WITNESS: A person of ordinary
2 skill in the art would know object detection in
3 light of the patent and the claims.

4 And if there was object tracking,
5 then a person of ordinary skill in the art would
6 look into the claim elements and the
7 specification to understand what that is.

8 BY MR. EKLEM:

9 Q. Did you interpret the claims in
10 light of the specification of the '980 patent?

11 MR. BAKER: Objection, asked and
12 answered.

13 THE WITNESS: I followed the legal
14 standards of obviousness as I stated in my
15 declaration and applied those as a person of
16 ordinary skill in the art at the time of the
17 patent.

18 BY MR. EKLEM:

19 Q. Are object detection and tracking
20 the same thing?

21 A. You need to look at the context of
22 what is being claimed, and in that context I

1 could give you the specific answer.

2 Q. So, aside from looking at the
3 claims, you don't have an understanding of what
4 tracking means in the provisional patent
5 application?

6 A. I analyzed the patent. I looked at
7 the provisional. I showed that the prior art --
8 that a person of ordinary skill in the prior
9 art -- the person of ordinary skill in the art
10 knowing the prior art would find it obvious for
11 meeting each of the elements of each of the
12 claims of the patent.

13 Q. Dr. Bajaj, I don't think you
14 answered my question. Does the word, tracking,
15 in a general sense have --

16 Does the person of ordinary skill in
17 the art in the relevant field of the '980 patent
18 have an understanding of what tracking means in a
19 general sense?

20 A. That is not something I was asked to
21 opine on, on what things were in a general sense.

22 I was asked to opine on the patent

1 claims. And what I have shown in my declaration
2 are that a person of ordinary skill in the art
3 would find it obvious in light of the prior art
4 that each of the elements of the claims were
5 obvious.

6 Q. Can you go to Paragraph 16 of your
7 expert report, please -- of your declaration,
8 please.

9 A. Sorry. Did you say 16?

10 Q. 16. 1-6.

11 A. 1-6. Thank you. I am there.

12 Q. In Paragraph 16 you say, "A person
13 of ordinary skill in the art (POSITA) in the
14 field of the '980 patent, as of its earliest
15 possible priority date of May 27, 2004, would
16 have been someone with a bachelor's degree in
17 computer science, computer engineering, computer
18 vision or visualization or an equivalent field,
19 and approximately two years of experience in
20 software development for computer vision
21 applications.

22 "Additional education might

1 compensate for less experience, and vice-versa."

2 Do you see that?

3 A. I do.

4 Q. Would the person of ordinary skill
5 in the art as defined in your Paragraph 16 of
6 your declaration -- let me start over.

7 Would the person of ordinary skill
8 in the art as defined in Paragraph 16 of your
9 declaration understand what the word, tracking,
10 means in the context of the provisional
11 application?

12 A. It would -- or he or she would.

13 Q. And what would he or she's
14 understanding be?

15 A. A person of ordinary skill in the
16 art would analyze and read the patent and the
17 provisional and see in what context are those
18 terms being used.

19 Q. Would the person of ordinary skill
20 in the art, as defined, be familiar with the
21 term, tracking? For example, would they have
22 ever heard of it before?

1 A. Tracking is an English word. So,
2 I'm fairly familiar. I would be fairly confident
3 that the person would know.

4 But, on matters such as these, the
5 person of ordinary skill in the art would look at
6 the specific context of the usage and what is
7 being claimed.

8 Q. Would the person of ordinary skill
9 in the art, as defined in Paragraph 16 of your
10 report, understand what tracking means in the
11 context of computer vision and visualization?

12 A. There is broad usage of tracking and
13 there are many forms of it.

14 But for this matter, one would have
15 to look specifically at its usage in the patent
16 or in the provisional.

17 And in that context the person of
18 ordinary skill in the art would understand and
19 analyze -- or analyze and understand.

20 Q. Let's go back to the provisional
21 application on Page 5, please.

22 A. Yes.

1 Q. In the second full paragraph that we
2 have been discussing, the first sentence mentions
3 AdaBoost, A-D-A-B-O-O-S-T.

4 A. Yes.

5 Q. Do you know what AdaBoost is,
6 Dr. Bajaj?

7 A. I do.

8 Q. What is it?

9 A. I have cited that in my declaration
10 as well, a technique. I point you to my
11 declaration.

12 If you go to, for example, on
13 Page 65, Paragraph 119, in the context of
14 Limitation 1/9(e), "Zhao uses probabilistic
15 framework for object detection that includes the
16 use of a threshold.

17 "Additionally, the threshold is
18 selected empirically based on a 'ROC curve' and
19 the rate of false detections are generated by
20 testing the RCR algorithm on 20 sequences," as
21 illustrated in the figure.

22 "A POSITA would have understood that

1 the threshold is determined 'empirically' because
2 the threshold is based off the rate of false
3 detections, which was measured by applying and
4 testing the system.

5 "Similar examples of empirical
6 threshold adjustments are explained in Paul Viola
7 and Michael Jones, 'Rapid Object Detection Using
8 a Boosted Cascade of Simple Features'."

9 And this is similar to the reference
10 of AdaBoost, which is Reference 7 in the
11 specification.

12 Notably, a POSITA would have
13 understood the empirical results are determined
14 through this experimental, you know, adjustments
15 of the threshold using this boosted cascade of
16 features.

17 And AdaBoost gives you that -- that
18 mechanism of selection of features from which you
19 can get improved classification.

20 And that is what the patent is also
21 using, its prior art.

22 Q. So, the person of ordinary skill in

1 the art would have understood AdaBoost as a
2 mechanism of selection of features which you can
3 get improved classification; is that right?

4 A. There is more to it as well. And
5 that is explained in the Viola reference. And
6 also Viola and Jones and other references of
7 AdaBoost that I have cited in my declaration.

8 Q. You mentioned improved
9 classification. What is classification?

10 A. So, again, this is a general
11 technique in the context of this patent.

12 It leads to recognition and correct
13 labelling of component parts of objects, since
14 you are trying to compute probabilities and the
15 likelihood of each part being present in an
16 image.

17 And in that form, you are looking at
18 features that allow you to correctly compute
19 these image likelihoods. And that is a form of
20 classification.

21 Q. Can you go to Paragraph 36 of your
22 declaration, please.

1 A. Sorry, could you repeat that? Which
2 paragraph?

3 Q. 36.

4 MR. BAKER: We have been going about
5 an hour. Is now a good time for a break or do
6 you want to do one more line of questioning?

7 MR. EKLEM: Let's go ahead and take
8 a break.

9 (Recess taken -- 10:07 a.m.)

10 (After recess -- 10:16 a.m.)

11 BY MR. EKLEM:

12 Q. Dr. Bajaj, could you go to
13 Paragraph 34 of your declaration, please. And
14 just let me know when you are there.

15 A. I am there.

16 Q. Okay. Paragraph 34 of your
17 declaration says, "Before the '980 patent's
18 priority date, computer vision was a well-known
19 field in image processing where computers were
20 used to detect, recognize, or track objects in
21 images."

22 Do you see that?

1 A. Uh-huh. Yes.

2 Q. What does detect mean in that
3 sentence?

4 A. As I further explain there, it is
5 recognizing different categories of objects:
6 Faces, people, cars.

7 Q. So, detecting is recognizing
8 objects?

9 A. In images, you are trying to
10 interpret the images as what is present in the
11 image. And that interpretation is done in the
12 context of this patent as well and the prior art
13 done with probabilities.

14 So, there is a notion of detection
15 of a pattern in the image that is then with the
16 label as to what type of object it is.

17 So, that context is, the term,
18 detection and recognition are coupled.

19 Q. How are detection and recognition
20 different from each other?

21 A. So, as would be well-known for a
22 person of ordinary skill in the art as well, that

1 the process of knowing the presence of a signal,
2 and that is a computer process, would be akin to
3 a form of detection.

4 But the detection is often, you
5 know, followed by -- the reason for the detection
6 and the presence of something is to recognize
7 what exactly is captured in that image.

8 Q. So, detection is followed by
9 recognition; is that correct?

10 A. Often that is the case, but there is
11 no requirement.

12 Q. So, in the first sentence of
13 Paragraph 34 of your declaration, you mention
14 three things: detect, recognize, and track.

15 Is there a difference between detect
16 and track?

17 A. These are broad terms. And yes, in
18 general they are, they are overlapping but
19 different.

20 Q. How are they different?

21 A. Again, you need to go to the context
22 of, you know, that subject matter. And with the

1 context of that subject matter one can be precise
2 as to how different they are.

3 Q. You said a computer vision was a
4 well-known field. Do you see that in
5 Paragraph 34?

6 Sorry. Do you see that, Dr. Bajaj?

7 A. Yes.

8 Q. Were the concepts of detect,
9 recognize, and track also well-known concepts?

10 A. Well-known concepts, but they have
11 specificity in different contexts.

12 Q. In the computer vision field, are
13 there any -- is there any level of specificity
14 where detection and tracking are always
15 different?

16 MR. BAKER: Objection, form.

17 THE WITNESS: You know, I haven't
18 thought about all of the various data forms and
19 data where this could be similar or different.

20 It is something I haven't opined on.

21 BY MR. EKLEM:

22 Q. So, are you able to tell me any

1 general differences between detection and
2 tracking that a person of ordinary skill in the
3 art would have understood at the time?

4 A. There are examples, yes. Motion is
5 an example where motion occurs and you are
6 detecting the presence of an object over time.
7 And that is where one would pick out a difference
8 between, generally speaking, between detecting
9 and tracking.

10 But exactly what it is should always
11 be viewed in the context of the data and the
12 subject matter that one is looking at.

13 Q. So, I would like to understand your
14 answer a little bit more.

15 You said that motion is an example
16 where motion occurs and you are detecting the
17 presence of an object over time. And that is
18 where one would pick out a difference between
19 generally speaking, between detection and
20 tracking.

21 So, what is, what is the difference
22 between detection and tracking in the motion

1 example that you gave?

2 A. The process, the computer process of
3 applying detection in a sequence of images is
4 akin to, in that sense, tracking the object in
5 the sequence of images.

6 And when you are doing that, the
7 object is moving or the camera that is acquiring
8 the object is moving.

9 And in that context, processes are
10 considered of detection and tracking in the
11 general context.

12 Q. If you detect the presence of an
13 object over time, for example, in multiple images
14 or multiple frames, does that necessarily mean
15 that you are tracking the object?

16 A. Yes. And it has to be looked in the
17 context of what processings are you doing.

18 If you are inferring between
19 multiple frames, then in that sense you are
20 tracking.

21 But just pure detection without that
22 inference would just be detection alone. Then

1 you are speaking very broadly and generally and
2 not with the specificity that is required when we
3 are looking at technical matters like this patent
4 and what I have stated in my declaration.

5 Q. In Paragraph 34 of your declaration
6 you say, "For computer vision applications
7 performing object detection, it was and remains
8 common to represent objects as collections of
9 features with distinctive appearance, spatial
10 extent and position."

11 What do you mean by object detection
12 there?

13 A. For certain computer vision
14 applications that perform object detection, what
15 I am stating is it is common to represent these
16 objects as collections of features and also their
17 localization, their spatial extent and their
18 position.

19 Q. Right. So, you say for computer
20 vision applications performing object detection.
21 That is the premise of your sentence.

22 And my question is, what do you mean

1 by object detection there?

2 A. In certain computer vision
3 applications that perform object detection, it is
4 the detection of, you know, the presence of the
5 object.

6 And this is dealing with images.
7 Then your objects are represented as collection
8 of features with distinctive appearance, getting
9 the colors, if they are color images, spatial
10 extent, your sizes and their position in the
11 image.

12 Q. Okay. And if you go to Paragraph 35
13 of your declaration, please. This is the next
14 paragraph.

15 A. Yes, I am there.

16 Q. The first sentence says, "According
17 to the intrinsic record of the '980 patent, known
18 methods for object detection included the use of
19 graphical models and belief propagation."

20 Do you see that?

21 A. I do.

22 Q. What is belief propagation?

1 A. So, I explained this, you know, also
2 in my declaration. It is a well-known technique
3 just like graphical models.

4 It is a way of doing probabilistic
5 inference in methods such as Bayesian
6 optimization, message passing and so on.

7 And I provide references in that
8 same paragraph.

9 For example, in computer vision
10 applications, you know, there is approximate
11 inference algorithms such as Bayesian
12 optimization and loopy belief propagation.

13 And I point to Exhibit 1019, 1020,
14 and 1021, 1022.

15 Q. At the bottom of Page 15, we are
16 still in Paragraph 35 of your declaration, but
17 near the very bottom of the page, there is a
18 citation to Exhibit 1003 at 5.

19 Do you see that? It is a
20 parentheses, "other known techniques included,"
21 and then it goes on to the next page.

22 It says, "temporal propagation." Do

1 you see that?

2 A. Yes.

3 Q. You put temporal propagation in
4 quotations.

5 Can you explain what that is?

6 A. We need to go back to Exhibit 1003,
7 and see the context of what I am citing
8 from 1003.

9 Q. Okay. Let's do that.

10 A. So, as 1003 on Page 5 explains, in
11 the sentence in the middle of the second
12 paragraph, "Probabilistic frameworks, such as
13 what has been explained above," you know, which
14 is well-known nonparametric belief propagation
15 methods and spatio-temporal graphical models
16 which are both known.

17 "Models objects using components
18 that integrates temporal information, and allows
19 for simultaneous tracking." And that is what is
20 being referred to as temporal propagation.

21 Q. You mentioned simultaneous tracking.
22 What is meant by simultaneous? What is it

1 simultaneous with respect to?

2 A. I'm just quoting what the exhibit
3 stated. I did not analyze what simultaneous
4 meant in this context. I was just referring to
5 the part about the well-known techniques of
6 spatio-temporal graphical models and
7 nonparametric belief propagation to infer
8 position and scale and also the integration.

9 So, one would have to go back and
10 look at those references that are being cited.
11 Murphy, I believe that is Reference 24. And
12 Reference 3 is Okuma and Freitas, to put it in to
13 proper context. And also Coughland and Ferreira.
14 So, they mention several prior art references.

15 Q. So, in paragraph, still in
16 Paragraph 35 of your report, on Page 16.

17 About four lines down from the top
18 it says, "In computer vision applications, such
19 as video human tracking, graphical models employ
20 approximate inference algorithms such as Bayesian
21 optimization (BO) and loopy belief propagation
22 (BP) used in Alspach." And you provide some

1 citations there.

2 What is human -- or, excuse me, what
3 is video human tracking?

4 A. So, those references that I provide
5 are just examples of how these Bayesian methods
6 are used to do approximate inferences in image
7 sequences.

8 So, the reference 1019 is Pampas,
9 Real-valued graphical models for computer vision,
10 reference Alspach. And Sorensen is a Nonlinear
11 Bayesian estimation using Gaussian sum
12 approximations. And in 1972, and that is what I
13 am referring to there.

14 And, if go to those references, you
15 will see the context of the applications of how
16 they track objects such as humans in video.

17 Q. So, what does it mean to track an
18 object, such as a human, in video; what does that
19 mean?

20 A. To understand that, I'm saying let's
21 go to those references. And their interpretation
22 of what they mean by tracking in that context is

1 what I am referring to in -- so that notion of
2 tracking using graphical models and approximate
3 inference such as belief propagation or Bayesian
4 optimization is what I am referring to in my
5 photograph there.

6 Q. So, could you give me -- could you
7 explain to me in the computer vision space
8 generally what tracking means outside the context
9 of a specific paper or document? Are you able to
10 do that?

11 A. I am able to do that but that is not
12 the subject matter I was asked to opine on.

13 What I was asked to opine on was
14 the '980 claim elements and how the prior art
15 makes each of those claim elements obvious which
16 is what I have stated in my declaration.

17 Q. I understand that, Dr. Bajaj. But
18 I'm asking the questions today. And I would like
19 you to answer my question.

20 Which is, could you give me -- could
21 you explain to me in the computer vision space
22 generally what tracking means, outside the

1 context of a specific paper or document?

2 MR. BAKER: Objection, form.

3 THE WITNESS: We have been
4 discussing this morning, tracking should always
5 be considered, just like any other process like
6 detection, and so on, in the context of the
7 subject matter. It is a broad term and it has
8 many different forms.

9 In this specific form, it is using
10 approximate inference algorithms that are
11 employing graphical models and using belief
12 propagation methods for this inferencing.

13 And in that context, these are
14 similar to what the '980 is using as well.

15 BY MR. EKLEM:

16 Q. Can you go to Paragraph 36 of your
17 declaration, please.

18 A. I am there.

19 Q. At the end of the first sentence in
20 Paragraph 36, you cite to Exhibit 1003 at Page 9.

21 I have a question about that
22 citation. In the parentheses, it says,

1 "Describing the use of image likelihood, i.e.,
2 the likelihood of observing the object in the
3 image," closed parentheses.

4 And in between the parentheses, you
5 have brackets around the word, object in the.

6 I would like to know why you added
7 those words.

8 A. Yes, I believe I know the reason.

9 Q. Okay.

10 A. So, if you were to look at Page 9.
11 The image likelihoods that are being referred to
12 come from their use in Page 8.

13 So, inferring the state of the
14 object and its component in our framework is
15 defined as estimating belief in a graphical
16 model.

17 We use a form of the nonparametric
18 belief propagation, which is Reference 19,
19 Pampas, which I was just pointing to as well, to
20 deal with this task.

21 And it goes back and explains that
22 how it infers the state of the object and its

1 components in that framework.

2 So, this inference algorithm that is
3 the belief propagation algorithm, which is on
4 Page 9, it states, "The inference algorithm
5 outlined in the previous section requires
6 probabilistic image likelihood model. This
7 likelihood model is the likelihood of observing
8 the, the image conditioned on the state of X_i of
9 the node i in this." And that is the object.

10 So, I mean, it is very clear that
11 the likelihood of observing the object in the
12 image because you are inferring the state of the
13 object and its components in this framework.

14 And that is why I added that as a,
15 you know, the writer was perhaps intending that
16 same -- but there is a typo there. It says
17 observing the, the image.

18 Q. Okay. Can you pull up the '980
19 patent and go to Column 5 at Line 25. And let me
20 know when you are there.

21 A. Yes, I am there.

22 Q. Okay, at Line 25 it says, "A

1 likelihood, $B_i(X_i)$ models the probability of
2 observing the image conditioned on the state X_i , I
3 think, of the node I ."

4 So, here in this Line 25 through 27,
5 is a very similar sentence to the one we were
6 just discussing.

7 Should it be modified in the same
8 way that you suggested that the provisional
9 application be modified?

10 In other words, should the words,
11 object in, be inserted after observing the, in
12 Line 26?

13 MR. BAKER: Objection, form.

14 THE WITNESS: I was not suggesting
15 any modification to the provisional nor the
16 patent. I am reading it as I read it.

17 And I was citing to the notion of
18 the image likelihood which are probabilities
19 of -- these are conditional probabilities of X_i of
20 the node i . And the node i here is referring to
21 the graphical model node which is a component of
22 the object.

1 So, this sentence, you know -- and
2 neither was I doing any other modification. This
3 sentence is quite clear.

4 BY MR. EKLEM:

5 Q. Could you go to Paragraph 38 of your
6 report, please, of your declaration?

7 A. Yes.

8 Q. First sentence in Paragraph 38 says,
9 "The '980 patent claims a probabilistic framework
10 for a component-based detection and tracking of
11 objects in images and/or video that combines
12 object detection with tracking."

13 Do you see that?

14 A. I do.

15 Q. Is that your understanding of what
16 the '980 patent claims?

17 MR. BAKER: Objection, form.

18 THE WITNESS: It is not the claim
19 language. I am citing to Column 2, Lines 43
20 to 47. And then follow it up by what it explains
21 with respect to its flow chart, which is
22 detailing, you know, the steps involved in that

1 process.

2 BY MR. EKLEM:

3 Q. So, when you say, "The '980 patent
4 claims a probabilistic framework," you are not
5 referring to the claims of the patent?

6 A. If I go back to the claim language,
7 then the claim language does not have those
8 terms.

9 All I am citing there is in the
10 section titled Specification. So, the
11 specification, you know, explains a probabilistic
12 framework.

13 And the use of claims there is just
14 an English word saying this is what the
15 specification is describing.

16 Q. Do you understand that a patent has
17 claims that are separate from the specification,
18 per se?

19 A. I do.

20 Q. So, when you are talking about the
21 claims, you are talking about what the patent
22 claims in your expert declaration. You are not

1 necessarily referring to what is actually in the
2 claims of the patent; is that right?

3 A. When I am referring to the patent's
4 claim language, and the claim elements, I specify
5 the patent's claim elements and I specify which
6 claim element and which claim. And that is what
7 I have done.

8 Q. So, earlier when we were talking
9 about Exhibit 1003, which is the provisional
10 application, and you told me that you would
11 prefer to analyze something in the context of the
12 claims, were you talking about the specification
13 of the patent? Or were you talking about the
14 claims that appear at the end of the patent?

15 A. I was talking about the claims at
16 the end of the patent. Those are the claims of
17 the patent.

18 Q. Okay. So, in Paragraph 38 of your
19 declaration, when you say -- when you describe
20 what the '980 patent claims, you are not talking
21 about the claims of the patent. You are talking
22 about the specification. Is that your testimony?

1 MR. BAKER: Objection, form.

2 THE WITNESS: On Page 18, the
3 section heading above 38 says Specification. It
4 doesn't say claim language or claim elements.

5 And my paragraph cites to the
6 specification.

7 BY MR. EKLEM:

8 Q. Do you understand what is claimed in
9 Claim 1 of the '980 patent to be a probabilistic
10 framework for a component-based detection and
11 tracking of objects and images and/or video that
12 combines object detection with tracking?

13 A. Sorry. I don't understand the
14 question. I understand the claim and I -- you
15 know, the claim language is what is given in the
16 patent.

17 Q. Does Claim 1 of the '980 patent
18 cover a probabilistic framework for
19 component-based object detection and tracking of
20 objects and images in a video?

21 MR. BAKER: Objection. Calls for a
22 legal conclusion.

1 THE WITNESS: Claim 1 of the patent
2 refers to probability. The claim language is
3 explicit. I have not construed any claim terms.
4 I have applied them as are given.

5 BY MR. EKLEM:

6 Q. So, let's go to Column 2, Line 43 of
7 the '980 patent, please.

8 A. I am there.

9 Q. So, from Lines 43 to 47 it says,
10 "According to an embodiment of the present
11 disclosure, a probabilistic framework for
12 automatic component-based detection and tracking
13 of objects in images and/or video combines object
14 detection with tracking in a unified framework."

15 Do you see that?

16 A. Which line number are you reading
17 from? Sorry.

18 Q. 43 through 47 of Column 2.

19 A. Okay.

20 Q. That is the portion cited in
21 Paragraph 38 of your declaration.

22 A. That's correct. So, that is what

1 the specification states.

2 Q. So, in that context, detection and
3 tracking are different concepts; is that correct?

4 A. They are different steps -- or I
5 should say different concepts or processes, yes.

6 Q. In Line 47, there is a sentence --
7 in Line 47 of Column 2 of the '980 patent, there
8 is a sentence that says, "Tracking makes use of
9 object detection for initialization and
10 reinitialization during transient failures for
11 occlusions."

12 Do you have an understanding of what
13 initialization or reinitialization is in that
14 context?

15 A. I do.

16 Q. Can you explain it to me, please?

17 A. So, tracking in this context is
18 probabilistic inferencing. And you infer by
19 initializing an image, the detection probability
20 of the object.

21 And the reinitialization that is
22 being referred to is when there is occlusion in a

1 component, or the parts of components of the
2 object are not detected and causing a transient
3 failure. That you would have to reinitialize the
4 object detection. And that is what is being
5 referred to there.

6 Q. So what does it mean to initialize
7 the object detection?

8 A. If you read further in that column,
9 on Line 55, it says, "Referring to Figures 2A
10 and 2B, object detection and tracking is
11 formulated as an inference in the two earlier
12 graphical model."

13 And as you read further, you are
14 computing probabilities or image likelihoods of
15 the presence of components of the object, and
16 also recognizing them or matching them. These
17 image likelihoods are for specific nodes of your
18 graphical model.

19 And that is the process of detection
20 in this probabilistic procedure.

21 Q. So, going back to Line 49 of
22 Column 2. It says, "Object detection considers

1 the consistency of the detection over time."

2 Do you see that?

3 A. Yes.

4 Q. So, in the context of the '980
5 patent, object detection considers the
6 consistency of the detection over time. Correct?

7 A. That is what it states.

8 Q. Do you know what it means to
9 consider the consistency of the detection over
10 time?

11 A. You would have to look elsewhere in
12 the patent to understand how the patent is trying
13 to explain that.

14 Q. So, is the patent saying that the
15 process of object detection involves considering
16 the consistency of detection over time?

17 A. That is what it is stating, yes.

18 Q. Going down to Line 55 of Column 2.
19 It says, "Referring to Figures 2A and 2B, object
20 detection and tracking is formulated as an
21 inference in a two-layer graphical model in which
22 coarse layer node represents the whole object and

1 fine layer node represents multiple components of
2 the object."

3 Do you see that?

4 A. Yes.

5 Q. So, is the patent saying that in the
6 context of the '980 patent, object detection is
7 formulated as an inference in a model?

8 A. In a graphical model.

9 Q. I'm sorry?

10 A. In a graphical model.

11 Q. So, the process of object detection
12 in the context of the '980 patent involves an
13 inference in a graphical model. Correct?

14 A. That is what it states.

15 Q. Does it also state that tracking is
16 formulated as an inference in a graphical model?

17 A. That's correct.

18 Q. Going down to Line 59 of Column 2.
19 There is a sentence that says, "Directed edges
20 between nodes represent learned spatial and
21 temporal probabilistic constraints."

22 Do you see that?

1 A. I do.

2 Q. Do you know what directed edges are?

3 A. So, in this patent, you know, they
4 are referring to Figures 2A and 2B and referring
5 to that.

6 So, if you go to Figures 2A and 2B,
7 you don't see any directed edges. You only see
8 edges.

9 Q. In 2A and 2B, in Figures 2A and 2B,
10 you do not see directed edges?

11 A. You only see edges between nodes.

12 Q. What is the difference between a
13 directed edge and an edge?

14 A. So, in a graph, an edge is a pair
15 that connects two, and that pair is two nodes.
16 And an edge connects that pair.

17 A directed edge is an edge between
18 the first element of the pair to the next element
19 of the pair. And there is typically an arrow of
20 direction in the graph.

21 Q. And what does the arrow represent?

22 A. The direction of dependency.

1 Q. So, if an edge has no arrow, is
2 there a dependency?

3 A. We are talking about the distinction
4 between directed edges and nondirected edges.

5 So, that is a mistake in this
6 patent. There are no directed edges.

7 Q. Is the mistake in the figures or in
8 the description in the specification?

9 A. Either or. If they were referring
10 to directed edges, they would have drawn directed
11 edges as opposed to plain edges.

12 Q. Going back to Column 2 for a minute
13 at Line 60. It says, "Each node in the graphical
14 model corresponds to a position and scale of the
15 component or the object as a whole in an image at
16 a given time."

17 Do you see that?

18 A. I do.

19 Q. So, looking at Figures 2A and 2B, if
20 you take, for example, in Figure 2A, the -- do
21 you see the word, object, next to 203, in the top
22 left?

1 A. Yes.

2 Q. Do you understand that to be
3 indicating where the object nodes are in the
4 model?

5 A. Yes.

6 Q. So, do you see three object nodes in
7 Figure 2A?

8 A. I do.

9 Q. So, each of those object nodes
10 correspond to a different point in time; is that
11 correct?

12 A. That is as the specification
13 explains it. It corresponds to a position and
14 scale of the component or the object.

15 So, here we are referring to the
16 object node as a whole in an image at a given
17 time instant.

18 Q. So, in the context of the '980
19 patent, object detection is formulated as an
20 inference in a graphical model like that shown in
21 Figure 2A; is that correct?

22 A. The figure doesn't explain

1 everything. The figure is being referred to.
2 The specification explains some more about what
3 the inference is.

4 Q. If we go to Column 3 of the '980
5 patent, please, at Line 47.

6 A. Sorry, I missed the first part.
7 Which column?

8 Q. 3.

9 A. And which line number, please?

10 Q. 47 -- actually, let's go to, let's
11 go to Paragraph 40 of your declaration, please.
12 4-0.

13 THE WITNESS: By the way, it is
14 about an hour. Do you want to take a quick
15 break?

16 MR. EKLEM: Sure, if you would like.

17 THE WITNESS: Yeah, I need a bio
18 break. Sorry.

19 MR. EKLEM: Yes, certainly. Let's
20 go ahead and do that.

21 THE WITNESS: Okay, thanks.

22 MR. EKLEM: Yes.

1 (Recess taken -- 11:17 a.m.)

2 (After recess -- 11:23 a.m.)

3 BY MR. EKLEM:

4 Q. Okay, Dr. Bajaj. Could you go to
5 Paragraph 40 of your declaration, please.

6 A. Yes, I am there.

7 Q. You state in Paragraph 40, "With
8 respect to the 'spatio-temporal model,' the '980
9 patent specification states, 'the spatio-temporal
10 model is a graphical model comprising nodes
11 corresponding to each of the collection of
12 components and to the object'."

13 Do you see that?

14 A. Yes.

15 Q. And you cite there Column 1,
16 Lines 41 to 42 of the '980 patent. Correct?

17 A. Yes.

18 Q. Do you understand the patent to be
19 providing a definition for what a spatio-temporal
20 model is?

21 A. Yes.

22 Q. Is that the definition that you

1 applied in rendering your opinions in your expert
2 declaration?

3 A. When I interpreted the claims and
4 wherever the term came up, I applied that.

5 Q. Did you apply any other meaning or
6 definition of spatio-temporal model in rendering
7 your opinions?

8 MR. BAKER: Objection, asked and
9 answered.

10 THE WITNESS: I applied that
11 definition --

12 BY MR. EKLEM:

13 Q. I'm sorry. You cut out. Could you
14 say that again?

15 A. I said I applied that definition as
16 stated.

17 Q. Which --

18 Okay. What I am asking is, in
19 rendering your opinions, did you apply any other
20 interpretation, in addition to the one that is
21 defined in Paragraph 40?

22 A. No.

1 Q. So, the opinions in your expert
2 declaration apply only to the definition of
3 spatio-temporal model provided by the patent at
4 Column 1, Line 40 through 42?

5 MR. BAKER: Same objection.

6 THE WITNESS: I interpret -- sorry,
7 I didn't hear you.

8 MR. BAKER: I said same objection.

9 You can answer the question.

10 THE WITNESS: So, in the '980, which
11 I analyzed, I look at the claim terms and the
12 claim elements and I look at the specification
13 and I apply that precisely as the specification
14 calls it.

15 BY MR. EKLEM:

16 Q. So, for example, Claim 1 of the '980
17 patent uses the term, spatio-temporal model,
18 correct?

19 A. An element of that claim talks about
20 a spatio-temporal model. Claim 1, providing the
21 spatio-temporal model for an object to be
22 detected.

1 Q. So, in order for every element of
2 Claim 1 of the '980 patent to be satisfied, the
3 spatio-temporal model as claimed would have to be
4 a graphical model comprising nodes, corresponding
5 to each of the collection of components and to
6 the object. Is that correct?

7 A. The claim element, you know,
8 providing a spatio-temporal model for an object
9 to be detected, only appears in that element.

10 It is not invoked in the other
11 elements. The other elements describe providing
12 a video, measuring the object, determining
13 probability, and so on.

14 Q. If a, does the -- does
15 spatio-temporal model have a meaning to the
16 person of ordinary skill in the art outside the
17 context of the '980 patent?

18 A. That is an opinion I was not asked
19 to render for this declaration. Everything was
20 specific to this '980 patent and the analysis of
21 that -- of this patent.

22 Q. So, if any of the documents that you

1 referred to in your expert report mention
2 spatio-temporal model, would that be a different
3 spatio-temporal model than the one described in
4 the '980 patent?

5 MR. BAKER: Objection, form.

6 THE WITNESS: The subject matter
7 that I was asked to provide my opinion on was
8 what I have stated in my declaration.

9 And I apply, you know, as by the
10 letter of the law, the obviousness of the prior
11 art. And I have explained that, that meets each
12 of the elements of the claim of the '980.

13 And that is what I have stated in my
14 declaration.

15 BY MR. EKLEM:

16 Q. So, in the Claim 1 of the '980
17 patent, is it your understanding that the
18 spatio-temporal model referred to in the claim
19 must be a graphical model comprising nodes
20 corresponding to each of the collection of
21 components and to the object?

22 A. The only definition of a

1 spatio-temporal model which is stated in Claim 1
2 is the one that is mentioned in Column 1.

3 There is also Claim 3 that further
4 states that. So, the claim element of the
5 dependent Claim 3 states the same language, "The
6 spatio-temporal model is a graphical model
7 comprising nodes corresponding to each of a
8 collection of components and to the object."

9 Q. Okay. So, given what you said about
10 Claim 3, is the spatio-temporal model in Claim 1,
11 must it also be a graphical model comprising
12 nodes corresponding to each of the collection of
13 components and to the object? Or is that not
14 required for Claim 1?

15 MR. BAKER: Objection. The question
16 calls for a legal conclusion.

17 THE WITNESS: The appearance of the
18 term, spatio-temporal model, occurs in Claim 1.
19 And as we have discussed, you know, the only
20 reference on that claim term in the
21 specification, so when you look at it in the
22 light of the specification is that sentence on

1 Column 1, Line 40 to 42.

2 BY MR. EKLEM:

3 Q. Do any other parts of the
4 specification inform your understanding of what
5 spatio-temporal model means in Claim 1 of
6 the '980 patent?

7 A. Looking at Claim Element 1, the only
8 mention of the spatio-temporal model is in the
9 first element which is providing a
10 spatio-temporal model.

11 And the definition is in Column 1 --
12 or at least that is where it is stated.

13 Q. And my question is, are there other
14 parts of the specification besides Column 1 that
15 informed your understanding of the meaning of
16 spatio-temporal model in Claim 1?

17 Or is it just that part of the
18 specification?

19 A. So, the specification explains the
20 usage of graphical models. In trying to
21 understand the claim, I look at the specification
22 and its usage.

1 Q. So, would you go to Column 3,
2 please, at Line 47, and just let me know when you
3 are there.

4 A. I am there.

5 Q. Okay. At Line 47 the patent says --
6 at Line 47 of Column 3, the '980 patent says, "An
7 object, such as an automobile (See Fig 2B) is
8 molded as a spatio-temporal directed graphical
9 model."

10 Do you see that?

11 A. I do.

12 Q. Does Figure 2B of the '980 patent
13 depict a spatio-temporal model?

14 A. It is just a figure which shows a
15 graph and it has the same flaw. It talks about
16 directed but there is no directions. But it is a
17 graph.

18 And given the further sentences in
19 that, where, "Each node in the graph represents
20 either the object or a component of the object at
21 time T. Nodes have an associated state vectors."
22 And so on.

1 All of that together inform what
2 graphical object models are.

3 Q. In Line 53 of Column 3, so, just a
4 little bit further down, the patent says, "The
5 joint probability distribution for this
6 spatio-temporal graphical object model with N
7 components can be written as," and then it
8 provides an equation.

9 Do you see that?

10 A. Yes.

11 Q. So, is the spatio-temporal model of
12 the '980 patent a probabilistic model?

13 A. A graphical object model or a
14 graphical model is a probabilistic model.

15 Q. And the spatio-temporal model of the
16 '980 patent is a graphical model according to
17 your interpretation; is that correct?

18 A. My interpretation is based on what
19 is stated in the patent. The patent states, "The
20 joint probability distribution for the
21 spatio-temporal graphical object model with N
22 components can be written," in this joint

1 probability distribution form.

2 Q. Can we go to Column 4 of the '980
3 patent, please, at Line 18. 1-8.

4 A. I am there.

5 Q. Okay. On Line 18 in Column 4,
6 the '980 patent says, "For a single frame,
7 objects are represented using a two-layer spatial
8 graphical model, for example, as shown in Figs 2A
9 and 2B."

10 Do you see that?

11 A. Yes.

12 Q. So, if we go to Figure 2A, could you
13 show me what the single frame spatial graphical
14 model is?

15 A. You can actually read in the
16 specification that explain Figure 2A.

17 "The fine component layer 201
18 includes a set of loosely connected parts,
19 Example 202."

20 And, "The coarse object layer 203
21 corresponds to an entire appearance model of the
22 object and is connected to all constituted

1 components, Example 202.

2 "Examples of such models for
3 pedestrians and vehicle detection are shown in
4 the shaded regions of Figures 2A and 2B,
5 respectively."

6 So, what they are referring to in
7 labeled nodes and edges are forming that
8 representation. There are no probabilities in
9 all shown. But those are like labels of CI and
10 OI.

11 So, taken in totality, that is what
12 is being depicted in the specifications or
13 explained in the specifications.

14 Q. Okay. So, at Figure 2A -- at
15 Figure 2A, there are -- do you see three, do you
16 see three spatial models -- or let me ask that a
17 different way.

18 So, if you look at Figure 2A and you
19 see the shaded region there in the middle. Do
20 you see that?

21 A. Yes.

22 Q. So, the nodes that are within that

1 shaded region, do those nodes correspond to a
2 single frame?

3 A. Those nodes correspond to different
4 components of the object in that frame or instant
5 of time.

6 Q. Okay. So, going back to Column 4.
7 We go down to Line 34. The patent says, "To
8 integrate temporal constraints, the spatial
9 graphical models are extended over time to an
10 arbitrary length temporal window. The resulting
11 spatio-temporal graphical model -- models are
12 shown in Figs 2A and 2B."

13 Do you see that?

14 A. Yes.

15 Q. So, is the patent teaching that a
16 spatio-temporal model -- a spatio-temporal
17 graphical model in the context of the patent is
18 the result of extending a spatial model over
19 time?

20 A. So, it is clearly stated as to
21 integrate the temporal constraints, the spatio
22 graphical models are extended over time to a

1 temporal window.

2 And what they are showing is three
3 instances of that spatio models in time.

4 Q. Okay. And so, in, where it says in
5 Line 36 of Column 4, it says, "The resulting
6 spatio-temporal graphical models are shown in
7 Figs 2A and 2B."

8 So, my question is, are the
9 spatio-temporal graphical models the result,
10 because it says resulting, are they the result of
11 extending those graphical models over time or the
12 graphical model over time?

13 A. The figures are not showing anything
14 other than three instances in time of that graph.
15 And it is the same graph.

16 Q. Okay. So, Figure 3A -- or, I'm
17 sorry, 2A, for example, shows three instances of
18 the graph; is that right?

19 A. Three copies of that graph.

20 Q. Okay. And are the three copies of
21 the graph connected to each other?

22 A. Well, there are dots and ellipses

1 and they are in the time dimension. So, these
2 are -- at each instance you have a graph.

3 So, there is a graph or a graphical
4 model in that time instance. Then there is
5 another time instance and another time instance.

6 So, this is like a discrete
7 instances and the same graph has been copied
8 over.

9 Q. Okay. And at the object layer in
10 Figure 2A, for example, there is a line that goes
11 from one object node to another object node.

12 What does that line represent?

13 A. The patent doesn't explain that. It
14 is just saying that there is a graphical model at
15 each instant of time, and it is showing you three
16 snapshots of it.

17 Q. Well, at Line 34, it says, "To
18 integrate temporal constraints, the spatial
19 graphical models are extended over time to an
20 arbitrary length temporal window."

21 So, what does it mean to integrate
22 temporal constraints?

1 A. That explains about how these
2 temporal constraints and spatial constraints are
3 done in the same column, if you go down.

4 And it talks about how the graphical
5 model incorporates these temporal constraints,
6 but there is no edge as you are talking about.

7 It is just showing you instances of
8 time and there are ellipses on them.

9 Q. Do you know what the ellipses stand
10 for? Oh, I'm sorry. I didn't mean to interrupt.

11 A. No, the ellipses are just telling
12 you that this is in the time dimension, and I am
13 showing you three snapshots.

14 And so it is not saying that it is,
15 you know, the -- there is no resolution of time.
16 These are three different time snapshots. They
17 could be an hour apart. They could be seconds
18 apart. The patent is silent about that.

19 Q. So, when the patent says Column 4,
20 Line 34 to 36, it says, "The spatial graphical
21 models are extended over time."

22 Do you know what it means to extend

1 over time a graphical model?

2 A. I don't have to come up with
3 anything. I have to look at what the
4 specification states. And the specification
5 explains how these spatial and how these temporal
6 constraints are encoded to produce.

7 So, this starts off from Line 49,
8 right. There is a potential function that
9 encodes the compatibility. The potential is
10 modeled using a mixture of Gaussians. This is
11 all about the spatial graphical model.

12 And you have to read further and
13 understand what they mean by incorporating these
14 temporal constraints.

15 Q. Okay. Let's take a look at the
16 provisional application real quick which is
17 Exhibit 1003 to your declaration.

18 Exhibit 3 to your deposition on
19 Page 6. And just let me know when you are there.

20 A. Yes.

21 Q. Under the heading 2.1, Building a
22 Graphical Model, there is a paragraph that begins

1 with, "In a single frame, we choose to represent
2 an object using a two-layer spatial graphical
3 model."

4 Do you see that?

5 A. Yes.

6 Q. And down about four lines in the
7 same paragraph, there is a sentence that says,
8 "We can extend this model over time to an
9 arbitrary length, spatio-temporal graphical model
10 as shown in Fig 2C and 2D."

11 Do you see that?

12 A. Yes.

13 Q. Okay. So, if you go to the next
14 page, which is Page 7 of the provisional
15 application. There are Figures 2C and 2D that
16 look similar to the figures in the '980 patent.

17 Do you see those?

18 A. Yes.

19 Q. So, in 2 -- in Figure 2D of the
20 provisional, do you see the three graphs that
21 are -- how do I explain? So, in 2D, do you see
22 three graphs -- sorry. Let me ask that question

1 differently.

2 In Figure 2D of the provisional
3 application, do you see three graphs that
4 correspond to three different instances in time?

5 MR. BAKER: Objection, form.

6 THE WITNESS: This is similar to
7 what is in the patent in the figure, so --

8 BY MR. EKLEM:

9 Q. Okay. So, if you go down to the
10 bottom of Page 7 where it has a description of
11 Figure 2.

12 Do you see where it says,
13 "Spatio-temporal models are obtained by
14 replicating a spatial model along the temporal
15 domain to a w-length window, and then connecting
16 the second layer nodes across time."

17 Do you see that?

18 A. Yes.

19 Q. Are the object layer nodes in
20 Figure 2D connected across time?

21 A. They are not shown. So, the only
22 thing is what I had stated earlier. The train,

1 they are repeating the same graph three times.

2 And this is in each image in that
3 image sequence, it is a w-length window which, if
4 you read the specifications, are image frames.

5 And there is a implicit temporal
6 connection only shown in the object layer.

7 Q. And so what is -- the implicit
8 temporal connection, what is that connection?

9 A. This second image, if you go from
10 left to right, is following the first one.

11 And the third image is following the
12 second one in time.

13 Q. So, in the, on Page 7 of the
14 description of Figure 2, where it says,
15 "Spatio-temporal models are obtained by
16 replicating a spatial model along a temporal
17 plain to a w-length window and then connecting
18 the second layer nodes across time," is that
19 providing a definition of what a spatio-temporal
20 model is?

21 MR. BAKER: Objection, form.

22 THE WITNESS: The specification

1 provides the definition. This is just a caption
2 to this figure. And there is, there is, as we
3 already saw, you know, errors and other things.
4 There are no connections showing anything. So,
5 you can't take that.

6 BY MR. EKLEM:

7 Q. What do you mean there is no
8 connections?

9 A. The only connections are the edges
10 that are being shown in the figure.

11 Q. Are the object nodes connected by
12 edges?

13 A. The object nodes are connected to
14 the components by edges in the graphical model.

15 Q. Are the object layer nodes connected
16 to each other by edges?

17 A. There is a sequencing in time being
18 shown for the three instances which are
19 replicating the spatial model three times in the
20 figure.

21 Q. Could there be more replications of
22 the graph in between two of the graphs shown in

1 Figure 2D?

2 A. Possibly, yes, because time is
3 continuous. So, it is back to what sequencing
4 you are enacting or trying to depict.

5 Q. Okay. So, let's go back to the '980
6 patent. And let's look at Figure 2A, please.

7 I would like to know what, in your
8 opinion, the meaning of, "the line between two
9 object nodes," in Figure 2A, what meaning the
10 line has?

11 A. Can we go back to the patent
12 specification. In the first instance is in
13 Column 2, where it says, "Referring to Figures 2A
14 and 2B, object detection and tracking is
15 formulated," referring to this figure, "as an
16 inference in a two-layer graphical model in which
17 a coarse layer node represents the whole object
18 and a fine layer represents multiple components."

19 And then, "Directed edges between
20 nodes represent learned spatio and temporal
21 probabilistic constraints."

22 And if you refer to the figure, the

1 only edges that you see are there, which is in
2 the object and the components.

3 And the other ellipses that you see
4 is showing you a temporal sequencing of the same
5 graph being replicated in three instances.

6 Q. So, is it your understanding that
7 the line between two-object layer nodes does not
8 represent spatial or temporal constraints?

9 A. No, they are temporal in the edge
10 there, because the second image follows the
11 first. So that is, quote, unquote, a temporal
12 constraint. It can't be switched around
13 temporally.

14 So, the second follows the first and
15 the third follows the second.

16 Q. So, does the line between two object
17 layer nodes represent a probabilistic constraint?

18 A. Explained in the specification and
19 to understand that you have to read the rest of
20 the specification.

21 The figure is just a figure.

22 Q. I understand that. So, I would like

1 to go Column 2, go to Line 59. And it says,
2 "Directed edges between nodes represent learned
3 spatial and temporal probabilistic constraints."

4 And in Figure 2, 2A, for example,
5 there are three object nodes. So, are those
6 object nodes connected by temporal probabilistic
7 constraints?

8 That is my question.

9 A. The object nodes are not connected
10 by constraints. The directed edges, and we have
11 already talked about the fact that there are no
12 directed edges, there are only edges, represent
13 learned temporal and spatial constraints.

14 Q. So, in Column 4 at Line 37 of
15 the '980 patent, it says, "Having a two-layer
16 graphical model allows the inference process to
17 reason explicitly about the object as a whole."

18 Do you see that?

19 A. Yes.

20 Q. It is kind of a long sentence but it
21 continues on to Line 42. But it indicates that
22 the -- so, to take it all together, let's just go

1 ahead -- hold on. It is just a very long
2 confusing -- well, a very complicated sentence.
3 Let me try to simplify it here.

4 So, the sentence says, "Having a
5 two-layer graphical model allows the inference
6 process to reason explicitly about the object as
7 a whole, for example, 203, and reduce the
8 complexity of the graphical model by allowing the
9 assumption of the conditional independence of
10 components, for example, 202 and 208 through 210,
11 over time, given the overall object appearance."

12 So, in light of this, does the
13 patent explain that having a two-layer graphical
14 model allows the inference process to reason
15 explicitly about the object as a whole over time?

16 A. I'm sorry. What was the question
17 now? Because you were reading the sentence, and
18 then I didn't --

19 Q. Does the patent teach that having a
20 two-layer graphical model allows the inference
21 process to reason explicitly about the object as
22 a whole over time?

1 A. The inference process, you know,
2 allows you to consider the object as a whole, but
3 you have to understand that the object is
4 consisting of parts as given by the various
5 components that the object consists of.

6 So, the fact that the object has all
7 of these parts is always part of this articulated
8 object.

9 And here Figure 2A is about a human.

10 Q. So, in Column 4 at Line 37, where it
11 says, "Having a two-layer graphical model allows
12 the inference process to reason explicitly about
13 the object as a whole," what does it mean by
14 reason explicitly?

15 A. So, the object -- you know, as a
16 whole is a sum of also its parts.

17 So, if you just want to think of the
18 object as a whole, you are looking at the object
19 layer.

20 But the object always consists of
21 the remaining graph, which are the components
22 that belong to that object.

1 Q. So, if we go down to Line 46 of
2 Column 4. The '980 patent at Line 46 of
3 Column 4, says, "As can be seen in Figs 2A
4 and 2B, an object at the current time is denoted
5 as O_t with an earlier model denoted as $O_{t-(w-1)/2}$ and
6 a later model denoted as $O_{t+(w-1)/2}$."

7 Do you see that?

8 A. I do.

9 Q. Does "w" refer to the length of the
10 window?

11 A. Yes, the image sequence of the
12 window of frames.

13 Q. And that is the window over which
14 the inference is made. Correct?

15 A. That is what it is explaining in
16 this context, if there is a window of frames,
17 then this is showing you in this figure, three
18 instances, you know, $w-1$, backwards, and $w-1$
19 over 2, forwards -- I should say $w-1$ over 2 from
20 the current time instance at T , backwards. And
21 then $w-1$ over 2, forwards.

22 Q. Okay. So, if w was equal to 1, then

1 the object model at the current time would also
2 be -- it would be the same object model for the
3 earlier model and the later model, correct?

4 A. There would not be any later model
5 or -- it is only that model at that frame. And
6 that is -- w equal to 1 is like the case of
7 Claim 1 of the '980. It is talking about an
8 image.

9 Q. Only one image?

10 A. We can look at the data. We have to
11 look at the claim element. And as you read the
12 claim element, it talks about measuring the
13 object in a collection of components in each
14 image. So, that image is --

15 Q. So, when you say each image, you
16 mean each of only one image?

17 A. This is like w equal to 1, right?
18 There is no time behind that T or in front of
19 that T.

20 Q. Well, let me -- let's -- before we
21 go to the claim, let's keep looking at Column 4
22 here for a second.

1 If w equals 1, and there would only
2 be one object at a single point in time, correct?
3 So there would be no spatio-temporal model,
4 correct?

5 A. I think the words you are using are
6 somewhat, you know, juxtaposed.

7 So, there is always one object. At
8 each instance of time, the spatial extent of that
9 object exists, because there is only one object.

10 Hence w equal to 1 is referring to
11 all of the components and their conditional
12 probabilities of that components for that one
13 object, in that instant of time.

14 So, in any single instance of time,
15 there is one graphical model.

16 Q. But, if w equals 1, there would be
17 no temporal elements, would there? Because there
18 is only one graph at one point in time?

19 A. So, what is the question there?

20 Q. So, wouldn't it be the case that if
21 w equals 1, you are not dealing with a
22 spatio-temporal model, because there is no

1 temporal elements, right?

2 A. That is not how a person of ordinary
3 skill in the art interprets it.

4 Whenever we use notation and
5 symbols, we look at all values those variables
6 take. So, when we define a window, there is a
7 window of size 1. There is a window of size 2.
8 And so on.

9 So, in each case, in a computer
10 program needs to be addressed, the computer --

11 So, the terminology is also true for
12 w equal to 1. But the patent explains that. It
13 says w greater than or equal to 1 in the
14 specifications.

15 Q. It says the --

16 A. Equal to 1.

17 Q. So, if you go to Column 7. And then
18 you go to Line 20 of Column 7. It says, "Note
19 that with $w=1$, the algorithm resembles single
20 frame component-based fusion."

21 Do you see that?

22 A. I do.

1 Q. So, a single frame means one frame,
2 correct?

3 A. A single frame means a single frame,
4 yes.

5 Q. And, do you know what
6 component-based fusion is?

7 A. The graphical model is a
8 component-based fusion. It has got multiple
9 components connected by edges.

10 Q. So, with w equals 1, you have
11 components connected by edges in a single frame.
12 Correct?

13 A. Sorry. I don't understand what you
14 said.

15 Q. What do you not understand? And I
16 will fix it.

17 A. Could you repeat your question,
18 please?

19 Q. With w equals 1, you would have
20 components connected by edges in a single frame.
21 Correct?

22 A. These components we are referring to

1 are graphical components. They are nodes. They
2 are connected by edges. And they are present in
3 a single image frame.

4 Q. So, if you have a single image frame
5 with components of an object, is that a
6 spatio-temporal model?

7 A. We are not trying to define a
8 spatio-temporal model. The specification is
9 explaining the claim elements. What the claim
10 elements call out for is explained in the
11 specification. We are not going after this
12 backwards.

13 So, if you look at the claim
14 elements and then one can understand what the
15 specification is trying to explain.

16 Q. So, if you go to Column, 4, Line 18.
17 It says, "For a single frame, objects are
18 represented using a two-layer spatial graphical
19 model."

20 Do you see that? Why does it not
21 say spatio-temporal graphical model?

22 MR. BAKER: Objection, form.

1 THE WITNESS: Sorry. What line?

2 BY MR. EKLEM:

3 Q. Column 4, Line 18.

4 A. 18. And what was your question?

5 Q. It says, "For a single frame,
6 objects are represented using a two-layer spatial
7 graphical model."

8 Do you see that?

9 A. Yes.

10 Q. It does not say a two-layer
11 spatio-temporal graphical model, does it?

12 A. No, it says a two-layer spatial
13 graphical model.

14 Q. Okay. Let's go to Line 34 of
15 Column 4. It says, "To integrate temporal
16 constraints, the spatial graphical models are
17 extended over time to an arbitrary length
18 temporal window. The resulting spatio-temporal
19 graphical models are shown in Figs 2A and 2B."

20 Do you see that?

21 A. Yes.

22 Q. So a spatio-temporal model is

1 extended over time to a non-0 temporal length,
2 right?

3 A. That is correct.

4 Q. Okay.

5 MR. BAKER: Excuse me, Philip. We
6 are at the hour again. Of course, this is
7 between you and Dr. Bajaj, if you guys want to go
8 a little further.

9 And I also wanted to contemplate
10 timing for lunch.

11 MR. EKLEM: Yes, I was going to ask
12 that. Now might be a good time for lunch,
13 Dr. Bajaj, if you are ready. What do you think
14 about that?

15 THE WITNESS: I can go for lunch
16 now.

17 (Recess taken -- 12:24 p.m.)

18 (After recess -- 1:02 p.m.)

19 BY MR. EKLEM:

20 Q. Dr. Bajaj, do you have a copy of
21 Exhibit 1006 to your expert report with you?
22 That is the Zhao reference.

1 A. I believe I do. Let's find it.

2 Yes.

3 Q. Okay. Do you see on the bottom
4 right corner a label that says Meta 1006?

5 A. Yes.

6 Q. Okay. And the front cover, it says
7 Dressed Human Modeling, Detection and Parts
8 Localization. Right?

9 A. Yes.

10 MR. EKLEM: Okay. So, let's go
11 ahead and mark as Exhibit 4 the document that is
12 in Box, the file name EX 1006, Zhao, Dressed
13 Human Modeling, Detection and Parts Localization.

14 That will be Exhibit 4 to the
15 deposition.

16 (Bajaj Exhibit 4 marked for
17 identification.)

18 BY MR. EKLEM:

19 Q. All right, Dr. Bajaj. Before we
20 look in -- before we look at Zhao, can you please
21 go to Paragraph 74 of your expert declaration.
22 And let me know when you are there.

1 A. I am there.

2 Q. Okay. So, in Paragraph 74, you
3 state that, "Zhao uses an object model in the
4 form of a human model for a human to be
5 detected."

6 Do you see that?

7 A. Yes.

8 Q. And then at the bottom of that
9 paragraph you say, "Zhao illustrates using this
10 model in the flow chart of Figure 9 -- of
11 Figure 1.9."

12 Do you see that?

13 A. Yes.

14 Q. And by this model, you are referring
15 to the human model, correct?

16 A. The human detection model as shown
17 in this flow chart, yes. It is a procedure, the
18 RCR algorithm procedure.

19 Q. Figure 1.9 is pasted into your
20 expert report in Paragraph 74, right?

21 A. Yes.

22 Q. And Figure 1.9 shows human model at

1 the bottom, with an upward arrow pointing into
2 the RCR algorithm, right?

3 A. Yeah, the component which is being
4 shown is the -- in dotted which has part
5 identification, contour updating, human
6 detection, and then arrows coming in from
7 outside, image detection, alignment, and so on.

8 Q. So, the human model in the RCR
9 algorithm figure is input into the human
10 detection block; is that correct?

11 A. The flow chart, yes, is part of the
12 RCR algorithm.

13 Q. So, human model is an input to the
14 RCR algorithm?

15 A. One of the inputs.

16 Q. Is another input an image?

17 A. That's correct.

18 Q. Zhao's model is designed to encode
19 the shapes of body parts and the size and spatial
20 relationships between body parts, correct?

21 A. And more, as I have explained in my
22 declaration.

1 Q. If you would go to Paragraph 77 of
2 your report -- of your declaration, please.

3 A. Yes, I am there.

4 Q. Paragraph 77 says, "Further,
5 specifically with respect to the Zhao reference,
6 Zhao states that its 'model is designed to encode
7 the shape of the body parts and the context
8 information -- the size and spatial relationships
9 between the body parts'."

10 Do you see that?

11 A. Yes.

12 Q. Do you agree with that?

13 A. That is what Zhao states and I have
14 cited it in my declaration.

15 Q. So, you agree that Zhao's model is
16 designed to encode the shapes of body parts and
17 the size and spatial relationships between body
18 parts?

19 A. That is what I state in that
20 paragraph.

21 Q. You cite Exhibit 1006 at Page 43, so
22 you cite Zhao at Page 43 in Paragraph 77 of your

1 declaration; is that correct?

2 A. By Exhibit 1006 at 69.

3 Q. I'm sorry, I -- let me point you

4 to -- so, the next sentence you say,

5 "Specifically, Zhao incorporate the spacial

6 relationships between body parts as part of its

7 model for a human to be detected through several

8 model matrices: an aspect ratio vector, a length

9 ratio matrix, a relative position vector, and an

10 orientation or posture vector."

11 Do you see that?

12 A. Yes.

13 Q. Okay. And then below that you have

14 a block quotation, in italics font, with a

15 citation to Zhao at Page 43. Right?

16 A. Yes.

17 Q. Zhao at Page 43 is describing a TRS

18 and variant body model; is that correct?

19 A. That's correct.

20 Q. Zhao's human body model consists of

21 six main body parts and 12 subparts; is that

22 correct?

1 A. Six main body parts and 12 subparts
2 of the full limbs.

3 Q. So, Zhao's human body model consists
4 of -- I'm sorry. Zhao's human body model
5 consists of six main body parts and 12 subparts
6 of the four limbs, correct?

7 A. Six main body parts: the head
8 torso, two arms, two legs and 12 subparts of the
9 four limbs.

10 Q. Okay. And you have a citation there
11 to Zhao at Page 42. Do you see that?

12 A. In my declaration, are you pointing
13 me to?

14 Q. Yes, in Paragraph 84 of your
15 declaration, you have a citation to -- sorry,
16 maybe I wasn't clear about where we were at.

17 In Paragraph 84 of your declaration,
18 you say that, "Zhao explains each human body
19 model consists of six main body parts: the head,
20 the torso, two arms and two legs, and 12 subparts
21 of the four limbs."

22 And you have a citation to

1 Exhibit 1006 at Page 42, right?

2 A. That is correct.

3 Q. Okay. And Page 42 of Zhao is
4 describing the TRS and variant body model,
5 correct?

6 A. That's correct.

7 Q. Zhao's model is comprised of ribbons
8 for the body parts; is that correct?

9 A. They are a model with ribbons.

10 Q. Zhao provides a formulation for a
11 human detection problem, correct?

12 A. Human detection and tracking.

13 Q. And Zhao formulates the human
14 detection problem as given a detected contour
15 determined whether the contour represents the
16 silhouette of a person or not, correct?

17 A. Are you referring to the paragraph
18 in my declaration?

19 Q. Yeah, you can go to Paragraph 98.

20 A. Yes, I am there.

21 Q. Okay. So, to detect a human, Zhao
22 teaches determining whether a contour represents

1 the silhouette of a person or not; is that
2 correct?

3 A. As part of his recursive algorithm,
4 yes.

5 Q. If you would go to Page 64 of Zhao,
6 please.

7 A. I am there.

8 Q. Okay. So, under the heading 3.4.1,
9 Decision Rule, Zhao says human -- Zhao says, "The
10 human detection problem is: given a detected
11 contour C, determine whether this contour
12 represents the silhouette of a person or not."

13 Do you see that?

14 A. Yes.

15 Q. So, Zhao defines human detection as
16 determining whether a contour represents the
17 silhouette of a person or not, correct?

18 A. So, it is the starting of its
19 algorithm. Because the human model consists of
20 many components.

21 So, to evaluate the best hypothesis
22 for that contour representing a person, the

1 likelihood. It then explains how it has to
2 compute the likelihoods of the various components
3 that make up that human model consisting of 12
4 parts and six body parts.

5 Q. So, here on Page 64, Zhao says, "The
6 human detection problem is," and then it provides
7 a description. Right?

8 A. What is the question? It has a
9 description which spans multiple pages.

10 Q. On Page 64 under the heading
11 Decision Rule, there is a sentence, a complete
12 sentence there that starts, "With the human
13 detection problem," and ends with, "a person or
14 not."

15 Do you see that?

16 A. First sentence, is that what you are
17 asking me?

18 Q. Yes, the very first sentence
19 under 3.4.1, Decision Rule. Do you see it?

20 A. Yes.

21 Q. Right. So, that sentence in the
22 first part, Zhao says, "The human detection

1 problem is:"

2 And then after that it provides a
3 description that ends with a period, right?

4 A. Yes, that is the end of the
5 sentence.

6 Q. Okay. So, Zhao's description of the
7 human detection problem in that sentence is,
8 "Given a detected contour C, determining whether
9 this contour represents the silhouette of a
10 person or not."

11 Do you agree with that?

12 A. That is Zhao's statement, yes. Yes.

13 Q. If you would go to Paragraph 121 of
14 your declaration, please. Just let me know when
15 you are there.

16 A. Oh, I am here.

17 Q. Okay.

18 A. Thank you.

19 Q. In Paragraph 121, you state,
20 "Accordingly, the joint probability used in Zhao
21 and well known to a POSITA is easily
22 representable in the form of the joint

1 probability distribution formulated by
2 Claims 8/16."

3 Do you see that?

4 A. Yes.

5 Q. What is the joint probability used
6 in Zhao?

7 A. What we were looking at Zhao, and
8 that is what I referred to, is the graphical
9 model that Zhao explains. For an object O with
10 state X_i at timeframe i of the video and K
11 equals $1/N$ of the components.

12 This with respect to the conditional
13 probabilities that they are computing for their
14 hypothesis of the presence of a person is the
15 joint probability distribution of the graphical
16 model.

17 Q. Is there, is there a portion, like a
18 page or two of Zhao that shows the joint
19 probability formulation that you are referring to
20 in Paragraph 121?

21 A. Yes. You have to -- the page we
22 were on, if you read through what the contour

1 represents, it points to the likelihood P of a
2 contour C , conditional limb of a person can be
3 calculated by conditioning on the hypotheses for
4 the body part identification.

5 And then that probability is a sum
6 of a set of product probabilities PCH person --
7 H , comma, person.

8 For each person, there is a
9 hypothesis, times the probability of that
10 hypothesis conditional on that person in the
11 hypothesis space.

12 And then it further says, "Because
13 it is not efficient to explore all hypotheses in
14 the hypothesis space, telegraphic H , a
15 winner-take-all strategy is employed to
16 approximate this conditional probability of a
17 person," which is where you use the optimal
18 hypothesis as selected in the part identification
19 procedure described in Section 3.3.3.

20 So, if you go to Section 3.3.3,
21 there is how these hypotheses -- optimal
22 hypotheses through a dynamic model assembly

1 procedure is described.

2 So, the exhaustive search for the
3 best hypothesis H^* is to check every possible
4 hypothesis and find the best one based on the
5 goodness function, $G(H)$, given an equation 3.9.

6 And if you look at Equation 3.9,
7 that function is a product of distributions of
8 Gaussians, A_{prime} -- A_{prime} over a summation of
9 A_{prime} , for each of the component parts.

10 And that component is then searched
11 for to find H^* . And then it goes through the
12 efficiency of the search process by looking at
13 each model part through a gating and a comparison
14 of the aspect ratios of the decomposed ribbons,
15 which are given on Page 59, and comparing it to
16 thresholds for a global optimal hypothesis.

17 And if you put all of that together,
18 that forms the joint probability distribution
19 that I am referring to which is very similar to
20 the '980.

21 Q. Okay. Do you have a copy of
22 Exhibit 1009 to your declaration handy? That is

1 the TLP reference.

2 A. I think so. 1009. Oh, yes, I have
3 a copy now.

4 Q. You have it now?

5 A. Yes.

6 Q. Okay. So, then on the bottom right
7 corner, is there a marking that says Meta 1009?

8 A. Yes.

9 MR. EKLEM: Okay. So then we can
10 mark the next exhibit, which I think is going to
11 be Exhibit 5 to the deposition. And that
12 corresponds to, in the Box it is identified as
13 EX 1009 TLP, Tracking Loose-Limbed People.

14 (Bajaj Exhibit 5 marked for
15 identification.)

16 BY MR. EKLEM:

17 Q. So, that would be Exhibit 5 to the
18 deposition.

19 TLP. And is it all right if we
20 refer to the exhibit that we just marked,
21 EX 1009, can we just refer to that as TLP, and
22 you will know what we are talking about?

1 A. Yes.

2 Q. Okay. So, TLP's graphical model
3 comprises nodes corresponding to an object's
4 constituent parts, right?

5 A. So, like in TLP's Figure 1, it says,
6 "The graphical model for a person are nodes
7 representing limbs and arrows representing
8 conditional dependencies between limbs."

9 And "For clarity, only a few of the
10 temporal dependencies have been shown."

11 Q. So, TLP describes a graphical model
12 that comprises nodes corresponding to an object's
13 constituent parts, right?

14 A. As well as links. Some of the
15 temporal dependencies where the model each part i
16 at time t is connected by an edge to part i at
17 time $t-1$ and $t+1$.

18 Q. Okay. So, can you go to
19 Paragraph 68 of your declaration, please.

20 A. Paragraph 68?

21 Q. Yes. It is on Page 33. And just
22 let me know when you are there.

1 A. I am there.

2 Q. Okay. In Paragraph 68, you state,
3 "Specifically, TLP describes a graphical model
4 for detecting objects, such as a human, that
5 comprise of nodes corresponding to the object's
6 constituent parts."

7 Do you see that?

8 A. Yes.

9 Q. You agree that TLP describes a
10 graphical model that comprises nodes
11 corresponding to an object's constituent parts,
12 right?

13 A. A graphical model is complete when
14 you define nodes and edges. The second sentence
15 there says, "Edges in the graphical model
16 corresponds to position and angle relationships
17 between adjacent body parts in space and time, as
18 illustrated in the figure."

19 Q. So, does TLP's model -- graphical
20 model comprise nodes corresponding to the
21 object's constituent parts; yes or no?

22 A. As stated in my declaration is what

1 TLP describes as a graphical model. And we read
2 the two sentences that constitute a graphical
3 model. They consist of nodes and edges.

4 Q. Each node in the model of TLP
5 represents the 3D position and orientation of a
6 limb, correct?

7 A. No, it presents probabilities,
8 likelihoods. That is why this is a graphical
9 model, exactly like used in the patent, the '980
10 patent.

11 Q. So, can you go to Page 1 of the TLP
12 reference, please.

13 A. I am there.

14 Q. Under the Heading Number 1,
15 Introduction, there is a paragraph. And about
16 six or so lines down into that paragraph, it
17 says, "Each node in the graphical model
18 represents the 3D position and orientation of a
19 limb (Figure 1)."

20 Do you see that?

21 A. Yes.

22 Q. Okay. So, each node in TLP's

1 graphical model represents the 3D position and
2 orientation of a limb, right?

3 A. You have to read the whole
4 paragraph. You can't just take it one line at a
5 time.

6 Q. Okay.

7 A. "Each node in the graphical
8 represents the 3D position -- directed edges
9 represents statistical dependencies.

10 "Additionally, each node has an
11 associated likelihood defined over a rich set of
12 image cues using a learned Gibbs model."

13 And, "These highly non-Gaussian
14 likelihoods and a six-dimensional continuous
15 parameter space (3D position and orientation)
16 makes the standard belief propagation algorithms
17 infeasible.

18 "Consequently we exploit a
19 non-parametric model."

20 But the following sentence of,
21 "Additionally each node has an associated
22 likelihood is what then constitutes the graphical

1 model."

2 Q. Are you finished with your answer?

3 A. Yes.

4 Q. I'm going to object to your answer
5 as nonresponsive. Let me try this again.

6 Do you see where, on Page 1, in the
7 paragraph under the Introduction heading, about
8 six lines down, TLP says, and I quote, "Each node
9 in the graphical model represents the 3D position
10 and orientation of a limb (Figure 1)."

11 Do you see that?

12 A. Yes.

13 Q. Okay. And I read that correctly?
14 Did I misrepresent what TLP says?

15 A. That is the sentence in that
16 paragraph, yes.

17 Q. So, based on that sentence, do you
18 agree that each node in the graphical model of
19 TLP represents the 3D position and orientation of
20 a limb?

21 A. What I said before, I will repeat.
22 You don't take that sentence alone, because the

1 very next sentence after that, a subsequent one
2 is, "Additionally each node has an associated
3 likelihood defined over a rich set of image cues
4 using a learned Gibbs model which is a
5 probabilistic model."

6 And the sentence before that also
7 talks about probabilistic. And that, as a person
8 of ordinary skill in the art would understand a
9 graphical model.

10 Q. And within that graphical model that
11 you just described, each node corresponds to a
12 limb, correct?

13 A. Corresponds to the 3D position and
14 orientation. And there is a probability attached
15 to that estimate of the 3D position and
16 orientation. That is what the node captures.

17 Q. For a limb, correct?

18 A. For a limb, which is a component.

19 Q. Just a moment, please.

20 In TLP, in TLP, tracking is
21 formulated as an inference in a graphical model,
22 correct?

1 A. Tracking is a inference over a
2 sequence of graphical models.

3 Q. Is that in the context of TLP or
4 just in general?

5 A. TLP. Exactly like in the '980.

6 Q. So, in TLP, the tracking problem is
7 formulated as one of inference in a graphical
8 model. And belief propagation is used to
9 estimate the pose of the body at each time step;
10 is that right?

11 A. Over the entire sequence. So, it is
12 a spatio-temporal model.

13 Q. On Page 1 of TLP, under the
14 Introduction heading, four lines down, do you see
15 where it says, "The tracking problem is
16 formulated as one of inference in a graphical
17 model and belief propagation is used to estimate
18 the pose of the body at each time step."

19 Do you see that?

20 A. That is correct.

21 Q. So, that is how TLP describes the
22 tracking problem, correct?

1 A. So, we discuss Figure 1. Figure 1
2 is a graphical model for a person. They
3 represent nodes and have both spatial and
4 temporal dependencies.

5 And each part i at time t is
6 connected by an edge to a part i at times $t-1$ and
7 $t+1$.

8 And belief propagation is used to
9 derive the inference within this spatio-temporal
10 graphical model.

11 Q. And the inference that is derived
12 that you mentioned at the end of your answer,
13 that is an inference for tracking -- hold on a
14 sec here. I didn't mean to restate that.

15 The inference that you referred to
16 at the end of your answer is the inference for
17 tracking. Correct?

18 A. If you look at Figure 8 of the same
19 TLP, it explains quantitative tracking
20 evaluation, automatic initialization error as a
21 function of iterations of the belief propagation
22 algorithm, tracking error over a 50-frame

1 sequence.

2 And that is what I was referring to.

3 MR. EKLEM: We came back
4 at 1 o'clock central, right?

5 MR. BAKER: Yes.

6 MR. EKLEM: Why don't we take our
7 break a little bit early?

8 MR. BAKER: Okay.

9 MR. EKLEM: Come back at ten after.

10 MR. BAKER: Sounds good.

11 (Recess taken -- 1:56 p.m.)

12 (After recess -- 2:10 p.m.)

13 BY MR. EKLEM:

14 Q. Dr. Bajaj, do you have a copy of
15 Exhibit 1007 to your declaration handy? That is
16 the Steffens reference -- wait. Yes, Steffens.

17 A. I do.

18 Q. And, okay. Ms. Steffens references
19 U.S. Patent Number 6,301,370, right?

20 A. That is correct.

21 Q. Okay. At the bottom right corner,
22 do you see the stamp that says Meta 1007?

1 A. That is correct.

2 MR. EKLEM: Okay. So, let's make
3 that our next exhibit, which corresponds to, in
4 Box it is the file name is EX 1007 Steffens,
5 U.S. 6,301,370.

6 (Bajaj Exhibit 6 marked for
7 identification.)

8 BY MR. EKLEM:

9 Q. Could you take a look at -- just a
10 second. Would you go to Column 9 of the Steffens
11 reference -- at the very top of Column 9. Just
12 let me know when you are there.

13 A. I am there.

14 Q. In Column 9, Rows 1 through 3.
15 Steffens says, "A model graph 168 that is
16 particularly designed for finding a human face in
17 an image is shown in Figure 12. The numbered
18 nodes of the graph have the following locations."

19 Do you see that?

20 A. Yes.

21 Q. Okay. So, there Steffens is
22 referring to an image shown in Figure 12 of

1 Steffens, right?

2 Dr. Bajaj, so, what I am getting at
3 here is the description in Lines 1 through 3 of
4 Column 9 in Steffens is referring to what is
5 shown in Fig 12; is that correct?

6 A. Yes.

7 Q. Okay. And if you go to
8 Paragraph 1 -- well, actually while we are still
9 here.

10 So, just below from Lines 4 through
11 about 22, you see a list of the numbered nodes
12 that Steffens is referring to, Numbers 0
13 through 17. Do you see that?

14 A. Yes.

15 Q. Okay. Going to Paragraph 135 of
16 your report, of your declaration. Why don't you
17 go over there and --

18 A. Which part --

19 Q. Let me know when you have it in
20 front of you.

21 A. Which paragraph?

22 Q. 135. 135. Do you have

1 Paragraph 135 in front of you?

2 A. Yes.

3 Q. Okay. So, under -- so, in
4 Paragraph 135, you say, "A model graph that is
5 designed for finding a human face is illustrated
6 in Figure 12 with nodes corresponding to a
7 collection of components."

8 And below that you have pasted in
9 Figure 12 and the portion of Column 9 running
10 from Lines 4 through 22 in Steffens, correct?

11 A. Yes.

12 Q. The list of nodes that you have
13 included in Paragraph 135 of your report does not
14 include a node corresponding to the face, does
15 it?

16 A. So, the -- in this figure, it is
17 just detailing out all of the components of the
18 face. In totality, the entire object is
19 representing the face.

20 And later in its procedure, it
21 explains how it has a hierarchy. And so there is
22 exactly this hierarchy of components where there

1 is a face.

2 And of course many components inside
3 it. And in this hierarchy these components are
4 merged together.

5 Q. Okay. But the list that you have
6 pasted into your report in Paragraph 135, the
7 list from 0 to 17 does not include a face node,
8 correct?

9 A. That entire collective is the face.

10 Q. So, you agree that there is not a
11 node in the list under Paragraph 135 that says
12 face, correct?

13 A. Not in this figure, no.

14 MR. EKLEM: Okay. All right, Todd,
15 why don't we do a quick five-minute break to make
16 sure I don't have any other notes. But I think
17 we are going to be just about done here. Let's
18 go off the record.

19 MR. BAKER: Okay. Do you want to
20 check back at 2:30?

21 MR. EKLEM: Let's do that.

22 MR. BAKER: All right, will do.

1 (Recess taken -- 2:22 p.m.)

2 (After recess -- 2:32 p.m.)

3 BY MR. EKLEM:

4 Q. Dr. Bajaj, during any of our breaks
5 today, did you talk with your counsel about the
6 substance of your testimony today?

7 A. No.

8 MR. EKLEM: Okay. Todd, that is it.
9 We are going to pass the witness.

10 MR. BAKER: All right. Give us five
11 minutes to get together and discuss if we will
12 have any redirect. It may be shorter, but five
13 max, okay?

14 MR. EKLEM: Yes, take your time.

15 MR. BAKER: All right. Thank you.

16 (Recess taken -- 2:32 p.m.)

17 (After recess -- 2:34 p.m.)

18 MR. BAKER: We have no redirect.

19 Thank you.

20 MR. EKLEM: Okay, Dr. Bajaj, thank
21 you for your time today.

22 (Whereupon, signature not having been waived,

1 the deposition suspended at 2:34 p.m. CST)

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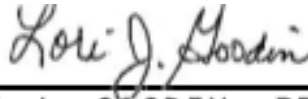
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CERTIFICATE OF NOTARY

2 I, LORI J. GOODIN, RPR, CLR, CRR,
3 CA CSR # 13959 the Notary for this deposition, do
4 hereby certify that the witness whose testimony
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7 nor employed by any of the parties to the action
8 in which this deposition was taken; and, further, that I am
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10 counsel employed by the parties hereto, or
11 financially or otherwise interested in the
12 outcome of this action.

7



8

LORI J. GOODIN, RPR, CLR, CRR
Notary Public in and for:

9

10 STATE OF FLORIDA, COUNTY OF SARASOTA
11 Notary Commission Number: GG987804
12 My Commission expires: May 12, 2028
13
14 STATE OF CALIFORNIA, CA CSR# 13959
15 My Commission expires: February 22, 2025
16
17 STATE OF MARYLAND, COUNTY OF ANNE ARUNDEL
18 My Commission expires: August 2, 2025
19
20 DISTRICT OF COLUMBIA, WASHINGTON DC
21 My Commission expires: June 1, 2026
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1 Chandrajit Bajaj, Ph.D., c/o
2 KIRKLAND & ELLIS LLP
3 1301 Pennsylvania Avenue, Northwest
4 Washington, D.C. 20004

5

6 Case: Meta Platforms, Inc. et al. v. VL Collective IP LLC

7 Date of deposition: February 14, 2024

8 Deponent: Chandrajit Bajaj, Ph.D.

9

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– ERRATA –

February 14, 2024 Deposition of Chandrajit Bajaj, Ph.D.

Meta Platforms, Inc. et al. v. VL Collective IP LLC

IPR2023-00924

U.S. Patent 7,436,980

Page	Line	Correction / Change	Reason
28	10–11	<u>Edit from:</u> “the standard ADA boost” <u>To:</u> “the standard AdaBoost”	Typographical error
31	22	<u>Edit from:</u> “standard in data boost” <u>To:</u> “standard AdaBoost”	Typographical error
32	3	<u>Edit from:</u> “The tracking is a broad term.” <u>To:</u> “The word tracking is a broad term”	Transcription error
43	17	<u>Edit from:</u> “So, that context is, the term,” <u>To:</u> “So, in that context, the term,”	Transcription error
54	5	<u>Edit from:</u> “photograph there” <u>To:</u> “paragraph there”	Transcription error
58	1	<u>Edit from:</u> “likelihood, Bi(Xi) models” <u>To:</u> “likelihood $\phi_i(X_i)$ models”	Typographical error
65	11	<u>Edit from:</u> “in the two earlier” <u>To:</u> “in the two level”	Transcription error
116	14	<u>Edit from:</u> “the hypothesis space, telegraphic H,” <u>To:</u> “[the hypotheses space] H”	Transcription error

Date: ___ March 9, 2024 ___

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