

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ALIGN TECHNOLOGY, INC.,
Petitioner,

v.

DENTAL MONITORING SAS,
Patent Owner.

IPR2024-00052 (Patent 11,049,248 B2)
IPR2024-00110 (Patent 11,109,945 B2)

Record of Oral Hearing
Held: January 29, 2025

Before JEAN R. HOMERE, MICHAEL R. ZECHER, and
KARA L. SZPONDOWSKI, *Administrative Patent Judges*.

IPR2024-00052 (Patent 11,049,248 B2)

IPR2024-00110 (Patent 11,109,945 B2)

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The above-entitled matter came on for hearing on Wednesday, January 29, 2025, commencing at 1:00 p.m., via video teleconference.

1 P R O C E E D I N G S

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3 JUDGE SZPONDOWSKI: We have our hearing in IPR2024-
4 00052 and IPR2024-00110. Let me introduce the panel. I'm Judge
5 Szpondowski and joining me are Judge Homere and Judge Zecher.
6 Let's get started with the parties' appearances first. Who do we have
7 for Petitioner?

8 MR. ARGENTI: Good afternoon, Your Honor. Matt Argenti
9 from Wilson Sonsini on behalf of Petitioner Align Technology. Also
10 on the line we have my co-counsel Mike Rosato and Patrick Medley
11 and on the public line we have some representatives from Align
12 attending, including Martha Shane (phonetic sp.) and Dennis Chang.

13 JUDGE SZPONDOWSKI: Okay, thank you. And who do we
14 have from Patent Owner?

15 MS. JACOBSEN: Good afternoon. This is Charlotte Jacobsen
16 from Gibson Dunn on behalf of Patent Owner and joining me from
17 Gibson Dunn are Allyson Parks and Andrew Blythe. And on the
18 public line we also have representatives from Patent Owner Dental
19 Monitoring.

20 JUDGE SZPONDOWSKI: All right, thank you. Well,
21 welcome everyone. Obviously, our hearing today is over video.
22 Given that, I just want to start off by clarifying a few items. First, if
23 you encounter any technical difficulties that you feel fundamentally
24 undermines your ability to adequately represent your client, please let
25 us know immediately.

1 Second, when not speaking please mute yourself. And please
2 identify yourself each time you speak in order -- so that the correct
3 reporter can prepare an accurate transcript.

4 Fourth, we have the entire record including all of the
5 demonstratives, so please refer to the demonstrative papers or exhibits
6 clearly and explicitly by slide or page number, also to ensure the
7 preparation of an accurate transcript. You're welcome to either share
8 your demonstratives or, like I said, we have the whole record so you
9 can just refer, whatever you prefer.

10 And finally, as you know, there is a public line so please be
11 aware that members of the public may be listening as well.

12 We've set forth the procedure for today's hearing in our
13 December 19th, 2024 order. As a reminder, each party will have a
14 total of 80 minutes to present arguments. Petitioner has the burden of
15 proof as to whether the challenged claims are unpatentable and will go
16 first. Patent Owner will then present opposition arguments.

17 Then to the extent that Petitioner has reserved prime, Petitioner
18 will present the rebuttal arguments. And then to the extent that Patent
19 Owner has reserved time, Patent Owner will present sur-rebuttal
20 arguments.

21 We remind the parties that they are not interrupt the other party
22 while the other party is presenting its arguments and demonstratives.
23 If a party believes that a demonstrative or argument presented by the
24 other party is objectionable they should raise that objection or any
25 arguments relating to that during your own time.

1 We saw that Petitioner filed objections to Patent Owner's
2 demonstratives 33 through 38, 64, 65, 69 through 71, and 83 through
3 87. So, I would like the parties to address those objections and to hear
4 Patent Owner's response during your time.

5 Are there any questions before we get started?

6 MR. ARGENTI: No, Your Honor.

7 MS. JACOBSEN: No. Thank you, Your Honor, none from
8 Patent Owner.

9 JUDGE SZPONDOWSKI: Then I think we're ready to begin.
10 Would Petitioner like to reserve time for rebuttal?

11 MR. ARGENTI: Yes, Your Honor, 20 minutes, please.

12 JUDGE SZPONDOWSKI: Okay. You reserve 20 minutes,
13 and you can start whenever you're ready.

14 MR. ARGENTI: Thank you, Your Honor. So, I do plan to
15 share my screen to have the demonstratives on the display. Let me do
16 that right now. Hopefully, that will now work. Let me know if you
17 don't see the demonstratives. It looks like we do. All right.

18 So, good afternoon, Your Honors. Again, my name is Matt
19 Argenti on behalf of Petitioner Align. Today during my presentation
20 I'll be referring to our demonstratives which have been submitted as
21 Exhibit 1053 in both of the IPRs that we'll be discussing.

22 Your Honors, it's well-established that it is not patentable to
23 take a routine, long-established practice and claim it as an invention
24 performed on a computer, but that's what's happened here. For at least
25 14 years before the challenged patent, orthodontists assessed aligner

1 fit by looking at the separation between aligner and teeth. It's a very
2 straightforward principle.

3 If the gap between the aligner and the teeth was too big that
4 meant the aligner didn't fit properly, which was detrimental to
5 treatment. The evidence of record shows this was a common aspect
6 of the aligner treatment and the Patent Owner's dental experts agree.

7 The challenged claims recite nothing more than performing that
8 routine assessment using a captured image and generic image
9 processing software. That's not patentable. That's something that the
10 District Court has already recognized when finding Claims 1 and 14
11 of the '248 ineligible under Section 101. And despite Dental
12 Monitoring currently appealing that to the Federal Circuit, they are
13 not challenging the ineligibility of Claim 1.

14 For similar reasons, the claims are obvious. The prior art
15 demonstrates that there was nothing inventive about remote aligner
16 treatment using cellphone images or using a computer to detect edges
17 of objects in a dental image or analyzing the gap between an aligner
18 and the teeth.

19 All of that is in the prior art and that's not in dispute. Putting
20 those conventional concepts together doesn't make them any more
21 inventive. All the Patent Owner is left with is a legally erroneous
22 argument that relies on attacking the references individually.

23 But as the Board recognized in the institution decision, that did
24 not revise a prima facie obviousness showing.

25 Now, turning to slide 2, in the grounds challenged for both IPRs
26 are grounds involved with the Kim, Invisalign and Salah references.

1 Kim provides methods for remote aligner treatment services involving
2 capturing the images with a patient's cellphone and transmitting them
3 for (inaudible 0:48:29). Invisalign is an align clinical guide from
4 2003 describing consideration for monitoring aligner treatment.

5 Salah in Patent Owner's own PCP application describing image
6 analysis methods for monitoring patient teeth during the dental
7 treatment. Now, the IPR in the '248 patent also involves the Maninis
8 reference which teaches state-of-the-art approaches for deep learning-
9 based image analysis.

10 Turning to slide 3, as we see here on this slide the '248 patent
11 relates to the field of image analysis, specifically dental arch image
12 analysis. The patent explains an image of an alignment in a service
13 position, that means worn on the teeth, is captured and analyzed.

14 The analysis involved what the patent calls a deep learning
15 device which can be a neural network. The patent says neural
16 networks were well-known to POSAs and provides the non-limiting
17 list of them.

18 As we see here in the abstract, the analysis leads to a
19 determination of a tooth attribute relating to a separation, the
20 separation between the aligner and the teeth. So, what happens is you
21 capture an image of a tooth, analyze it using any one of a number of
22 known neural networks to determine something about the separation
23 between the aligner and the teeth.

24 Now, turning to slide 4 and the '945 patent, which contains
25 similar disclosure using some different terminology but getting at the
26 same idea. It describes capturing at least one 2-dimensional image of

1 an aligner in the service position and then analyzing the image to
2 compare outlines at the edges of the teeth and the aligner.

3 Turning to slide 5, the claims of the '248 patent broadly capture
4 the basic elements we just saw in the disclosure. Looking at Claim 1
5 on this slide, it recites capturing a cellphone image of the aligner in a
6 service position. That's the text in purple. Then generically analyzing
7 the image on a computer using a known deep learning technique.
8 That's the text in blue.

9 And as a result, determining a value relating to a separation
10 between the teeth and the aligner. That's in red.

11 But as we will see, considering that separation was just a
12 standard part of orthodontic treatment and there was nothing non-
13 obvious about doing it with cellphone images and software,
14 particularly when those tools were already used for dental treatment
15 applications.

16 Turning to slide 6, Claim 1 of the '945 patent similarly involves
17 acquiring an image of an aligner in a service position. It also
18 encompasses capturing and analyzing a second image of just the teeth,
19 but that's an alternative that we don't need to address in our ground.
20 That's why the clause number two here is lined out on the slide. We
21 show obviousness based on the first, third, and fourth clauses.

22 Compared to the '248 claim that we just saw, this claim does
23 not require analysis by a deep learning device. It more broadly says
24 you use image processing software. That's why the deep learning
25 teachings of the Maninis reference are not at issue in the '945 IPR,
26 only the '248.

1 Turning to slide 7 and claim construction, in the '248 Petition
2 we propose constructions for four terms. The parties only dispute one
3 issue, but Petitioner construes the tooth attribute term to mean an
4 attribute of a tooth that may relate to the tooth separation from an
5 aligner. Patent Owner agrees that a tooth attribute is an attribute of a
6 tooth but then carves out positions or edges of teeth or aligners from
7 that definition. There's no support for that.

8 The patent says the separation between the tooth and aligner
9 can be a tooth attribute so it follows that the location of the tooth edge
10 used to determine that separation can also be a tooth attribute.

11 Turning the slide 8, for the '945 patent we've proposed three
12 constructions in the Petition. The Patent Owner Response did not
13 respond to any of them so these are undisputed.

14 Now, turning to slide 9 and Patent Owner's constructions, in the
15 '248 Response they proposed two constructions, but as we explained
16 in our Reply neither impacts our ground of challenge and they don't
17 just dispute in the Sur-reply.

18 Now, turning to slide 10 and the '945 patent, in the '945 IPR
19 Patent Owner likewise proposed two constructions in their Response
20 but neither one has any effect on the Petition ground and neither one
21 of these constructions is in dispute.

22 Turning to slide 11 and the prior art cited in the ground. Kim is
23 a public patent application describing a system for remote teeth
24 alignment services. As we see in Figure 1 on the left of this slide,
25 both the patient and the orthodontist have their own computer
26 terminals in addition to terminals for the aligner manufacturer and the

1 operator of the server (phonetic sp.) in this figure. Kim explains that
2 the patient takes pictures of their teeth using a smartphone and sends
3 them to the orthodontist for analysis.

4 In addition to sending a picture of the teeth alone, Kim also
5 describes sending the orthodontist a photo of the clear aligner
6 currently worn by the patient. You see that in paragraph 66 on this
7 slide.

8 JUDGE SZPONDOWSKI: Counsel, this is Judge
9 Szpondowski. So, what does that mean, the clear aligner currently
10 worn by the orthodontic patient, because I think there's some dispute
11 over that?

12 MR. ARGENTI: It's pretty clear disclosure of sending a photo
13 of the aligner in a service position, but Patent Owner does dispute
14 that. Patent Owner disputes that Kim means what it says in that
15 paragraph. Patent Owner argues that that's just a photo of the aligner,
16 not an aligner on the teeth, so I think it's pretty clear that that is a
17 photo of an aligner worn by the patient.

18 However, even if Patent Owner's position was the correct
19 interpretation of Kim, which it isn't, there's no dispute that Kim
20 discloses remote aligner treatment methods involving capturing
21 photos of teeth to send to an orthodontist and photos of an aligner to
22 send to an orthodontist.

23 Turning to slide 12 and the Invisalign guide, this reference
24 describes considerations for aligner treatment. One of those issues
25 that it talks about is aligner fit.

1 JUDGE HOMERE: Counselor, this is Judge Homere. In the
2 second scenario that you give regarding paragraph 66 of Kim, so how
3 would that meet the limitation in question here? So, all you have is
4 picture of the aligner and picture of the teeth. How do you get you to
5 the aligner (inaudible 40:59) is being worn by the patient?

6 MR. ARGENTI: Well, let me jump ahead then, Your Honor,
7 just one moment and find where we address that. So, if we go to slide
8 20, one of the disputed issues is Patent Owner's argument that Kim
9 doesn't teach taking a photo of an aligner worn on the teeth, and that
10 has two big problems. As I mentioned, the first problem is that their
11 position is at odds with the plain language of Kim, which is explicit
12 about taking a photo of the clear aligner currently worn by the
13 orthodontic patient. They can't rewrite the reference through
14 unsupported testimony.

15 The second problem, and this goes to your question, Your
16 Honor, is that even if the Board was to credit their argument about the
17 scope of Kim's disclosure, our Petition explains that capturing a
18 cellphone image of an aligner in a service position would be obvious
19 in view of the combination of Kim and Invisalign. The Board
20 recognized in the institution decision that they can't rebut our
21 obviousness showing by attacking the references individually, but
22 they're still trying to do that.

23 Invisalign teaches assessing the separation between an aligner
24 and the teeth and provides a photo to illustrate that. We see that here.
25 So, Patent Owner is incorrect that our combination depends on Kim
26 for this aspect of the claims. Applying Invisalign to Kim's method of

1 capturing teeth and aligner images for remote treatment purposes
2 would lead a POSA to combine what Patent Owner says are two
3 distinct images in Kim in order to perform the assessment taught by
4 Invisalign.

5 So, whether Kim teaches separate photos of teeth and aligners
6 or photos of aligners worn on the teeth, this element of the claims is
7 taught or suggested by the combination.

8 JUDGE ZECHER: Mr. Argenti, this is Judge Zecher. How
9 would you respond to Patent Owner's argument that this photo in
10 Invisalign was actually just something perceived by orthodontists in
11 that timeframe and it wasn't actually captured on a cellphone such that
12 they could assess it remotely?

13 MR. ARGENTI: Well, a number of problems with that, Your
14 Honor. The fact that it was -- it was clearly captured by a camera.
15 They argue that it was a digital camera rather than a cellphone, but as
16 we pointed out, this is a 2003 guide. The priority date is in 2017.
17 Smartphones were incapable and probably performing better image
18 capture with a cellphone in 2017 than this 2003 digital camera. So,
19 that's one problem.

20 The other is that Kim teaches capturing the images of teeth and
21 images of aligners with a cellphone and sending them for assessment.
22 So again, they're attacking the references individually.

23 JUDGE ZECHER: Let me ask a follow-up question to that.
24 How does this reliance on Frey in your Petition, kind of, play into
25 that?

1 MR. ARGENTI: Well, I wouldn't say that we're relying on
2 Frey. We provided it as corroboration of the motivation that you get
3 from the references themselves, the prior art references. So, I think
4 it's to stretch Patent Owner's position that we are relying on Frey. It's
5 cited as helpful corroboration.

6 Beyond that, if I can jump ahead to slide 22 to discuss the Frey
7 reference, the motivation to combine Kim and Invisalign to arrive at
8 capturing images of aligners, it's clear from those two references
9 themselves, as well as the testimony of both party's experts. However,
10 Frey provides further collaboration. Frey is an orthodontics blog that
11 predates the priority date and talks about recording video of a patient
12 wearing an aligner and sending into an orthodontist for review.

13 While the Frey blog does compare this approach to the product
14 that was offered by Dental Monitoring at the time, an earlier blog
15 entry that they submitted as evidence, explained that, quote, "We
16 routinely do this for international and out-of-state patients already,"
17 end quote.

18 So, you get the corroboration from Frey. You get the
19 motivation from Kim and Invisalign themselves. Kim is telling
20 people how to accomplish remote orthodontic treatment. Invisalign is
21 telling people what are important considerations for orthodontic
22 treatment.

23 They fit together well on their own and teach the motivation
24 themselves. However, Frey just corroborates that this is something
25 that was not only beneficial to do, it was already done.

1 JUDGE ZECHER: When you say that Frey corroborates then
2 are you really just saying that it's just evidence of the general
3 background knowledge in the art at that time?

4 MR. ARGENTI: I think that's one way of looking at it, yes,
5 Your Honor, that it was just something that was not -- that people in
6 the field were aware of. They were aware of the capabilities of
7 cellphones for remote dental treatment. They were aware of the
8 importance of certain aspects of aligner treatment, including
9 considering the separation between the aligner and the teeth. And as
10 Frey shows, the background state-of-the-art establishes that this, even
11 the combination was something that was routinely done for out-of-
12 area patients at the time.

13 Now, I'm going to go back into the slide. We were talking
14 about Invisalign. I think I touched on just about everything that we
15 needed to touch in our discussion there in response to your questions.
16 I would just point out at the bottom of this slide that Invisalign not
17 only provides the photographic image.

18 The teaching that it's important to assess, the separation
19 between the aligner and the teeth, as well as the photographic example
20 of that, but also it provides a particular threshold that they say
21 orthodontists should look out for, 1 millimeter. So, the teachings of
22 the reference are plain on their face.

23 Turning to slide 13 and the Salah reference. This is, again,
24 Dental Monitoring's own PCP application. We spoke about this
25 reference quite a bit during the hearing on the '409 patent last month.

1 Salah talks about capturing an image of the patient's teeth and
2 applying computer image analysis to track treatment progress.

3 Among the types of information that Salah describes
4 identifying in these images is contour information such as the edges of
5 the teeth. And it's described as detecting objects within images. It
6 lists a number of different image processing approaches, all of which
7 were known at the time. These include simple methods of edge
8 detection like the canny filter, as well as deep learning. And as we see
9 on the slide, it provides an example in Figure 6 where a photograph of
10 the teeth is analyzed to identify the edges of the teeth.

11 Turning to slide 14, finally, in the '248 ground but not in the
12 '945 ground we apply the Maninis reference. As I explained in the
13 last hearing, Maninis describes the use of deep learning neural
14 networks for image analysis.

15 In particular, it provides a state-of-the-art detecting contours in
16 an image, and it explains that this modular approach that -- excuse me
17 -- that adding this modular approach, a well-known pipeline, provides
18 improved results for, among other things, semantic segmentation and
19 object detection. So you not only know where the object edges are in
20 the image, you can classify what the objects are.

21 Turning to slide 15, these figures on this slide provide examples
22 of the edge detection and object classification described In Maninis.
23 On the left in Figure 10 Maninis illustrates object boundary detection,
24 and on the right in Figure 16 Maninis shows how it improves object
25 classification.

1 By combining classification results with COB boundary
2 determinations, Maninis says that the results are improved in all cases.

3 Now, turning to slide 16 and the proposed combination. For
4 both patents we rely on combining the teachings of Kim, Invisalign
5 and Salah. Kim teaches an approach to remote monitoring for
6 orthodontic aligner treatment involving capturing pictures of teeth and
7 aligners with a cellphone and sending them to an orthodontist for
8 analysis.

9 And Invisalign explains that a relevant consideration for an
10 orthodontist monitoring aligner treatment is aligner fit and in
11 particular assessing whether the separation between the aligner and
12 the teeth more than 1 millimeter. And it provides a photographic
13 example, as we've discussed. So, the combination of their teachings
14 provides analyzing tooth aligner separation in a cellphone image
15 relative to a threshold.

16 Salah provides detail on how to accomplish that using image
17 processing techniques to identify the edges of teeth and aligner in an
18 image. And for the '248, both Salah and Maninis teach applicable
19 deep learning techniques with Maninis providing a state-of-the-art
20 approach to the contour detection described in Salah.

21 Again, this is really nothing more than performing a
22 longstanding aspect of aligner treatment using standard computing
23 hardware and software techniques that were likewise well-known.

24 JUDGE ZECHER: Mr. Argenti, before you get into your next
25 slide I do have a question about Maninis. And I believe there's a lot of
26 arguments from Patent Owner that the so-called deep learning device

1 that's disclosed by Maninis cannot be trained a specific way that's
2 required by the claims. Can you address that?

3 MR. ARGENTI: Yes, Your Honor. Their arguments are based
4 on one particular example in Maninis. They argue that the learning
5 base is binary only. It uses ones and zeroes to designate whether
6 something is a contour or not a contour in an image.

7 Our Petition was in no way limited to that learning base
8 example. We discussed this at length as noted in the '409 patent and
9 really the arguments are the same here. They fail for the same reasons
10 here. As I explained during the last hearing, our Petition was much
11 broader in its citation to Maninis' teachings. They were not limited to
12 a particular learning base that was capable of contour detection only.
13 And I explained that Maninis itself would refutes their argument that
14 the learning base is only for one purpose or another. Maninis
15 provides examples, including the Pascal Context database and the
16 VOC12 segmentation database, which are in the sections on the pages
17 that we cited in our Petition where those learning bases are used for
18 both what Maninis calls the low level and the high level application.

19 So, the learning bases in Maninis are not so limited as how
20 Petitioner would argue deep learning and neural networks work as a
21 matter of course. Maninis refutes that. We in no way limited
22 ourselves to one particular example in one particular paragraph of
23 Maninis. Our citations were much broader, as we've explained in our
24 papers.

25 And even putting all that aside, Petitioner (sic) fails to respond
26 and has never responded to our argument that we proposed in the

1 Petition a modified learning base that was suitable consistent with the
2 teachings of all the combined references, that was suitable to the
3 annotated for identification of teeth aligners and the gaps between
4 them. That is, I believe, at page 38 of our '248 patent. It's a very
5 similar argument to what we have in the '409 Petition.

6 So, we're hearing the same arguments again that we heard in the
7 '409 and they fail for the same reasons here.

8 JUDGE ZECHER: Thanks for that explanation. Can we just
9 take a step back from that just a little bit because Claim 1 in the '248
10 patent says, "Analysis of the analysis image by means of a deep
11 learning device, trained by means of a learning base." What does it
12 mean to be "trained by means of a learning base" with respect to the
13 deep learning device? What's the scope of that?

14 MR. ARGENTI: I'm not sure the disputed issue has been
15 framed as a scope issue, Your Honor, so --

16 JUDGE ZECHER: Well, I'm just trying to figure out the
17 meaning of those words. You know, I understand your position and
18 what you -- how you've mapped it to Maninis, but in light of the '248
19 patent what does it mean to be "trained by means of a learning base?"

20 MR. ARGENTI: The experts here on both sides are in
21 agreement, at least the experts knowledgeable in neural network
22 image analysis that neural networks that are used for image analysis
23 are trained on a learning base where in this context it would be a
24 correction of the images. And then it talks about a learning base
25 database that has over 10,000 images in it and they've been annotated
26 to identify some information that is consistent with and going to be

1 helpful for the information that you're trying to extract in your
2 subsequent analysis.

3 JUDGE ZECHER: So, does "trained by a learning base" just
4 mean basically inputting a bunch of images, a certain number or
5 whatever it may be, a 1,000, 10,000, that may have annotations in
6 them such that the trained learning device can take those and, kind of,
7 create their system that they're going to use to analyze any future
8 pictures that are inputted into it? Is that correct?

9 MR. ARGENTI: I think that's -- well, yeah. That sounds
10 correct to me, Your Honor. That sounds consistent with the testimony
11 that we have in this case.

12 JUDGE ZECHER: Okay, thank you.

13 MR. ARGENTI: So, turning to slide 17 and the rationale to
14 combine, the references themselves provide it. Kim says that his
15 methods of evaluating cellphone images reduce the time and cost of
16 treatment and facilitate remote assessment.

17 Invisalign teaches that aligner fit evaluation, including the 1
18 millimeter separation threshold, is a useful consideration for aligner
19 treatment. To accomplish that in the context of a cellphone-captured
20 image POSAs would look to Salah's teachings of image processing
21 techniques in that context, including detecting object edges in dental
22 photos to provide accurate edges for the measurements that Invisalign
23 teaches.

24 And for the '248, the further combination with Maninis
25 provides state-of-the-art object detection and edge protection. Salah
26 teaches deep learning as one possible approach to its image analysis

1 and consistent with that, Maninis provides an improved deep learning
2 technique.

3 Now, turning to slide 1 --7 excuse me -- 18, and the disputed
4 issues. First, Patent Owner argued that our expert Dr. Foroosh is not
5 qualified to offer opinions on obviousness because he's not a dental
6 practitioner. But regardless of which definition of the level of
7 ordinary skill in the art is applied, Dr. Foroosh qualifies.

8 The parties agree that this would be someone trained in
9 computer science or related fields, like Dr. Foroosh, and even under
10 Patent Owner's definition, which they say is not materially different
11 than ours. A POSA would be part of the team that included
12 individuals familiar with medical imaging or dental imaging. Dr.
13 Foroosh has experience with both.

14 In addition -- sorry, Your Honor. I'm now turning in the
15 demonstratives to slide 18, which I'm addressing. In addition, as
16 we've explained, Petitioner's own expert Dr. Mongan formed his
17 opinions on these prior art references in a declaration for the
18 preliminary response where he doesn't mention consultation with any
19 dentist.

20 Turning to slide 19 --

21 JUDGE ZECHER: Mr. Argenti, can I ask a question about
22 this? I know in related IPR2023-01369 you introduced the declaration
23 of Dr. Valley to inform Dr. Foroosh's opinions in that case. You
24 reference it here in the '248 one, in the '248 patent Petition, as well as
25 the '945 patent Petition, but you never introduced the declaration of
26 Dr. Valley in these two proceedings. Why is that?

1 MR. ARGENTI: We only referenced it to point out a repeated
2 pattern of meritless attacks on Dr. Foroosh and to, again, point out
3 that we had refuted it in the previous '409 IPR. We didn't introduce
4 that declaration here because, as Patent Owner has noted, the prior art
5 at issue in the other case and the disputed issues in the '409 are largely
6 distinct from what's going on here, with the exception of some of the
7 arguments about Maninis. So, it was really just to say, Your Honors,
8 this has happened before and it's happening now. There was no big
9 deal there and it has no merit here.

10 We didn't need any dental expert testimony in this case because,
11 one, the references speak for themselves. They refute the argument.
12 Two, when we're looking at something like Kim and a dispute about
13 how to interpret Kim and the scope of its disclosure, we've explained
14 that under either interpretation of Kim, they didn't respond to the
15 obviousness case that we laid out in the Petition.

16 And then the other disputed issue, as I'll point out in a few
17 slides, relates to whether an image was representative, whether the
18 Invisalign image is representative. So, Dr. Foroosh applied his
19 computer science expertise and said, well, the images that you now
20 say are representative I was able to perform the exact same analysis
21 on.

22 JUDGE HOMERE: Counsel, Judge Homere. Regarding the
23 level of experts there are two components. There is the education
24 component and the experience. What is it as far as Dr. Foroosh's
25 experience qualifies him to be an expert under this definition here?

1 MR. ARGENTI: Because he has ample experience with
2 computer vision, image processing and any other types of activities
3 that are laid out in both definitions as would be required. Again, the
4 POSA here is someone with a computer science image analysis
5 background, which is undisputed that that's what Dr. Foroosh has.

6 If you go beyond that and you look at the component of the
7 definition of that says -- talks about they could be or they would be
8 part of a team, a multidisciplinary team where you have people from
9 different backgrounds, even there he qualifies under that definition as
10 being not only a computer science expert but someone familiar with
11 and has ample experience with medical imaging, dental imaging. We
12 pointed out the citations in our Petitioner's Reply to his CV, multiple
13 pages of his CV establishing that he has that experience even under
14 Patent Owner's definition.

15 JUDGE HOMERE: Okay. But as I reviewed his CV, I'm not
16 sure that I saw anything pertaining to an experience relating to
17 evaluating a dental apparatus in a patient's, you know, mouth
18 (inaudible 0:20:39) Invisalign or something like that. So, how do you
19 get to that particular qualification here if he is -- if Dr. Foroosh knows
20 his particular experience in assessing this particular apparatus in a
21 patient's mouth?

22 MR. ARGENTI: That knowledge is not a requirement of the
23 POSA under either party's definition. Patent Owner's arguments are
24 based on an assertion that the POSA has to be a dentist or an
25 orthodontist or has to have knowledge of dentistry or orthodonture
26 practice. That's just not true based on their own definition.

1 So one, it's not required. So, two -- which doesn't mean that the
2 POSA can't understand these references or isn't qualified to
3 understand these references. The references speaks for itself.

4 So, it's very clear when Invisalign talking about this is what
5 you're looking for orthodontist, the separation -- a 1 millimeter
6 separation between an aligner and the teeth. See? There's no dispute
7 that that's not an accurate statement. There's no dispute that it should
8 be interpreted a different way.

9 Their only argument is that the (inaudible 0:19:22)
10 accompanying that test in Invisalign is not representative of what an
11 orthodontist would see.

12 But they submitted with Dr. Kusnoto's testimony additional
13 photos that they said are representative. And Dr. Foroosh showed that
14 you can run the same analysis on those photos.

15 JUDGE HOMERE: Okay.

16 MR. ARGENTI: Very briefly at slide 19, Dr. Kusnoto during
17 cross-examination admitted that Dr. Foroosh doesn't misunderstand
18 any of the terminology in these references.

19 We've already addressed slide 20 very briefly. This refutes
20 their argument that Kim doesn't teach remote assessments of an
21 aligner on the teeth, nor does Invisalign. That doesn't respond to the
22 combination of those two references.

23 Turning to slide 21, continuing their attack on Kim in isolation,
24 they argue that Kim is entirely directed to tracking how teeth are
25 moved during treatment, not tracking aligner fit. But as we just saw,
26 Kim talks about assessing the aligner, not just tooth movement.

1 In addition, consistent with Invisalign's teachings, Patent
2 Owner's dental expert admits that checking aligner fit was the routine
3 aspect of aligner treatment. It was done at regular intervals along with
4 assessing treatment progress based on tooth position. So, those are
5 the two primary assessments throughout aligner treatment. You see
6 that here.

7 Patent Owner's attack on Kim in isolation ignores the teachings
8 of the Invisalign guide, which are representative of the undisputed fact
9 that checking aligner fit was a crucial aspect of aligner treatment and
10 that involves assessing the separation between the aligner and the
11 teeth.

12 Turning to slide 22, we already discussed the Frey reference
13 that corroborates motivation, including its assertion in the separate
14 exhibit that Dental Monitoring themselves filed where Frey is saying,
15 "We routinely do this for international and out-of-state patients
16 already."

17 Turning to slide 23, Patent Owner also disputes the motivation
18 to combine the teachings of the Salah with Kim and Invisalign where
19 Salah describes image processing techniques, including edge detection
20 and deep learning in the context of dental image analysis.

21 So, if a POSA for computer science or for someone similar is
22 combining the teachings of Kim and Invisalign to provide a remote
23 aligner treatment solution that includes the well-known approach of
24 assessing separation between the aligner and the teeth, Salah
25 demonstrates the image processing tools to do that.

1 Applying Salah's contour detection techniques allows the POSA
2 to detect those teeth edges and make the threshold measurement value
3 or the threshold value measurement described in (inaudible 0:16:07).
4 This is right in the wheelhouse for someone knowledgeable in image
5 processing, and Salah is telling the POSA that these techniques work
6 on two edges.

7 Now, I've already alluded to this earlier, Patent Owner argues
8 that even if Salah's techniques work for tooth edges they wouldn't
9 work on aligner edges. They say Salah teaches away from low
10 contrast images, and they say that's what images of aligners in a
11 service position would be.

12 So, we asked Dr. Foroosh, as I mentioned, to run a basic edge
13 detection algorithm on each of the so-called representative images that
14 Patent Owner and their experts pointed to, and as you can see here,
15 every one of them allowed for edge detection. And these are all using
16 the canny filter example from Salah.

17 There are other image processing techniques described in Salah
18 even more sophisticated than this one. There's no credible argument
19 that the teachings of Salah are not supportive of the combination.
20 And, of course, as we explain, Maninis would be expected to be even
21 more effective, given its state-of-the-art teachings.

22 Turning to slide 25 and the Maninis reference, which as I
23 mentioned is only relevant to the '248 IPR, as an initial matter Patent
24 Owner also argues that Maninis is not prior art.

25 We discussed that during the hearing on the '409 patent and I
26 don't want to repeat myself, but very briefly Maninis was submitted to

1 archive.org for publication months before the priority date, and the
2 evidence establishes that it was published within four days after
3 submission. That's confirmed not only by archive.org's policy at the
4 time but also by our expert Dr. Foroosh's own personal experience as
5 an archive.org user.

6 Turning to slide 26, Patent Owner also argues that our
7 combination involving Maninis would be inoperable. That's again
8 something that they raised in the IPR on the '409 patent that we
9 discussed at length during the last hearing. The arguments failed here
10 for the same reason as discussed in that earlier case.

11 They concoct something they call them Maninis COB neural
12 network which they say is incapable of object classification, such as
13 identifying teeth and aligners and the gap between them. But just as
14 in the '409 IPR, our combination is not limited to Maninis' COB
15 neural methods, which is a term that you won't find in our Petition or
16 in Maninis itself.

17 Rather, the Petition proposed using Maninis' deep learning
18 architecture for improved object detection and object classification,
19 which is exactly what Maninis describes.

20 Turning to slide 27, Patent Owner also argues that a POSA
21 would not have been motivated to assign Maninis' deep learning
22 techniques. But recall that Salah lists deep learning as one of its
23 image processing options and Maninis provides this state-of-the-art
24 deep learning image processing approach. Contrast that to the '248
25 patent's (inaudible 0:12:55) disclosure of using known neural
26 networks. It doesn't claim to provide an improved neural network. It

1 just says use a known technology for this application, which again, is
2 equivalent to a visual assessment dental professionals have been
3 making for years.

4 Turning to slide 28, also as in the '409 IPR Patent Owner argues
5 here that the time and expense of training a neural network to analyze
6 dental images would have weighed against motivation to combine.
7 But as we explained in that earlier case, Patent Owner exaggerates the
8 necessary cost. Dr. Kusnoto admits his opinions here are based on
9 things that our combination doesn't require like anonymizing photos
10 and adding unnecessary labels.

11 Dr. Foroosh explains that many of those steps would be easily
12 automatically accomplished using software at low cost. And even if
13 the alleged costs were real, Dr. Foroosh explains that a one-time
14 investment would not deter a POSA. It's just the standard
15 development cost for a tool like this.

16 Turning to slide 29, as to '945 patent, Patent Owner raises one
17 argument that only applies to this patent and not the '248. They say
18 that our combination cannot identify the edges of individual teeth or
19 distinguish between the edges of teeth and aligners because the image
20 processing in Salah is only capable of identifying contours in an
21 image, not distinguishing between what objects those contours
22 correspond to.

23 That misrepresents Salah and the ground in the Petition. Salah
24 lists over 30 kinds of image processing techniques and there's no
25 dispute that many of them were capable of detecting and

1 distinguishing between objects in an image. That would have been
2 readily apparent to POSAs reading the reference.

3 And Salah itself is capable of recognizing the contours of the
4 gum as opposed to the contours of the teeth. Patent Owner has
5 presented no theory why a POSA would ignore these teachings or
6 think them inapplicable to distinguishing between, for example, the
7 edges of an aligner and the teeth, particularly when Invisalign says
8 that's what you do as a routine matter of treatment.

9 Turning to slide 30 and then dependent claims in the suit in the
10 '248 IPR, starting with Claims 7 and 14. As a reminder, Claim 14 is
11 another claim that has been found ineligible by the District Court.
12 These claims recite training the deep learning device using a learning
13 base of images with historical tooth zones representing a tooth and a
14 tooth attribute relating to separation between the tooth and the aligner.

15 We explain in the Petition that in our combination in view of
16 the teachings of Maninis, the deep learning base would be trained on
17 images labeled with pixel-wise annotation corresponding to the teeth,
18 the aligner, and the gap in between. Those annotations provide the
19 location of the edges of the teeth and the aligner, which define the
20 separation between the two, as well as identify the separation itself
21 with the gap labeling.

22 Each of those is an attribute relating to the separation.

23 Patent Owner --

24 JUDGE SZPONDOWSKI: Mr. Argenti? Sorry, counsel, this
25 is Judge Szpondowski. What are you mapping the tooth attribute
26 value to?

1 MR. ARGENTI: The tooth attribute value would be, as I was
2 just mentioning, the labeling of the teeth, the aligner, and the gap in
3 between. So, the value could be the individual -- collection of
4 individual pixels that identify the edge of a tooth, the edge of the
5 aligner, and the gap in between. It could also be a measurement of the
6 distance which is consistent with the specification.

7 Any other questions on that issue or should I continue?

8 JUDGE SZPONDOWSKI: Well, I'm just looking at the
9 petition. Patent Owner's argument is that you didn't map anything for
10 the (inaudible 0:08:17) and I'm just -- it seems kind of vague. Maybe
11 you can point me in the Petition, you know, where you did that?

12 MR. ARGENTI: So, in the Petition, if we look at the
13 discussion of, for example Claim 7, I believe the most relevant portion
14 is going to be at pages 46 and 47. This is where we discussed that by
15 applying those pixel-wise annotations designating something as tooth,
16 aligner, or gap, or identifying an individual tooth, tooth one, tooth
17 two, tooth three, the collections of those pixels corresponding to a
18 particular contour become the tooth attribute.

19 If the tooth attribute can be a measurement of the separation,
20 maximal mean separation, that disclosure in the specification, then it
21 follows that, of course, the location, identification of the location of
22 the boundary, which is the basis of that calculation, can also be a tooth
23 attribute.

24 Where is the tooth edge located in this image? Where is the
25 aligner edge located in this image? Those are the tooth attributes that
26 we're referring to.

1 JUDGE SZPONDOWSKI: Thank you.

2 MR. ARGENTI: So, as I just mentioned, the annotation that
3 we propose provides the locations of the edges of the tooth and the
4 aligner, which define the separation between the two, as well as
5 identification of the separation itself. Each of those is an attribute
6 relating to the separation as required by the claim.

7 Patent Owner argues that this conflates a tooth attribute with a
8 tooth zone, but the zone merely represents a tooth. It isn't recited as
9 consisting of a tooth or defining a tooth. So, the zone can be more
10 than just the tooth and even include the aligner, as we pointed out in
11 our Petition.

12 Therefore, the location of the tooth outline is not the same thing
13 as the zone. Their argument is not mentioned (phonetic sp.) with the
14 scope of the claims. And even if the zone is coextensive with the
15 tooth, we explain that our identified tooth attribute can just be the
16 portion of the tooth edge corresponding to the respective aligner edge,
17 not the entire tooth outline. So, our combination is not conflating the
18 tooth attribute at the tooth zone.

19 Beyond that, Patent Owner argues that the pixel annotations in
20 our combination can't serve as attributes of tooth. The specification
21 makes clear that an attribute value can be a collection of values, which
22 their own expert conceded, so there's no issue with relying on a
23 collection of pixel values. So, what we have is a collection of pixel
24 annotation that collectively establish the location of the teeth and the
25 aligner edge in the image, which in turn define the separation between
26 the two.

1 So, of course, those are attributes relating to a separation, not to
2 mention our combination also involves labeling the separation itself as
3 a gap, which unquestionably relates to the separation.

4 Turning to slide 31 and Claim 8. Whereas Claim 7 said the
5 historical image included a tooth attribute value or values, here the
6 claim says that the historical image has an image attribute value,
7 which the specification says can be a collection of tooth attribute
8 values. Patent Owner's arguments here largely roll down to a
9 proposition that it's because, they say, we have failed to show tooth
10 attribute value for Claim 7, we've also failed to show image attribute
11 values to this claim, which can be rejected for the reasons that we just
12 discussed for Claim 7.

13 We also explained that labeling any pixels in the image as an
14 aligner or a gap would serve to provide the image attribute value that
15 an aligner or gap is present in the image. Patent Owner argues that
16 that would just be pixel-wise annotations, not image attribute values,
17 but they haven't explained how anything in the claim, excludes pixel-
18 wise labeling from (inaudible 0:03:47) image attribute values.

19 Patent Owner does not contest that an indication of a presence
20 of an aligner gap image would satisfies this claim element, and that's
21 exactly what our combination provides.

22 Now, unless Your Honors have any questions, I'm happy to
23 reserve the remainder of my time for rebuttal. As you noted, we do
24 have objections to Patent Owner's demonstratives. The basis for that
25 is set forth in our objection, and I'm happy to discuss that now or
26 during my rebuttal time, whatever you think is appropriate.

1 JUDGE SZPONDOWSKI: I think you should address it now,
2 if you could just touch on your objection?

3 MR. ARGENTI: Of course.

4 JUDGE SZPONDOWSKI: That way we can hear from Patent
5 Owner.

6 MR. ARGENTI: Of course. So, we noted the specific slides.
7 You noted them at the beginning of the hearing. There are quite a few
8 of them. The issue boils down to that all of those slides contain new
9 argument primarily in the form of graphics and images that are found
10 nowhere in the record.

11 When we look at those slides, in the initial slides in the 30 to 40
12 range that we objected to, they contain images, things like a cat and a
13 flower.

14 We have no idea where those came from. They're not in the
15 record and therefore any arguments about what those images represent
16 or how they would be understood by a POSA are new arguments. It
17 appears that all of the flow charts and surrounding graphics are new
18 argument based on these new images.

19 We met and conferred. Patent Owner agreed, acknowledged
20 that this was new content created specifically for the oral argument.
21 Declined to remove those slides. They did provide alternative slides
22 at the end of their slide deck, which I think are intended to address the
23 same issue, but they swapped in images from Maninis as opposed to
24 the new images, but the graphics remain, the surrounding graphics
25 remain.

1 And they created new problems. If you look at the alternative
2 slides, they're making arguments that we never heard during the
3 proceeding but pointing to images in Maninis that are described in
4 reference as being analyzed and they're arguing that those are the
5 learning base basis, but in the input that they have annotations.

6 So, they're essentially taking the output of Maninis and moving
7 it back even before the input to the learning base page. It's
8 inconsistent with the reference and, most importantly, we don't know
9 what they're going to argue about those. But these are graphics and
10 figures that are found nowhere in the record.

11 Thank you, Your Honor.

12 JUDGE SZPONDOWSKI: Okay. Okay, thank you.

13 Okay. We will turn to Patent Owner. I'd like you to start with
14 your response to Petitioner's objections to the demonstrative because,
15 you know, I do have to agree that it seems like a lot of these pictures
16 you've used in these slides really aren't found anywhere in the record.

17 I looked at all the citations that were cited on the pages of the
18 demonstratives and didn't see that. So, I'd like to hear your response.

19 Would you like to reserve any time for sur-rebuttal?

20 MS. JACOBSEN: Yes. I will reserve 15 minutes, please, Your
21 Honor.

22 JUDGE SZPONDOWSKI: Okay, thank you. Okay. You may
23 begin whenever you're ready.

24 MS. JACOBSEN: Thank you, Your Honor. As you requested,
25 I'll start by addressing the slides that have objections to them. I don't
26 plan to cover all of those slides with the argument today in this

1 presentation, but really the explanation for why these are not new
2 argument is almost the same for all of them.

3 And particularly with respect to slides 33 to 38, they are based
4 on the explanation from Dr. Mongan, Patent Owner's expert in deep
5 learning, and he provides a background discussion of deep learning
6 where he explains that how a neural network functions is determined
7 by its structure and by its training. And that's in paragraph 61 to 67,
8 and particularly in paragraph 62.

9 And then in our discussion of Maninis we explain how there are
10 two fundamentally different types of neural network in Maninis. One
11 of those is a deep learning device that is trained to recognize generic
12 contours. The other one is a deep learning device or a neural network
13 that is designed to -- and able to recognize semantic contours. And
14 those two things are trained fundamentally differently. They're
15 designed fundamentally differently and they output a different output.

16 And that is, you know, the exact same argument that we make
17 with respect to Maninis and, indeed, _Patent Owner -- I'm sorry --
18 Petitioner doesn't object to any of Patent Owner's slides with the same
19 flow chart for Maninis. So, all we did was in order to provide some
20 background on deep learning, the fact that they have to be trained to
21 do a specific task, that they are designed to do a particular task, that
22 the function of a deep learning device is to (inaudible 1:01:20), all of
23 which is supported by Dr. Mongan.

24 We just used some generic images to illustrate the point. And
25 the image that we chose is an image of a cat because all through Dr.
26 Foroosh's deposition when we were talking about how a deep learning

1 device works, what it can recognize, how you train it, that it's trained
2 in a different way, what it would understand, that was with reference
3 to an image of cat. You know, can a different deep learning device
4 look at an image and recognize a cat?

5 And so that is the basis for that kind of image and that
6 explanation, and if I could just pause there and go into it in further
7 detail when I address Maninis and I can point you exactly to the
8 record where we make these arguments, where we explain it, and
9 what the basis is.

10 JUDGE SZPONDOWSKI: Well, I think we need to figure out
11 if we can even allow these slides before we get there. I mean, I think
12 there's the issue. And I, you know, like I said, I went through all the
13 citations here and I kind of agree with Petitioner that this does seem
14 like a new argument on these slides.

15 MS. JACOBSEN: Well, if we look at --

16 JUDGE ZECHER: Counselor, this is Judge Zecher. Can you
17 tell us where these paragraphs from Dr. Mongan are actually
18 developed in your papers and presented because I'd like to see where
19 that is.

20 MS. JACOBSEN: Right. So, in Patent Owner's Response,
21 which is Paper 20 at page 9, we discuss Dr. Mongan's testimony on
22 the background a deep learning device. And that is paragraphs 61 to
23 67 of Exhibit 2028. And what we explain there is that it was known
24 that each neural network trained for an image recognition (inaudible
25 0:59:27) is unique to the annotated images on which it is trained and

1 its success improves on the quality of the training and the challenges
2 of the attributes the neural network itself is recognizing.

3 And so that is the discussion in Exhibit, for example, in 2028,
4 paragraph 62, where Dr. Mongan provides more details on that point.
5 And --

6 JUDGE ZECHER: Where's the reference to images of cats,
7 though?

8 MS. JACOBSEN: Okay. So that was in, for example,
9 discussed at the Patent Owner's Response at page 43 where we talk
10 about how Dr. Foroosh misunderstood the teaching Maninis. And he
11 understood Maninis to be talking about the COB neural network able
12 to look at an image of a cat and say this is an image of a cat.

13 And what Dr. Mongan explains is, no, that's not right. That's
14 not what the COB neural network in Maninis does. Instead, the COB
15 neural network in Maninis can look at an image and all it can detect is
16 generic contours. Where are the boundaries? Where are the lines? If
17 I trace over all of the lines in that image then that's the output from
18 COB.

19 And so we used an image of a cat, which is what we discussed
20 at length with Dr. Foroosh in his deposition, to say, well, Dr. Foroosh
21 is saying it's a deep learning device in Maninis that gives you what's
22 called semantic contour. This is an image of a cat and it's labeled as a
23 cat, whereas, in fact, what Maninis' COB neural network can do is
24 only show you the generic contours, outline of the cat or outline the
25 sheep as in Maninis, but it can't tell you what is in that image. All it
26 does is draw the lines in the image, and that's the only output.

1 And that's really important here to understand that different
2 types of neural networks perform different tasks. They have a
3 different structure that determines what input they can receive and
4 what output they can generate. And what the problem with
5 Petitioner's case here is that they take a learning base and to train a
6 deep learning device that is fundamentally incapable of being trained
7 on that learning base, and it says that that deep learning device in
8 Maninis' COB is going to output something, which it cannot do.

9 So if we look at, for example, slide 40 in Patent Owner's slide
10 deck --

11 JUDGE ZECHER: Well, before we get down the road of you
12 presenting this slide deck, I think we need to decide whether or not
13 you should present these slides in the first instance. So, I mean we
14 don't want you to get off kilter on what you're going to present to us
15 by basically jumping right into this because I'm sure you had
16 something you wanted to start with versus something you want to,
17 kind of, lead us into.

18 But just a moment.

19 MS. JACOBSEN: Sorry, Your Honor. Slide 40 isn't actually
20 objected to. So, you know, I can do this with reference -- I can try
21 and do this with reference to only the slides that have not been
22 objected and perhaps, you know, if there's additional time at the end
23 we can talk a little bit more about these objections.

24 But the flow charts which explain how you start with an
25 untrained neural network, you then train it with a learning base so that
26 you get a trained neural network, and then you present it with a new

1 image to get a specific output for that deep learning device, that's all
2 explained in Dr. Mongan's report and where he distinguishes between
3 different types of deep learning device.

4 JUDGE ZECHER: Counselor, just give us a second. We're
5 consulting behind the scenes. Hold on.

6 MS. JACOBSEN: Understood.

7 (Whereupon, the proceeding was paused for Judges to confer.)

8 JUDGE SZPONDOWSKI: We are going to sustain Petitioner's
9 objections to these slides. So, you may continue, but just avoid the
10 slides that were objected to.

11 MS. JACOBSEN: Understood, Your Honor. So with that,
12 perhaps we can take a step back and start this presentation by talking
13 about the state-of-the-art. Now as Your Honors know, both of the
14 challenged patents are directed to new methods for assessing the fit of
15 a clear aligner. So, a clear aligner and the piece of plastic. It's
16 transparent, it's molded, and it's designed to go into the patient's
17 mouth and go on to the teeth and exert gentle pressure on the patient's
18 teeth to bring about a desired movement of those teeth.

19 And patients when they're being treated with clear aligners
20 receive a series of clear aligners over the course of that treatment,
21 maybe 10 or 15, and they're changed every one to two weeks
22 depending on the treatment plan from the orthodontist.

23 And I propose to start with a discussion of the state-of-the-art
24 with respect to how the progress of that clear aligner treatment was
25 assessed because it was notably absent from the Petition that there
26 was any discussion of the state-of-the-art in 2017 with respect to

1 assessing clear aligner treatment. And that's significant because the
2 state-of-the-art is the background against which we assess the
3 teaching in, the prior art and it's the way in which we avoid falling
4 into a hindsight bias which we all know is improper.

5 So, there are several points relating to the state-of-the-art that
6 are addressed by Patent Owner's declaration from Dr. Kusnoto. So,
7 Your Honors noted that in this case Petitioners have no evidence from
8 a dental expert or an orthodontist. (Inaudible 0:52:17) dental
9 treatment occurred in the prior art.

10 Dr. Kusnoto does know. He has 25 years of experience as an
11 orthodontist and he explains the state-of-the-art.

12 And so if you turn to slide 4 from Patent Owner's deck, there
13 you have an explanation that Dr. Kusnoto provided which is
14 undisputed, and that is about how aligner treatment was assessed in
15 2017 before the '248 and the '945 patent. And what Dr. Kusnoto
16 explains is that the progress of that aligner treatment was assessed in
17 person at that time. So, the patient would go to their orthodontist's
18 office and the orthodontist would do a series of different examinations
19 on the patient in order to see how the treatment is progressing.

20 One thing that the orthodontist would do is look at the position
21 of the patient's teeth, note how that compared with where they were
22 supposed to be at that stage of treatment. The orthodontist would also
23 look at things like, well, how are the attachments for the aligner on the
24 patient's teeth, and then they would look at the aligner fit.

25 They would assess the aligner fit, and that would involve the
26 patient putting on their clear aligner, the one corresponding to the

1 stage of treatment they're at at that time and probably the one before
2 and the one after as well. And the orthodontist would do a visual
3 inspection of how that clear aligner looks, but importantly they would
4 also do a manual manipulation of the clear aligner on the patient's
5 teeth. You know, does it lock?

6 And that was an important part of the clear aligner assessment,
7 and there's no suggestion that aligner fit could be assessed simply by
8 looking at an image. I mean, they're designed to exert pressure and
9 you can't see pressure in an image and so that's why the orthodontist
10 would also manually manipulate the patient's teeth.

11 And if we go to slide 5 then, this is evidence from Dr. Kusnoto
12 again explaining how clear aligner treatment was not assessed in
13 2017. And what he explains is that at that time orthodontists were not
14 using images to assess aligner fit, and they weren't doing any kind of
15 quantitative measurement of the separation between the clear aligner
16 and the patient's teeth.

17 And indeed at that time, there was no way to do that. And as
18 we explain on slide 6, that was at least in part because in order to take
19 high quality dental images, and this is just images of a patient's teeth
20 leaving aside an aligner of the teeth at the moment, you needed
21 training. You needed specialized equipment and training. And that's
22 understood and that's actually confirmed by Petitioner's expert Dr.
23 Valley when she gave evidence in other proceedings and in the
24 District Court. In this case it didn't -- in relation to images of teeth.

25 And while there were some dentists who had tried to take
26 images of teeth, not aligners but teeth just with a cellphone, what they

1 found was that was fraught with difficulty because if you got close
2 enough so that the image had high quality then the image was often
3 distorted or blurred. And if you went too far away then you couldn't
4 actually capture the image you wanted.

5 And so at that time in 2017 it was not standard to use images of
6 a patient's teeth to assess their treatment at all, and there's no
7 suggestion in the record that anybody at that time was using an image
8 of an aligner on a patient's teeth to assess aligner fit or do any kind of
9 quantitative analysis of a separation between the teeth and the aligner.

10 JUDGE ZECHER: Ms. Jacobsen, this is Judge Zecher. How
11 would you balance that against what I understood Petitioner to argue,
12 which was that the prior references speak for themselves. We have
13 Kim. We have Salah. They both talk about taking pictures of
14 patient's teeth and , subsequently, having a dental professional analyze
15 them.

16 MS. JACOBSEN: Right. So a couple of things on that. One
17 simply is they're saying that the references speak for themselves.
18 That's not a substitute for having a qualified expert give testimony
19 about how a person of ordinary skill in the art would read those
20 references and (inaudible 0:47:30) a substitute for understanding them
21 in the context of the state-of-the-art so as to avoid any kind of
22 hindsight bias in your analysis of those images.

23 And when you look at the images that are discussed in either
24 the Kim reference or in Salah, those references are of the teeth only.
25 Those are the bare teeth. There is nothing in those references that
26 suggest you should take an image of an aligner on the patient's teeth.

1 In fact, Salah doesn't mention aligners anywhere in the entire
2 reference, and it doesn't suggest that you can just use an image of an
3 aligner on a patient's teeth to assess how the aligner fits and the
4 progress of the patient's treatment.

5 JUDGE ZECHER: Ms. Jacobsen, but I thought we were
6 focused on just whether or not we had the capability in that timeframe
7 of taking a picture of a patient's teeth and providing it to a dental
8 professional to assess. I don't think we've quite got to the minutiae of
9 putting an aligner on the teeth. I'm just trying to -- I think -- it seems
10 like we're conflating those two things, so I --

11 MS. JACOBSEN: Right.

12 JUDGE ZECHER: -- was hoping to focus on the first one.

13 MS. JACOBSEN: Right. So there's two different things we're
14 talking about here is one is the state-of-the-art and how did people at
15 that time assess aligner fit or assess the treatment of a patient with a
16 clear aligner. And at that time it was not standard to use images for
17 that kind of assessment.

18 Now, Petitioner has been able to find one or two isolated
19 references that propose a new approach. They were filed very close to
20 the '248 and the '945 patents. They had no other -- there is no
21 evidence that they had been adopted into the state-of-the-art or
22 successfully implemented by the time the '248 or the '945 patent was
23 filed.

24 And so you need to read those references against the backdrop
25 of the state-of-the-art and they're very clear that they are only
26 proposing a new way to look at teeth, not to assess aligner fit.

1 JUDGE HOMERE: Counselor, this is Judge Homere. The
2 reference (inaudible 0:45:16) Invisalign. Invisalign is actually prior
3 art and (inaudible 0:45:07). And the picture taken with the (inaudible
4 0:44:59). So is it your position that given that that image (inaudible
5 0:44:59) the gap between the aligner and the edges of the teeth? Is
6 that your position?

7 MS. JACOBSEN: Yes. So, our position with respect to
8 Invisalign is that it is very clearly a guide that was intended to be
9 given to dental professionals and orthodontists so that they could
10 understand how to assess a patient in person.

11 If you go to slide 16 of Patent Owner's slides, we have there a
12 quote from Dr. Foroosh when he talks about how Invisalign is not a
13 remote treatment disclosure. And so he himself admits that there's no
14 suggestion in Invisalign that you should be taking images of a
15 patient's teeth with the aligner on and using them to assess aligner fit.

16 Instead, Invisalign is completely consistent with the state-of-
17 the-art in describing an in-person analysis that requires a combination
18 of steps to assess how the patient's treatment is going forward. And
19 there's no suggestion that you could do away with any aspect of that
20 treatment or that you could move that treatment to move analysis. So,
21 if you --

22 JUDGE HOMERE: Well, Counsel, my question was regarding
23 the depiction in Invisalign where you have a patient with the aligner, a
24 picture of a patient with the aligner on their teeth. So in that case -- so
25 once that picture captured because I know that (inaudible 0:43:13)
26 around this time and the ability to take a picture of anything unless,

1 you know, including a patient's teeth was, you know, that was part of
2 the state-of-the-prior-art. So, the question then, so would we have
3 been able to utilize a camera to produce a picture as depicted in
4 Invisalign?

5 MS. JACOBSEN: Well, Your Honor, the question is whether a
6 person of ordinary skill in the art would have been motivated to do
7 that. They had to have a reason to do that, and here --

8 JUDGE HOMERE: So, that's not the question that I asked. So,
9 I asked -- the question I'm asking is prior to the invention if cameras,
10 you know, cellphone cameras were available would one skilled in the
11 art be able to take a picture as what is depicted in the Invisalign
12 reference?

13 MS. JACOBSEN: Well, Your Honor, there's no --

14 JUDGE HOMERE: That's a simple question. That's a yes or
15 no question.

16 MS. JACOBSEN: Your Honor, there's no evidence that the
17 cellphone cameras in 2017 were able to take a sufficiently high
18 quality image of a patient's teeth with an aligner on in order to do an
19 inspection. The only way that the '248 patent is able to do that and to
20 recommend that is because it combines the image with a very
21 sophisticated deep learning device that has been trained a specific way
22 in order to conduct that analysis.

23 And so, no, Your Honor, there's no prior art that suggests that
24 you could do that and discloses that you could take an image with a
25 cellphone and that it would be sufficiently high quality. Counsel for
26 Petitioner --

1 JUDGE HOMERE: (Inaudible 0:41:31).

2 MS. JACOBSEN: -- admitted that all of these images that it
3 relies on, none of them were taken with a cellphone, so there's no
4 example of a cellphone image in the prior art that a person of ordinary
5 skill in the art could look to and conclude that I can get a good enough
6 image here in order to combine with deep learning and make an
7 adjustment to aligner fit.

8 JUDGE HOMERE: Okay. So assuming arguendo that around
9 that time the picture that you have that is depicted in Invisalign,
10 assuming that you had the capability of capture -- of producing a
11 picture like that, now if that picture is produced or provided to a
12 professional they wouldn't be able to assess the separation of the gap
13 between the patient's teeth and the aligner?

14 MS. JACOBSEN: Well, no, Your Honor, because at that time
15 there was no way to quantitatively assess separation between the teeth
16 and the aligner, and there's no suggestion and the prior art that you can
17 just look at an image and say, okay, well, that gap is 0.9 millimeters,
18 that's fine. Or that gap is 1.1 millimeters, that's too bad. That's not
19 how a dental professional worked in those days.

20 They had to do a combination of, one, looking at how they
21 choose the aligner was sitting on the teeth but also manually
22 manipulating it so they can see where it's exerting pressure, whether
23 it's rocking on the patient's teeth. And that's a critical part of the
24 evaluation that Petitioner ignores completely because it has no expert
25 that knows anything about how clear aligner treatment was assessed in
26 2017.

1 And it's really important when you look at, for example, Patent
2 Owner's slide 17, and there we have the image that Petitioner relies
3 on. That's Image A from Invisalign. And this is the image that they
4 seize upon, I think recognizing that Kim doesn't actually disclose
5 taking any images with an aligner on the patient's teeth. And we can
6 talk about why that is, but they realized that they have to rely on
7 Invisalign and they have to say that Invisalign provides the motivation
8 to take an image of a patient's teeth with an aligner on and do an
9 assessment from that image and do a quantitative measurement of the
10 separation between the edge of the teeth and (inaudible 0:38:52) in the
11 Petition and in Dr. Foroosh.

12 And they say this is what shows that separation is visually
13 distinguishable, and this is what they say provides the motivation here
14 to assess aligner fit. Well, this image is not representative of anything
15 that an orthodontist would have seen in the clinic in 2017.

16 And if Your Honors turn to slide 18, you see some testimony
17 from Dr. Foroosh. And even though Dr. Foroosh looked at Invisalign
18 and said, oh, you know, that image A shows a visual separation, that's
19 what somebody's going to see in the clinic. That's what you're going
20 to use to assess the treatment progress. He has no idea if that is
21 representative of what somebody would see in the clinic, and he
22 admitted to having no idea if that particular situation ever happened in
23 real life.

24 Now, unlike Dr. Foroosh, Dr. Kusnoto does know. And what
25 Dr. Kusnoto explained is that image A that Petitioner relies on is not
26 an aligner in the service position. It is an artificially created image

1 where the aligner has been pulled away from the teeth in order to
2 illustrate a gap for the purposes of the taking a photo and including it
3 in the clinical guide.

4 And the way that Kusnoto knows that and he explains that in
5 paragraph 61 of his declaration -- that's Exhibit 2030 -- is because the
6 separation is almost even across all of the teeth. And that's not what
7 we see in real life. In real life what we see is much smaller separation
8 between the teeth and the aligner, even in an aligner that is fitting
9 really poorly, that is fitting poorly.

10 And we have two examples on slide 18 of Patent Owner's
11 demonstratives.

12 Slide B you can barely -- I'm sorry, image B -- you can barely even
13 see there is an aligner there. And even the other image A, which is
14 shown on Patent Owner's demonstrative 18, even that one is a much
15 smaller gap than in the image that Petitioner relied on in support of its
16 case.

17 So, this is important for a couple of reasons. One, Petitioner
18 chose to hang their entire case on image A. They said this is the
19 image that shows a poorly fitting aligner with a clearly visually
20 distinguishable gap that would have motivated somebody to take an
21 image of an aligner in the service position, measure the separation,
22 and assess clear aligner treatment in that way.

23 And Dr. Foroosh has shown, and I don't think it's disputed now,
24 but it can't be. They have no evidence from anyone that knows about
25 aligner treatment that this isn't representative. It's not a representative
26 image and so it can't provide that motivation.

1 Now, the fact that after the fact in rebuttal Dr. Foroosh was able
2 to run some image analysis in 2024 using 2024 technology on other
3 images doesn't show that a person of ordinary skill in the art faced
4 with aligner fit like the examples on slide 18 would have been
5 motivated to try and take an image and use those types of images that
6 reflect actually what we see in the clinic in order to try and assess
7 aligner fit from an image.

8 A skilled person wouldn't. There's no evidence that these
9 images, the real-life images, the ones that a person of ordinary skill
10 might actually see would be sufficient to allow somebody to have a
11 motivation to do that.

12 The other point I want to make is that, you know, Petitioner
13 says, oh, well, you can use the same analysis to do image A as these
14 other images. Well, Dr. Foroosh admitted during his deposition that
15 he couldn't do that. You have to change the parameters on his image
16 analysis, 2024 image analysis technology, in order to be able to make
17 it work. And so it's not as simple as Petitioner suggests that all
18 images could be equally analyzed in order to assess aligner fit.

19 Now, I'd like to go back to Kim unless Your Honors have any
20 other questions on Invisalign and just to address that next.

21 No? All right. So if we turn to slide 13 in Patent Owner's
22 demonstratives, Petitioner's combination starts with Kim. And what
23 Kim is is a reference with a new way of assessing clear aligner
24 treatment. And what Dr. Kusnoto explains is that aligner fit and tooth
25 alignment are fundamentally different analyses.

1 A tooth alignment involves looking at the position of each of
2 the individual teeth in an image and seeing how they compare with the
3 intended position of the teeth. Assessing clear aligner, which is what
4 is in the '248 and the '945 involves at the time the 2017 looking at and
5 assessing how the aligner was sitting in the teeth and whether it was
6 the appropriate shape to exert the right pressure on the teeth to bring
7 around the desired motion of the teeth into the desired position.

8 And as I've explained, it's a combination of not just looking at
9 the aligner on the teeth but also being able to manipulate them to
10 ensure it's exerting the right pressure.

11 Now, to assess teeth alignment, Kim uses what it calls teeth
12 alignment information. Now, that can include images of teeth without
13 the aligner and we have examples shown on slide 13, and Kim goes
14 into great detail explaining the types of images you would need to
15 (inaudible 0:32:05), what views. It explains how to do that. It
16 provides guidance for the patient how to do that.

17 And then Kim is very clear that it is that teeth alignment
18 information that can include images of the bare teeth that is used for
19 diagnosis, and it's that information that's used for treatment of the
20 patient. And all of the benefits of Kim that Petitioner points to relate
21 to the reduced diagnosis time and the cost come from the use of the
22 teeth alignment information.

23 Now, if you turn -- Your Honors turn to slide 14 from Patent
24 Owner's, we have the paragraph 66, which is the part of Kim that
25 Ppetitioner zeroes in on. And a little bit like Invisalign, Petitioners

1 point to just one tiny part of the reference ignoring the larger context
2 of each of those references.

3 And what Petitioners says is that this paragraph 66, which
4 confirms the clear aligner information, teaches taking an image of an
5 aligner in a service position, and that's not right. As Dr. Kusnoto
6 explains, the way that that would be understood by somebody with
7 knowledge in the field is that that is an image of the bare alignment,
8 and the analysis that Kim proposes is to check that it's normal, which
9 is things like is it broken? Is it distorted? And does it correspond --
10 the clear aligner correspond to the appropriate step?

11 So, we're in step six. Is the patient wearing aligner number six?
12 When in step seven is the patient wearing aligner number seven?

13 And Petitioner says okay, but it says currently worn, and
14 counsel said it's pretty clear that that means or the claim language
15 means that that is on the patient's teeth. Well, there's several reasons
16 why that's not right.

17 The first is that Kim discusses teeth alignment information and
18 clear aligner information separate. Those are two different things in
19 the context of Kim. They're collected differently. They're processed
20 differently and they are used differently. It is the teeth alignment
21 information in Kim that is used for diagnosis and treatment, and it is
22 the clear aligner information and it's just used to check if the clear
23 aligner is normal and that the patient is using the right number aligner.

24 JUDGE ZECHER: Ms. Jacobsen, this is Judge Zecher.

25 MS. JACOBSEN: Yes.

1 JUDGE ZECHER: I'm going to just cut to the heart of the
2 issue. Let's just say for a second we agree with you that the clear
3 aligner currently worn by the orthodontic patient, which I believe is
4 the exact wording in paragraph 66 of Kim, it's just the aligner itself.
5 It's not the aligner on the teeth.

6 MS. JACOBSEN: Yes.

7 JUDGE ZECHER: It seems to me that the Petitioner does have
8 an alternative argument in its Petition. I'm looking at the Petition at
9 page 21 in the IPR2024-00052 case addressing the '248 patent where
10 he says, look, to the extent you're going to argue that Kim doesn't
11 sufficiently describe the aligner currently worn in an image is in the
12 service position on the patient's teeth, taking such an image would
13 have been readily apparent in view of Invisalign. Can you address
14 that specifically because let's just say, like I said we agree with you
15 that it's just the aligner itself, but it seems to be that he's buttressing it
16 with Invisalign.

17 MS. JACOBSEN: Yes, Your Honor. So, I think that's right.
18 Petitioner is buttressing it with Invisalign recognizing that Kim
19 doesn't disclose taking an aligner image. The problem with the
20 Petitioner is --

21 JUDGE ZECHER: Well, just to be clear, I think there's two
22 arguments. I think he's saying that Kim does teach a picture with the
23 aligner on the teeth. We can, of course, assess Kim ourselves and
24 decide and make that finding, but I think the alternative one is if it
25 doesn't then you need to also consider it in the context of what
26 Invisalign is teaching.

1 MS. JACOBSEN: Right. And what Invisalign is teaching, if
2 we go to slide 16, is a method for conducting an assessment of aligner
3 treatment progress in person. There's nothing in Invisalign itself that
4 suggests that you can take an image of an aligner on a patient's teeth
5 and use it to assess treatment.

6 JUDGE ZECHER: But why is this in-person aspect of it so
7 important?

8 MS. JACOBSEN: Because it --

9 JUDGE ZECHER: I mean, we do have a picture with an
10 aligner on the teeth in there. Now, whether or not it's taken in person
11 or remotely, why does that matter?

12 MS. JACOBSEN: Well, it's not about whether the image is
13 taken in person or remotely. It's about how is the aligner assessed?
14 And the aligner is assessed in person because the orthodontist needs to
15 be able to feel the patient's teeth and feel it on the patient. There's
16 nothing in Invisalign that says you can just look at the aligner on the
17 patient's teeth in an image and make an assessment of the treatment
18 progress because the clear aligner is intended to exert pressure on the
19 patient's teeth to move them. And so you need to be able to
20 manipulate the aligner on the patient's teeth in order to be able to see
21 if it's fitting correctly. And that's what Invisalign is talking about.

22 I mean, Dr. Foroosh, he suggests --

23 JUDGE ZECHER: But Ms. Jacobsen, I'm struggling with that
24 aspect.

25 MS. JACOBSEN: Yeah.

1 JUDGE ZECHER: You keeps saying that the orthodontist
2 needs to feel the aligner, you know, be in person, but yet that's not
3 what your claim requires. There's no touching of the aligner, anything
4 like that that would help the orthodontist to remember he is putting an
5 Invisalign on, determine whether it fits properly other than simply
6 looking at the picture. So, why is that such a critical aspect of this?

7 MS. JACOBSEN: Well, Your Honor, that's because it's a
8 critical aspect because that's what the prior art teaches and that's how
9 it was been done in the prior art. And we can't consider the
10 innovation and the '248, the brand new method in the '248 and then
11 hindsight to see if we can find a basis for the innovation in the '248 in
12 the prior art.

13 And it's only because the '248 patent combines an image of an
14 aligner in the service position with a deep learning device designed
15 and trained to do a particular analysis to detect a tooth attribute value
16 for an analysis (inaudible 0:25:115) relating to separation. That then
17 you can (inaudible 0:25:10) you still get those two innovations in
18 order to come up with the new method of assessing aligner fit that's in
19 the '248 patent.

20 And so without the innovation in the '248 patent, (inaudible
21 0:24:57) the deep learning device to do a particular type of analysis,
22 without that insight there's nothing in Invisalign that suggest to you
23 that you can use an image of an aligner to assess aligner fit. Instead,
24 Invisalign is talking about assessing a patient's treatment in person.
25 There's nothing there about any analysis, any taking of images, any

1 known human analysis of images, and it provides no method to assess
2 separation from an image. And that's what's really important.

3 JUDGE ZECHER: Okay, thank you.

4 MS. JACOBSEN: And, Your Honors, I'd like to just briefly
5 touch on Salah because Salah is important as well. And this we
6 discussed at slide 22. So, Salah is about again assessing tooth
7 positions and how it assesses the tooth positions and the movement of
8 teeth is by comparing (inaudible 0:23:50) in 3-D scans of the teeth. I
9 would say that's the treatment.

10 And so what Salah is about is tracking the movement of teeth
11 and not any accelerated (inaudible 0:23:37). Salah doesn't suggest
12 remotely accessing aligner fit. It doesn't suggest taking images of
13 aligners in the service position. It doesn't suggest analyzing any
14 images of an aligner in a service position.

15 And indeed, if we turn to slide 23, actually Salah teaches away
16 from doing any kind of contour analysis on an image of an aligner in
17 the service position. This is what Salah says is, okay, there's one way
18 in which you can analyze an image is to get contour. This is just any
19 contour within the image. It picks up, you know, the contour of the
20 tooth, the contour of the cone, the contour of the gum, whatever it
21 might be. It's not looking at individual parts of an image.

22 And it says, well, where there's a little (inaudible 0:22:45)
23 contour we're going to get a low quality contour and that's going to be
24 unreliable. And so it recommends that you filter that out and you
25 don't use the unreliable contour in your analysis.

1 And so when it comes to aligners, they are by definition
2 intended to delete contours, to visually blend with the patient's teeth.
3 And so they are intended to create contours of low contrast and the
4 kind of thing that Salah says you should not rely on if you are doing
5 image analysis because it can result in a false positive.

6 The Salah is the reference that Petitioner has that suggests
7 doing any known human analysis of any image from the dental field,
8 and it teaches away from using its contour analysis with low contrast,
9 and that's what we would have with an aligner image.

10 So, Your Honors, perhaps we can transition to Maninis next
11 unless Your Honors have any questions on Kim, Invisalign, or Salah?

12 And here we can start with slide 39, which Petitioner objected
13 to the slide. And sorry (inaudible 0:21:03). And when it comes to
14 deep learning devices, and as Your Honors know, the claims require a
15 deep learning device trained by means of a learning base so as to
16 analyze an image and determine a tooth attribute value related to
17 separation for an analysis (inaudible 0:20:41). That's what the claim
18 requires.

19 And actually before we do this, perhaps we should just start
20 with Petitioner's combination, which is at slide 26 of Patent Owner's
21 deck. And there we have '248 Claim B double prime and there's the
22 claim limitation that I just discussed. And the way that Petitioner
23 maps the prior art to this claim (inaudible 0:20:05) is by saying a
24 person of ordinary skill in the art would have used a deep learning
25 device in Maninis, and you can see in that purple box there that says
26 that Petitioner says he used the deep learning architecture of Maninis.

1 And as we've shown in our papers, Petitioner referred to the
2 deep learning architecture in Maninis is talking about COB, which is
3 in the Figure 2, which is a particular neural network that was
4 developed by the author Maninis and that is the subject of the vast
5 majority of the paper, the sole subject of the vast majority of that
6 paper.

7 Petitioner then proposes that that deep learning device would be
8 trained according to Maninis and it cites Exhibit 1007 at page 3. That
9 is the only training that Petitioner advances. And then it says it's
10 going to train COB according to Maninis using an "appropriately
11 annotated training set."

12 And so what it says there is is images of teeth with an aligner in
13 the service position that have been labeled as with the teeth, the
14 aligners, and the gap between them. And that is what our expert
15 explains and is now perceived as what's called semantic contours.

16 And then according to Petitioner, you're going to use the COB
17 neural network trained according to Maninis on a database of images
18 labeled with semantic contours in order to protect the boundaries of
19 the teeth and the aligner and the regions defined within those
20 boundaries being labeled as teeth or aligner. So that's semantic
21 contours.

22 And so that's important to understand here that that is how the
23 Petition says the claims are satisfied by the prior art. And in the
24 following slides 27, 28, 29, and 30 we explain where that's the case.

25 JUDGE ZECHER: Ms. Jacobsen, this is Judge Zecher. I took
26 a note when Mr. Argenti was presenting and he said, I quote, "The

1 combination is not limited to Maninis' COB neural network." That's a
2 term that you coined and brought up in the Patent Owner Response.
3 Can you respond to that argument?

4 MS. JACOBSEN: So, Your Honor, Maninis discusses COB
5 throughout his paper, and that is a neural network, a singular neural
6 network that is shown in Figure 2 of Maninis. And so purely for
7 (inaudible 0:17:18) is what it discusses the whole way through its
8 paper.

9 And if you look in the Petition in the discussion of element 1B,
10 and we explain this in our papers, the discussion of element 1B in the
11 Petition, the only thing that Petitioner points to is disclosure in
12 Maninis relating to COB. So, whether you call it COB or COB neural
13 network to make clear it is a neural network because there's no dispute
14 that's what it is, it doesn't matter. That's all they relied on to satisfy
15 element 1B, and that's shown in our slides, as well as (inaudible
16 0:16:39) and in the Sur-reply.

17 JUDGE ZECHER: So I am looking at page 36 of the Petition
18 and I do see the reference to COB. I also see some references to the
19 CNN convolution neural networks "plural."

20 MS. JACOBSEN: Right. And, Your Honor, as we explain in
21 our papers those are part of the COB neural network. That's what
22 COB was built on. That is not a separate and distinct neural network
23 and I can provide you with the cite for that.

24 JUDGE ZECHER: Okay, thank you. I apologize. I believe
25 that I interrupted my colleague. Judge Szpondowski, did you have a
26 follow-up question?

1 JUDGE SZPONDOWSKI: I did. I'm looking at toward the
2 bottom of page 37 of the Petition where Petitioner relies on pages 11
3 and 12 of the discussion of the semantics, boundaries and semantic
4 segmentation. But I mean, it does seem that they're relying on more
5 than what you're asserting.

6 MS. JACOBSEN: Well, yes, Your Honor, but as in view of
7 what actually is the deep learning device they only point to COB.
8 And that's significant because they rely on COB as the deep learning
9 device and they say it's going to do an analysis, which is object
10 recognition or semantic segmentation. But COB is incapable of doing
11 this, and that's -- I think perhaps if I can take a step back and just
12 explain neural networks a little bit more then we can make that point
13 more clearly.

14 And if we can turn to slide 31? And so it's important to
15 understand that a deep learning device is not generic. It's not
16 interchangeable. Each deep learning device has its own structure
17 architecture, and that determines the inputs that it can receive and the
18 outputs that it can generate. And so you have to select a deep learning
19 device with your task in mind.

20 So if I wanted to detect colors using a deep learning device I
21 pick one that can do that. I can't use a deep learning device that just is
22 able to recognize black and white. And so if we turn to slide 32 then,
23 what's undisputed between the technical experts is that a deep learning
24 device is useless in and of itself. It has to be trained to do its
25 particular task. And the way that a deep learning device is trained is
26 by using a dataset, and that data set in this context assesses images

1 annotated with the thing that you want your deep learning device to be
2 able to learn to recognize.

3 And so that training process is essentially giving the deep
4 learning device a question, you know, what's in this image? And the
5 answer in this image are teeth so that it can learn to recognize the
6 teeth or the aligner. And then when it's presented with a new
7 question, a new image, it can output what it's been learned to
8 recognize.

9 But they have trained to do a specific task. They're not
10 interchangeable. You can't plug and play. And what's undisputed is
11 in 2017 no prior art -- there was no deep learning device that existed
12 that could be purchased off the shelf that could already detect dental
13 images or detect teeth or detect aligners.

14 Instead, what has to happen is you have to take a deep learning
15 architecture and then as the patent describes you would have to train it
16 in order to do the particular analysis.

17 JUDGE HOMERE: Counsel, this is Judge Homere. Isn't it true
18 that part of the underlying problem itself describes the type of deep
19 learning device that you use, for example, could be a conditional
20 (phonetic sp.) neural network as one of the tasks the (inaudible
21 0:12:37) that can be used for that specific purpose?

22 MS. JACOBSEN: Right. That is a deep learning device with
23 the correct architecture, but in order to use it in any of the claims it
24 would have to be trained on a learning base of images appropriately
25 annotated in order to do any of the analyses that are described in the
26 patent and claimed in the patent. And so you can't just select, you

1 know, any of those deep learning devices. This is not a generic
2 analysis here.

3 No. You actually have to take the deep learning device and
4 train it and create something new in order to use it in the methods in
5 this patent.

6 JUDGE HOMERE: That is correct. And one of the examples
7 of a suitable deep learning device is provided in the patent (inaudible
8 0:11:46) the conditional neural network. Is that correct?

9 MS. JACOBSEN: That is correct. You could --

10 JUDGE HOMERE: Is it not (inaudible 0:11:38) directed to
11 such a deep learning device you can actually part of the Maninis
12 reference is directed to using a conditional (inaudible 0:11:26) neural
13 network, which is a type, a suitable type described in the patent?

14 MS. JACOBSEN: Well, Your Honor, CNN is a class of neural
15 networks and architectures and Maninis is concerned with a particular
16 individual neural network in that class which is COB. And if you turn
17 to slide 39, it describes what COB is.

18 And so COB is a neural network that has been designed to take,
19 you know, designed to be able to be trained to recognize only generic
20 contours. And what that means is it can only detect boundaries within
21 an image. It can't detect what is in an image. So even though in slide
22 39 we see an outline of a sheep, the neural network does not know
23 what is in that image. COB cannot identify that this is a sheep or a
24 tooth or anything. Instead --

25 JUDGE HOMERE: Well, Counsel, my question is not
26 regarding COB. It's regarding CNN that is described in the patent as a

1 suitable example of a neural network that is able to perform the
2 (inaudible 0:10:07) and to perform the (inaudible 0:10:08).

3 MS. JACOBSEN: And, Your Honor, what I'm saying is that's a
4 class of neural network and members of that class can be trained to do
5 the analysis, but simply because that was a known class it doesn't
6 mean that Maninis can be trained or describes the way to train a
7 neural network to do what is in the patent.

8 JUDGE HOMERE: No, but are we talking about the same --
9 we're talking about the same neural network. We're talking about
10 CNN that is provided in the patent. So, I'm not exactly sure because I
11 know that the claim (inaudible 0:09:27) does not articulate or recite a
12 particular neural network. The patent doesn't recite how to train that
13 neural network so all that we have (inaudible (inaudible 0:09:15)
14 what kind of example of neural network can be trained for what's in
15 the patent.

16 And one example is the CNN, which is also described in
17 Maninis. So, I'm not exactly sure how you are trying to, you know,
18 parse this here.

19 MS. JACOBSEN: Well, Your Honor, because (inaudible
20 0:08:52) is only designed to be able to train on generic contours and it
21 is only able to output generic contours. It is mathematically incapable
22 of training on semantic contours as Petitioner proposes, and it cannot
23 output what Petitioner proposes it would do if used according to the
24 claim.

25 CNN is a broad category of neural networks. COB is a special
26 individual neural network that was designed by the author, Maninis,

1 but they say it's an advance on the technology and that they have
2 created to do a very specific thing. And as we've discussed, a neural
3 network can only do the task it has been trained to do. In Maninis the
4 training algorithm and the images on which it's trained are only
5 generic contours. It can't do anything else, and that's what we've
6 illustrated.

7 If we go to slide 31, what Maninis actually describes is the
8 COB neural network, which is a neural network designed to recognize
9 generic contours and output generic contours. That is the vast
10 majority of Maninis. In any sections of Maninis, what Maninis says is
11 actually you can use a different neural network altogether, the dilated
12 network or the PSP net neural network to start detect semantic
13 contours.

14 And then Maninis says, okay, well, you can snap the output of
15 those two neural networks together and you can use COB to improve
16 the outlines of the output from the other neural network. But Maninis
17 doesn't talk about how to train those other neural networks and it
18 doesn't talk about what learning base to use for those other neural
19 networks. And that's the problem.

20 It says when you go to Petitioner's combination, and that's 43 --

21 JUDGE ZECHER: Ms. Jacobsen, this is Judge Zecher. I think
22 we understand your argument. I think you're effectively saying that
23 Maninis' neural network can't be trained the way that your claimed
24 neural network is required and therefore Petitioner's proposed
25 combination is inoperable. We've heard a lot of arguments in the

1 other case as well, but I just wanted to flag this for you because you
2 only have a few minutes left --

3 MS. JACOBSEN: Yes.

4 JUDGE ZECHER: -- before you start eating into your sur-
5 rebuttal. So if there's other issues you want to address I think you
6 should move forward.

7 MS. JACOBSEN: Yes. Thank you, Your Honor. So just
8 touching on slide 64, which is discussing the dependent claims in the
9 '248 patent, this is a slide that was objected to by Petitioner, but the
10 basis was that the images are not in the Petition set, or I'm sorry, in the
11 Patent Owner's Response. That's incorrect. All of these images come
12 from Dr. Kusnoto's declaration.

13 And so I don't think that there's a problem that me talking about
14 this slide, and I don't need to do it with reference to any particular
15 images, but the point that I would like to make here is the patent
16 discloses two very different types of analysis, a detailed image
17 analysis and a global image analysis.

18 And in the detailed image analysis you have to select a deep
19 learning device that can be trained on tooth attribute values and then it
20 will output tooth attribute values. And in the global image analysis
21 you have to train on image attribute values and output image attribute
22 values. And the problem for Petitioner is that those two are
23 fundamentally different deep learning devices. There's no deep
24 learning device identified that could do both of those. Either you're
25 trained on tooth attribute values and output tooth attribute values or
26 you're trained on global attributes in your output global attributes.

1 But Petitioner relies on the exact same combination to do both
2 things. It's like, yeah, and that's just it doesn't work like that with
3 deep learning devices. That is a fundamental misunderstanding of
4 this technology here.

5 The other problem with Petitioner's case in Claims 7 and 14 is
6 that they say the tooth attribute value is the pixels that represent the
7 edge of the tooth or the pixels that represent the edge of the aligner,
8 and those are not. It's simply taking an image and saying this pixel is
9 an edge, this pixel is an edge, this pixel is an edge. It's not telling you
10 anything about the actual tooth itself. It's simply identifying where in
11 the image the tooth is, but that's not an attribute of the tooth. It's not
12 something like the number of the tooth, the condition of the tooth, or
13 anything like that, and that's all its combination says that it outputs.

14 And so with respect to Claims 7 and 14, even if you agree that
15 Maninis, you know, can somehow do the analysis that they say it can
16 do, they don't identify any tooth attribute value. All they say is you're
17 identifying the pixels that correspond to the edge with a deep learning
18 device, and that's not a tooth attribute value.

19 And then just a few moments with respect to the '945 patent, all
20 of the same arguments relate to that element 11 in the '945 because
21 that claim element, again, requires the taking of an image of an aligner
22 in the service position for the purposes of assessing aligner fit. And
23 Kim does not support that you can assess the lines of an image.
24 Invisalign does not seem suggest that you can assess aligner fit from
25 an image, and Salah does not suggest that you can assess aligner fit
26 from an image.

1 And so even taking all of the prior art together, there's nothing
2 that would have motivated a person of ordinary skill in the art to
3 capture these images and use them in the method that is claimed in
4 either the '945 or the '248.

5 Now, the additional reason, and this is on slide 77, why
6 Petitioner's ground fails with respect to the '945 is that there's really
7 no dispute that the claim requires use of image processing software so
8 as to identify not just contours, but whether the contour belongs to a
9 tooth or it belongs to the aligner. And that is necessary so as to be
10 able to measure the distance between them and compare the position
11 of those two outlines.

12 And Petitioner's only reference that it relies on with respect to
13 image analysis software is Salah and what Salah is talking about is
14 just simply identifying the contours. Salah doesn't teach a skilled
15 person how to identify what the contour belongs to, and that is a
16 necessary step for the '945 patent.

17 And Petitioner, sort of, generally waved his hands and said, oh,
18 there's lots of different image processing software discussed in Salah
19 and, you know, one of them would work, but the Petition doesn't
20 actually identify any image processing software in Salah that could
21 actually do what is in the '945.

22 There is no identified way of doing it in the Petition, and they
23 have to identify a specific image processing software that would be
24 able to do that task.

25 And so unless Your Honors have any questions on that, I'll save
26 the remainder of my time for rebuttal and sur-reply.

1 JUDGE SZPONDOWSKI: Okay, thank you.

2 So we will turn back to Petitioner's counsel for rebuttal. And I
3 have found that you have 29 minutes.

4 MR. ARGENTI: I do want to respond to a few things that we
5 heard from Patent Owner's counsel. At one point, Patent Owner
6 argued that there's no evidence in the record that a cellphone in 2017
7 could take a suitable picture of an aligner on teeth and perform the
8 claimed analysis without their special deep learning approach. My
9 response to that is what about the '945 patent where the claims do not
10 recite deep learning and yet are still performing the same analysis?

11 Beyond that, look at Kim itself which is talking in 2017 about
12 taking cellphone images and sending them for assessment of aligner
13 treatment. Look at Dr. Foroosh's analysis about the ability to perform
14 known image processing analysis on what they are saying are
15 representative images.

16 As to that particular issue counsel argues that Dr. Foroosh was
17 applying 2024 technology for that analysis. That's not true. He
18 explained that he was using the canny filter, which is disclosed in
19 Salah. It was a prior art approach and, in fact, as Dr. Foroosh
20 explained, it was one of the less sophisticated image processing
21 approaches even in 2017. It's simply not true that he was using 2024
22 technology to make his point.

23 Counsel also argued that the manual manipulation is an
24 essential aspect of assessing aligner fit as described in the Invisalign
25 guide. The problem there is that they're arguing that for that reason
26 you wouldn't have done this remotely. You can't do the assessment,

1 the manual assessment remotely. But with (inaudible 0:12:23) by
2 their own argument Kim is addressing tracking tooth movement,
3 which is one aspect of aligner treatment, but it's not tracking aligner
4 fit. That's what they argue. So, even they themselves characterized
5 Kim as splitting up part of aligner treatment, breaking it out, doing it
6 remotely. They have no reason why you wouldn't do that for the
7 spatial assessment that the Invisalign guide plainly discloses.

8 They argue that that's not enough to assess aligner fit.
9 Invisalign says that if you have a gap greater than 1 millimeter that's
10 an indication of a poor fit. There is no reason that can't be performed
11 remotely, and they haven't identified one.

12 I believe --

13 JUDGE ZECHER: Mr. Argenti, sorry to interrupt. I think
14 somebody's got an open mic on here so I just want to make sure if
15 you're not speaking to mute it. Thank you.

16 MS. JACOBSEN: My apologies. That was me.

17 MR. ARGENTI: I believe at one point counsel also argued that
18 we haven't shown that the distance measurement of 1 millimeter or
19 any other distance between the aligner and teeth couldn't have been
20 performed with the technology that we're citing. I would direct Your
21 Honors to paragraph 113 of Dr. Foroosh's first declaration in Exhibit
22 1002 for example the '248 case where he does address that, how that
23 would be accomplished.

24 He explains that measurements like that in the context of image
25 processing can be done on a pixel-by-pixel basis so we are talking
26 much smaller than 1 millimeter. So when you look at those

1 representative images that they themselves introduced into the case
2 through Dr. Kusnoto's testimony, and Dr. Foroosh said, "No problem.
3 I can show you I can use the canny filter to identify the edges in these
4 images." He also has the testimony explaining how he would then use
5 those images and those identified edges to calculate the distance
6 consistent with the teachings of the Invisalign guide.

7 As to Maninis, we've talked about it at great length. I don't
8 want to belabor the point, but I will again reiterate that we've relied on
9 the full teachings of the Maninis paper which describes using its
10 improved boundary detection technique to accomplish both contour
11 detection and object classification. There's really no dispute that
12 Maninis describes that.

13 Patent Owner has not pointed to anything in their claim scope
14 in the '248 patent that would preclude using Maninis' full scope of its
15 techniques that we've cited to satisfy the claims.

16 As to their argument that Maninis doesn't talk about what
17 learning base to use for its other CNN besides the other CNN, I
18 believe she was referring to the CNN discussed in Section 6, the high
19 level analysis of Maninis, I already mentioned this during my first
20 portion of the discussion that we cited Maninis' disclosures of using
21 the same learning base, the same databases in both the low level and
22 high level analysis, for example, that's discussed at pages 5 and 6 as
23 well as 11 of Maninis cited in our papers where Maninis discusses
24 using both the Pascal context and the VOC12 segmentation databases
25 for high and low level applications. They are misrepresenting both
26 the reference as well as our arguments in this case.

1 Now, we also heard Patent Owner rely heavily on the so-called
2 standard of care in 2017 citing Dr. Kusnoto's testimony. Patent
3 Owner argues that alignment fit was assessed in-person and they say
4 that digital dental photographs were taken by trained dentists with
5 expensive cameras. They say that their claimed invention was not the
6 standard of care.

7 What you're not hearing from them and where that fits in the
8 obviousness, because it doesn't. They're essentially trying to say that
9 their claims aren't obvious because that's not how it was done, but
10 that's conflates obviousness with anticipation. Their standard of care
11 argument doesn't respond to the actual teachings that the prior art
12 references at issue. And referring to their standard care argument as
13 the state-of-the-art can't erase the prior art, which is also state-of-the-
14 art.

15 It doesn't fit in proper gram (phonetic sp.) analysis considering
16 the scope and content of the prior art and the differences, if any,
17 between those teachings in the scope of the claims, let alone address
18 what would have been obvious to a POSA.

19 A POSA that remember is a trained computer scientist. The
20 prior art teaches remote analysis of cellphone-captured dental images.
21 The prior art teaches assessing aligner fit based on the separation
22 between an aligner and the teeth. The prior art teaches ways of
23 detecting edges of teeth and aligners in the dental image. Our reasons
24 to combine those well-known teachings are largely undisputed as is
25 the reasonable expectation of success.

1 Whether remote assessment of aligner fit was a widely adopted
2 practice in dental offices in 2017 is of no moment and attacking the
3 references individually does not rebut our obviousness case.

4 Thank you.

5 MS. JACOBSEN: Your Honor, I cannot hear you. May I plan
6 to start?

7 JUDGE SZPONDOWSKI: Got it, yes. I'm sorry. I am
8 unmuted now. Thank you, Mr. Argenti.

9 Ms. Jacobsen, you may start whenever you're ready. You have
10 15 minutes.

11 MS. JACOBSEN: Thank you, Your Honor. I'll just address a
12 couple of points and that is that Petitioner tried to suggest that the
13 state-of-the-art is irrelevant to the obviousness analysis. That's plainly
14 incorrect. That case law that we cited to it says that it is important to
15 (inaudible 0:06:10) to avoid claim bias.

16 It's also important in this case because what Petitioner is
17 proposing is that a skilled person would do away with any -- with an
18 important aspect of assessing aligner fit, but it would separate out the
19 visual analysis from the manual manipulation. And even when there
20 is no teaching anywhere in the prior art that suggests that simply by
21 looking at an image of an aligner on a patient's teeth you can assess
22 how that aligner is fitting, and that's what the case -- the claims
23 require here.

24 And so there's nothing in Petitioner's references that would
25 have motivated a skilled person to make that change to the standard
26 operation because Kim does not suggest it can be done. Invisalign

1 doesn't suggest it can be done and neither does Salah. And those are
2 the three references that are directed to dental professionals and that
3 teach only about looking at tooth position and not anything about how
4 you can remotely assess aligner fit.

5 With respect to Dr. Foroosh's (inaudible 0:04:49) the Petitioner
6 said that that was not using 2024 technology. Well, that was using
7 images that are not captured on a cellphone but instead high quality
8 images, and as Dr. Foroosh admitted, he could not analyze them in the
9 same way. He had to make changes even to the technology that he
10 was using and that technology is not what is recited in the '248 patent.

11 With respect to the full teachings of Maninis, essentially what
12 Petitioner is now saying is that applying the full teaching of Maninis
13 means that you would use two different neural networks in order to
14 carry out this claim. You would use the Maninis COB neural
15 network, which is undisputed, that can only detect generic contours,
16 and you would use that in combination as Maninis did with a different
17 neural network that's not described in any detail in Maninis to achieve
18 the analysis that he is discussing.

19 The problem for Petitioner with advancing their case is, one, it's
20 not what was in the Petition. The Petition consistently said that the
21 deep learning device they would be using would be the COB.
22 (Inaudible 0:03:17) look at neural networks cannot be trained in the
23 same way using the same learning base to perform any kind of
24 analysis.

25 And so if Petitioner wanted to rely on two different neural
26 networks to satisfy the deep learning device limitation, they would

1 have had to have identified two different learning databases. They
2 only identify one. They would have had to identify two different
3 training algorithms. They only identify one.

4 And they would have had to explain how we would combine
5 the two outputs of those different neural networks in order to satisfy
6 the claim elements. And Petitioner has never done that anywhere in
7 its papers and that's because in truth what Petitioner claim was was
8 that you would use Maninis' COB. You would train it according to
9 Maninis on images labeled with semantic contours to detect semantic
10 contours, but as we pointed out in our reply, oh, I'm sorry, in Patent
11 Owner's Response and then our Sur-reply, it is now undisputed that it
12 doesn't work in that way. And if the deep learning device -- the COB
13 is non-functioning there is no motivation to use something that is
14 nonfunctional and no reasonable expectation of success with using
15 COB as proposed by Petitioner.

16 If on the other hand now Petitioner is trying to say, well,
17 actually it's really relying on those neural networks that actually
18 produce the semantic contours and it doesn't matter that COB doesn't
19 work at all in its combination, then it has no motivation. Everything
20 that it pointed to for the motivation, everything that it was excited
21 about in Maninis is specific to Maninis' COB neural network. That
22 was the innovation that it produced, the speed, the flexibility, the
23 modular nature of it. That is all specific to COB and COB cannot be
24 trained in the way that Petitioner says to do anything.

1 So, if COB is there it's not doing anything in that combination.
2 It can't contribute anything and so it has no motivation to use the other
3 neural networks.

4 And so unless Your Honors have any other questions, that
5 completes our presentation.

6 JUDGE SZPONDOWSKI: Great, thank you. Any further
7 questions from Judge Homere or Judge Zecher?

8 JUDGE ZECHER: Nothing for me.

9 JUDGE SZPONDOWSKI: Okay. This concludes our hearing
10 in IPR2024-00052 and IPR2024-00110. If the parties could stay on
11 the line in case the court reporter has any questions, we would
12 appreciate. So, thank you to both parties, and we are adjourned.

13 (Whereupon, the proceedings at 3:16 p.m. were concluded.)

IPR2024-00052 (Patent 11,049,248 B2)

IPR2024-00110 (Patent 11,109,945 B2)

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