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Source:	Charite
Title:	Att.7 - Presentation - Impact of AI on gaze patterns of dentists: A randomized controlled trial
Purpose:	Discussion

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Abstract: This PPT contains a presentation on the Impact of AI on gaze patterns of dentists: A randomized controlled trial.

AI for Health
ITU-WHO Focus Group

Impact of AI on gaze patterns of dentists: A randomized controlled trial

ITU-WHO, TG dental Symposium
Meeting P, 19 Sep. 2022

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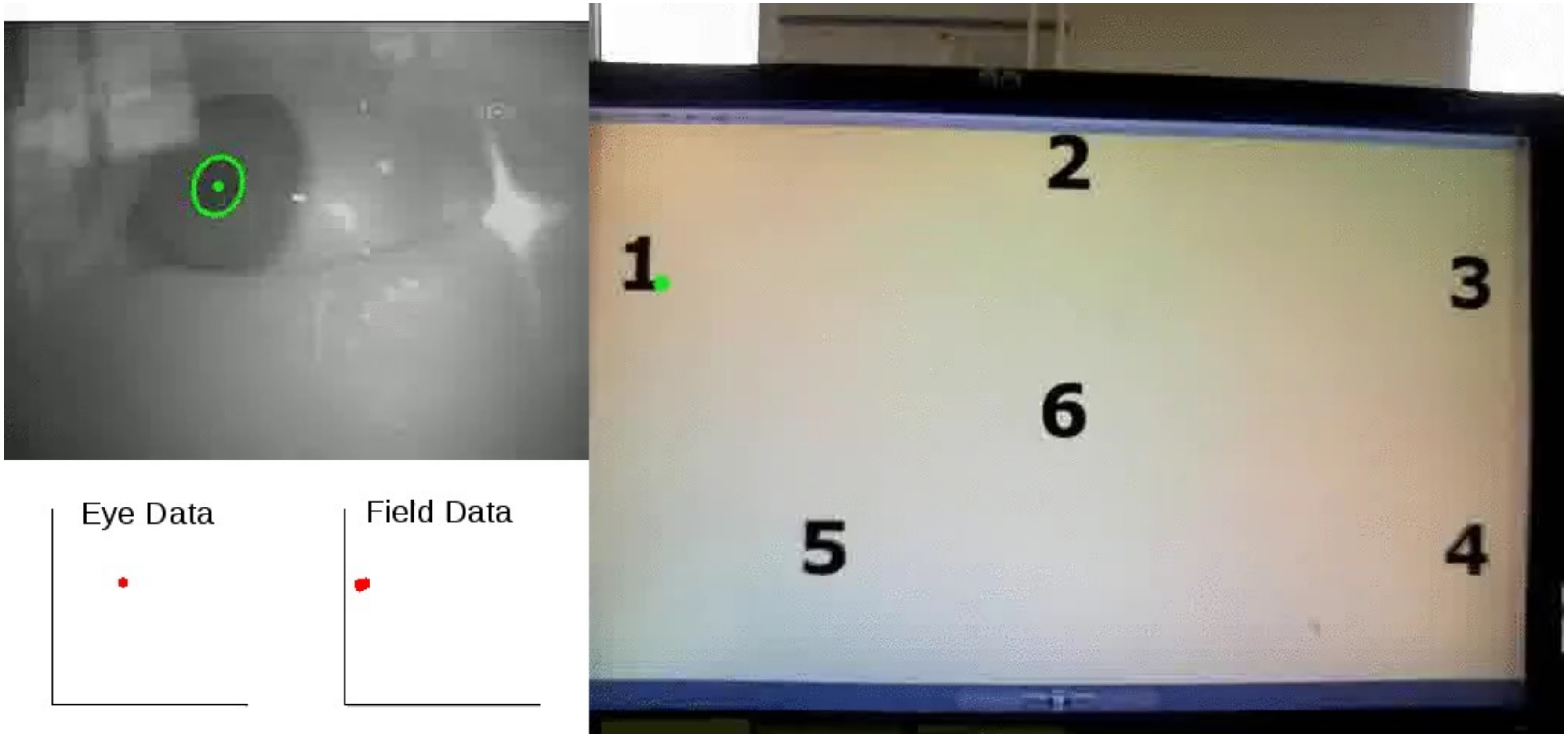
DISCLOSURE OF CONFLICT OF INTEREST

Falk Schwendicke and Joachim Krois are co-founders of an AI start-up called dentalXr.ai

WHAT IS EYE TRACKING ?

WHAT REALLY IS EYE TRACKING?


Eye Data
Field Data
2
1
3
6
5
4

TERMINOLOGY

SCAN PATH

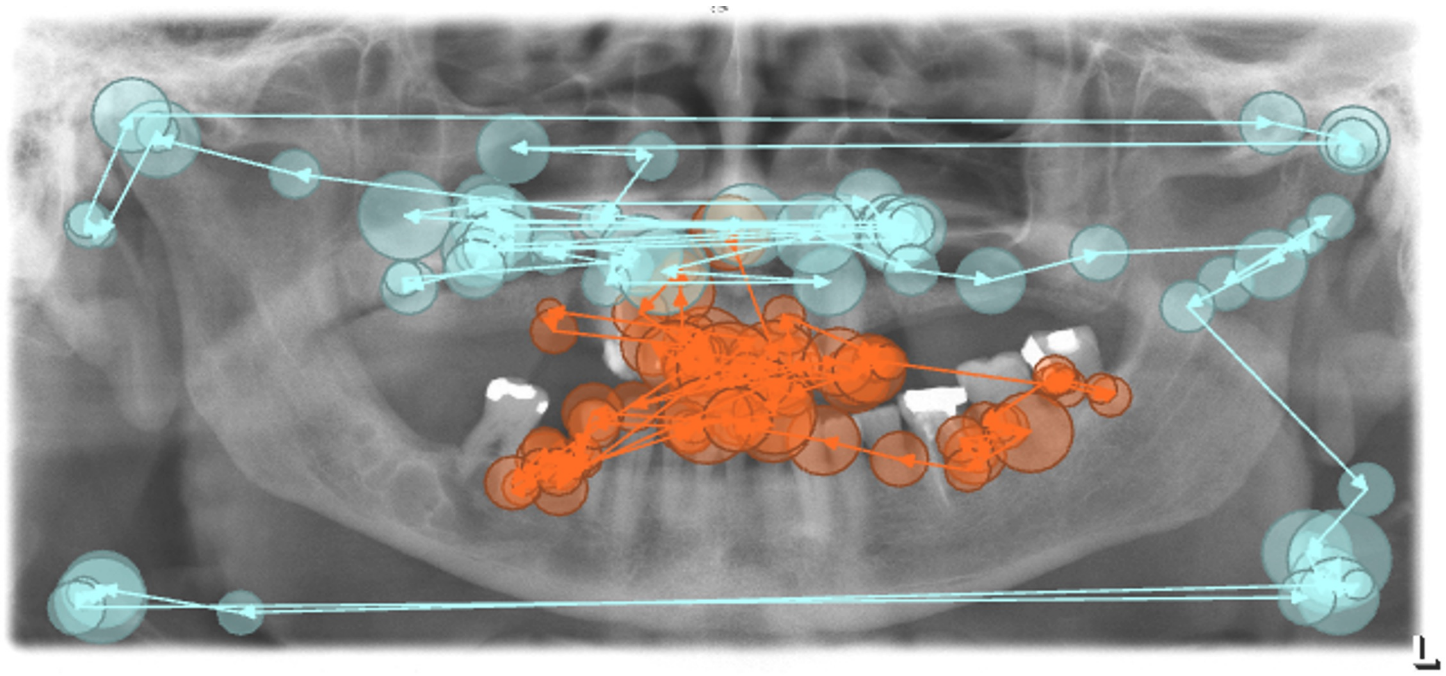
The path followed by your eyes when viewing a field for a given task.

GAZE PATTERN

The characteristic feature of your scan path.

Compare and classify gaze patterns for behavior recognition.

Experts vs. Novices



METHODS

- Study design: Randomized controlled trial
- Participants: 22 dentists
- Task: Diagnose primary caries in bitewing radiographs of the permanent dentition.
- Trial arm #1: Dentists only
- Trial arm #2: Dentists in conjunction with an AI tool
- During this task, the dentists’ eye movements were tracked.
- Our aim was to characterize the gaze patterns in the study.

RESULTS

- Gender: 16 male and 6 female dentists
- Age: 38 years (mean), 27-60 years (range)
- FIXATION

  Focus your eyes on a certain area

  - Time to 1st fixation
  - Fixation count
  - Fixation duration

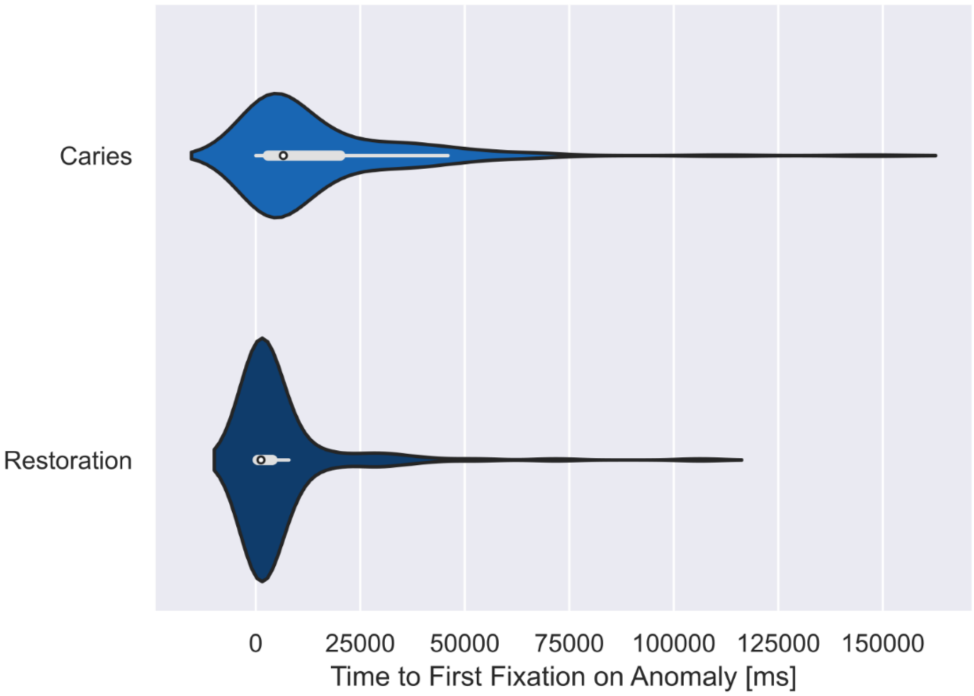
RESULTS

	Dentists only	Dentists + AI
Number of data instances used	172	177
Teeth w/o any features	365	341
Teeth with caries	364	378
Teeth with restorations	481	523

RESULTS

Time to First Fixation, milliseconds

Dentists only



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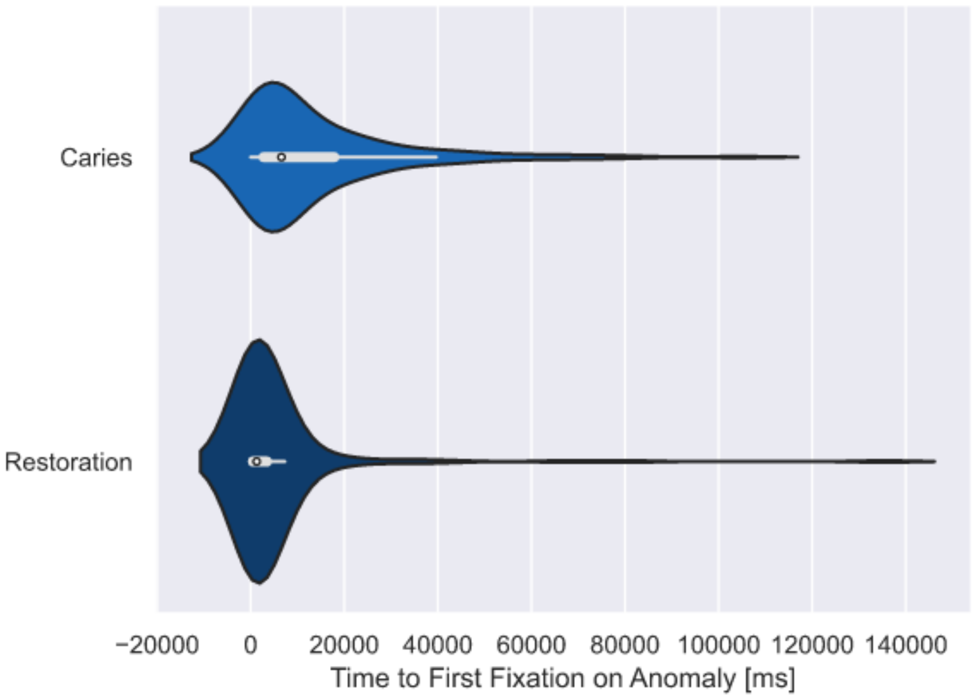
Dentists + AI



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Dentists only vs Dentists + AI

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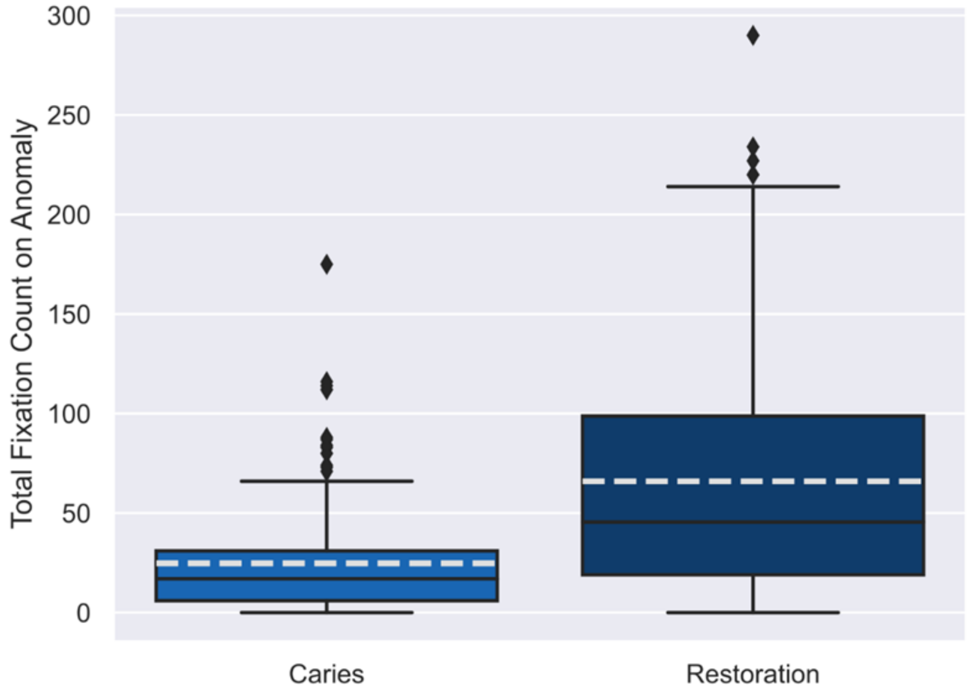
RESULTS

Fixation Count

Dentists only



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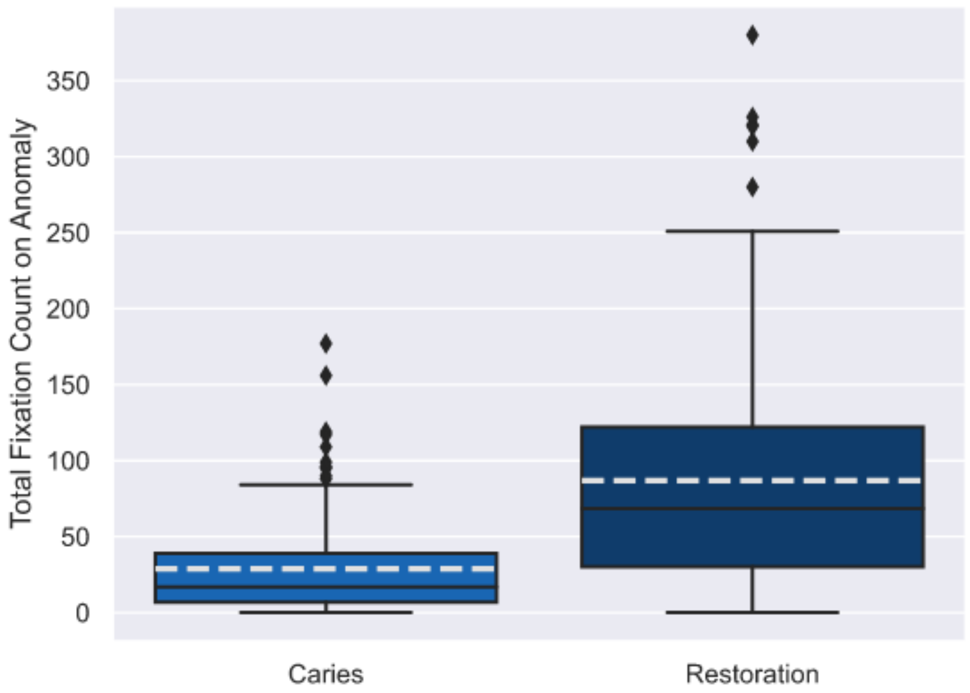
Dentists + AI



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Dentists only vs Dentists + AI

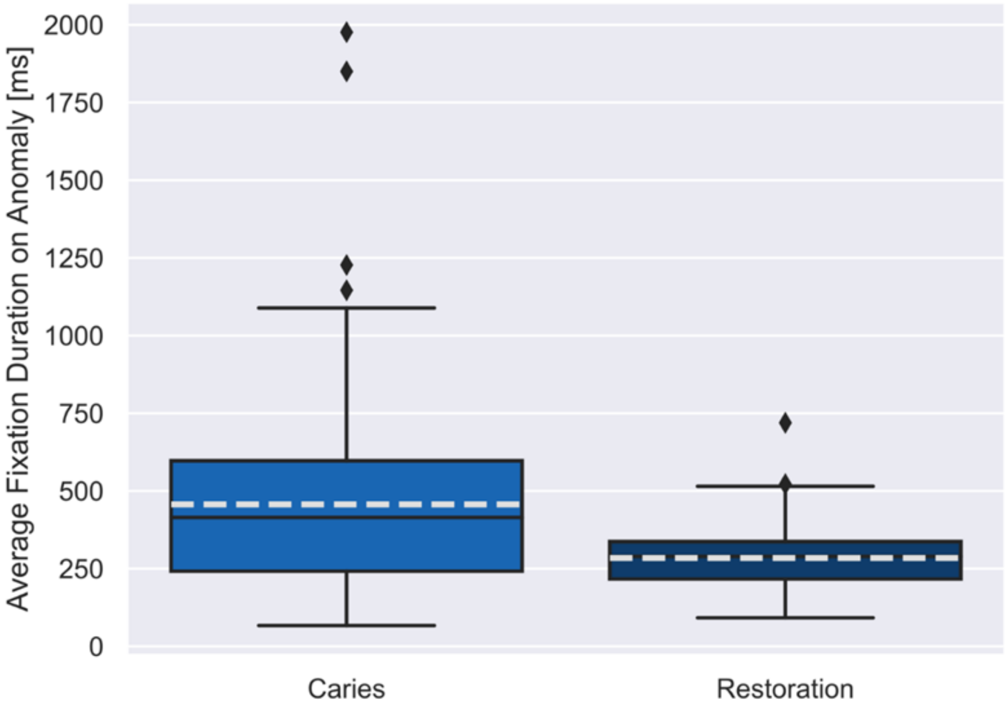
-

0.04

RESULTS

Average Fixation Duration, milliseconds

Dentists only



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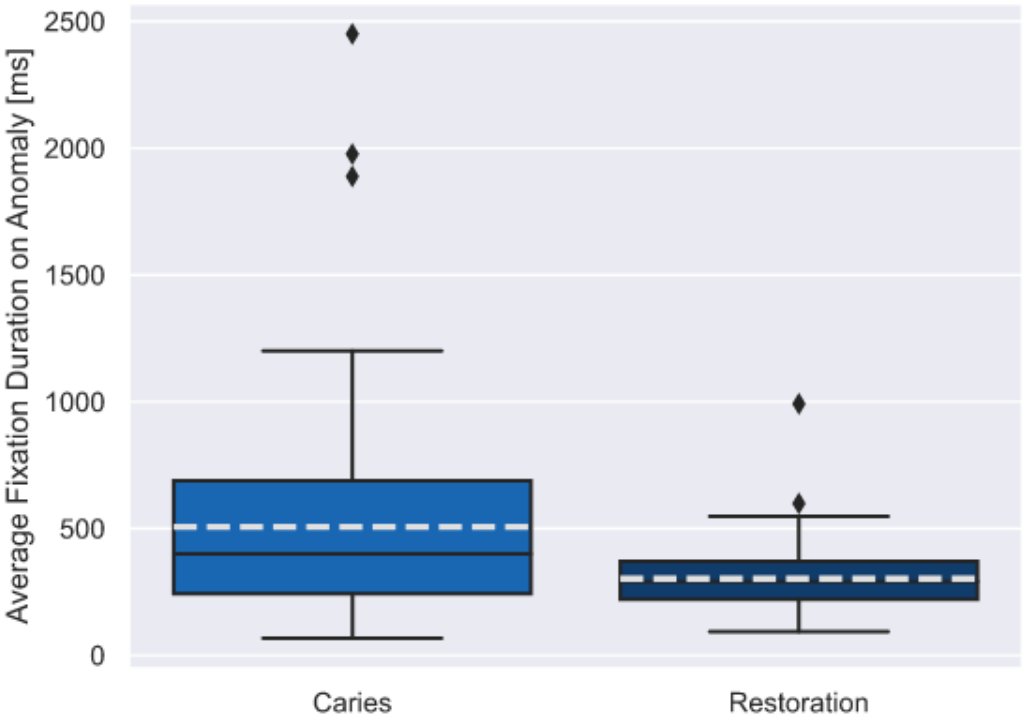
Dentists + AI



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Dentists only vs Dentists + AI

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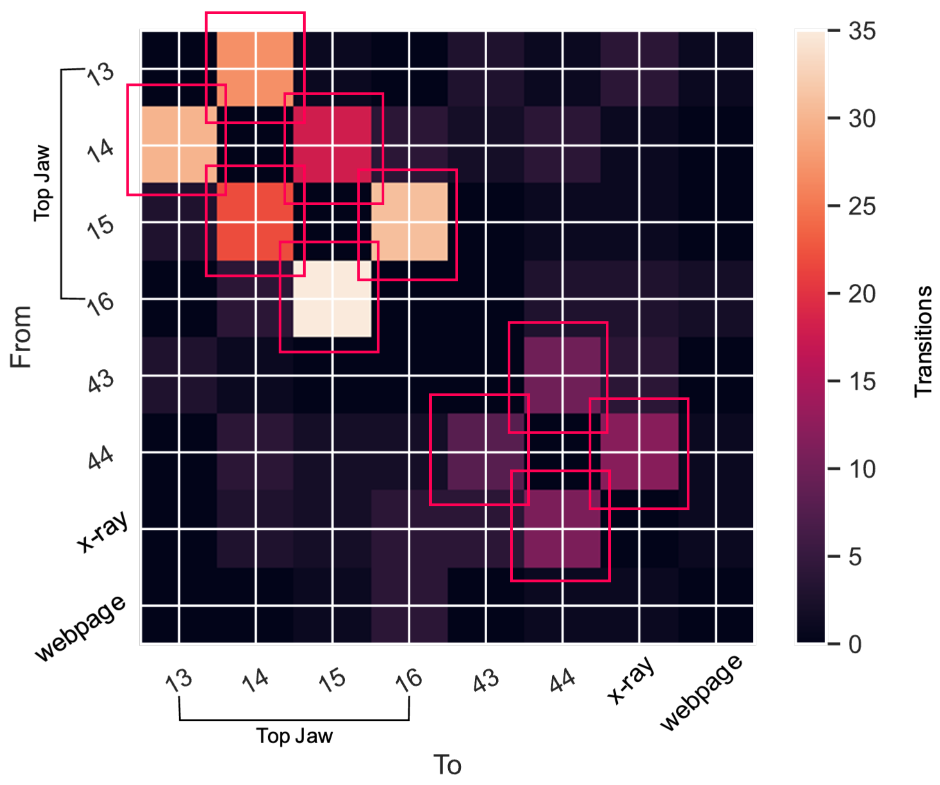
-

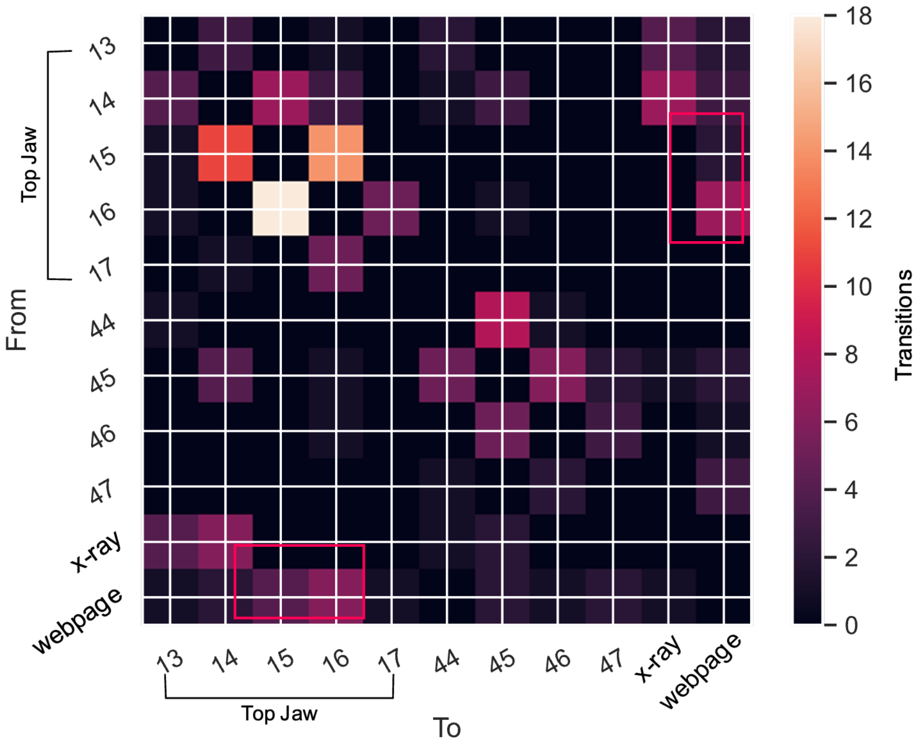
RESULTS

Gaze transitions

Dentists only



Dentists + AI



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Questions ?

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SUPPLEMENTARY SLIDES

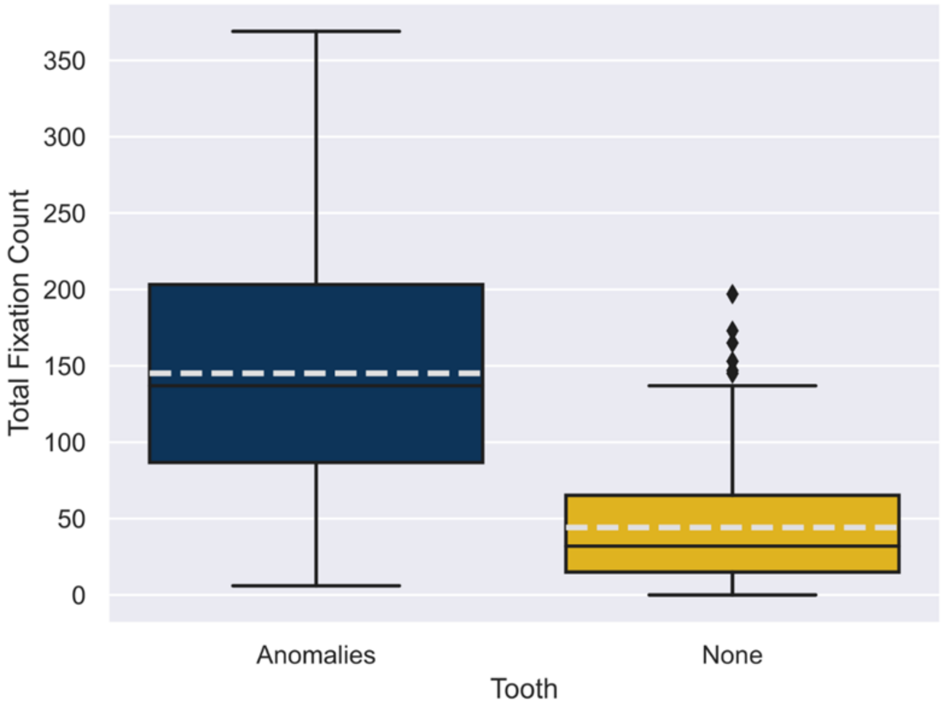
RESULTS

		Dentists only		**Dentists + AI**		**p-value of Dentists only vs Dentists + AI**
Time to First Fixation, median (IQR), milliseconds						
	Tooth with caries	6598 (2926, 20232)	**<0.001**	6586 (2830, 17826)	**<0.001**	**-**
	Tooth with restorations	1259 (485, 3987)		1283 (508, 3410)		**-**

RESULTS

Fixation Count

Dentists only



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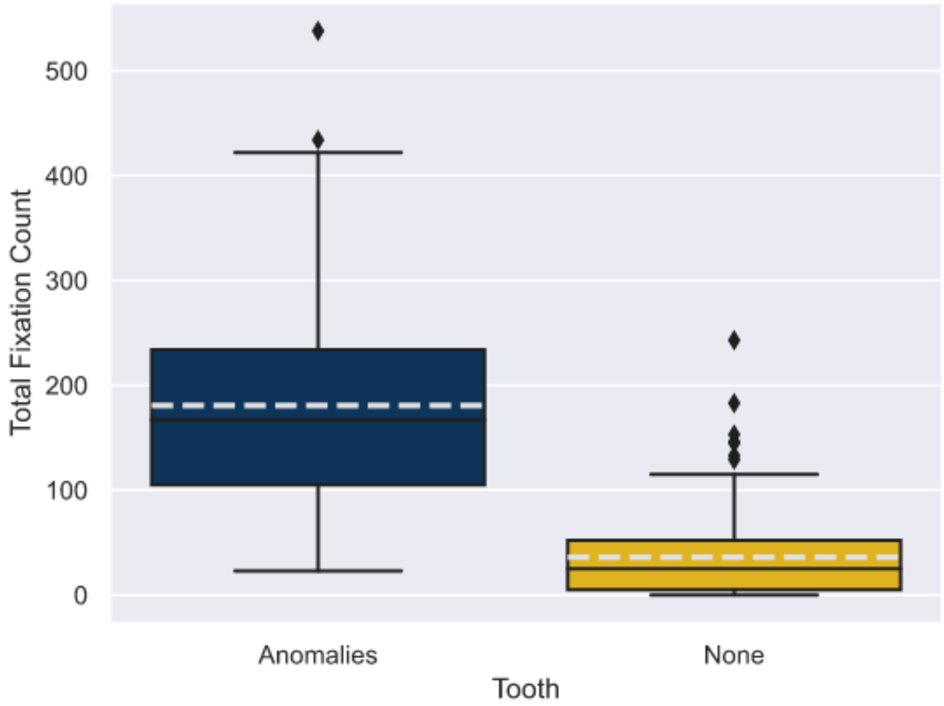
Dentists + AI



<0.001

Dentists only vs
Dentists + AI

0.002

-

RESULTS

		Dentists only		Dentists + AI		p-value of Dentists only vs Dentists + AI
Total Fixation Count, median (IQR)	Teeth with any features	137 (87, 203)	**<0.001**	167 (105, 234)	**<0.001**	**0.002**
	Teeth w/o any features	32 (15, 65)		25 (5, 52)		
	Tooth with caries	17 (6, 31)	**<0.001**	17 (7, 39)	**<0.001**	
	Tooth with restorations	46 (19, 99)		69 (30, 122)		**0.04**

RESULTS

		Dentists only		**Dentists + AI**	**p-value of Dentists only vs Dentists + AI**
Average Fixation Duration, median (IQR), milliseconds	Teeth with any features	337 (249, 414)	0.52	347 (263, 421)	**0.04**
	Teeth w/o any features	307 (230, 367)		293 (233, 367)	
	Tooth with caries	415 (242, 597)	**0.002**	401 (242, 689)	**<0.001**
	Tooth with restorations	289 (216, 337)		292 (221, 370)	

RESULTS

Results stratified by caries level

- The longest time to 1st fixation was for teeth with a caries level E1. This may be because they are incipient lesions and hence most difficult to spot.
- The highest fixations were on teeth with D2 level of caries and lowest on E1 level of caries. The dentists were also required to note the caries level for each lesion that they identified. One could hypothesize that the smaller lesions needed more fixations for a diagnosis, and this is reflected in time to 1st fixation and average fixation duration.

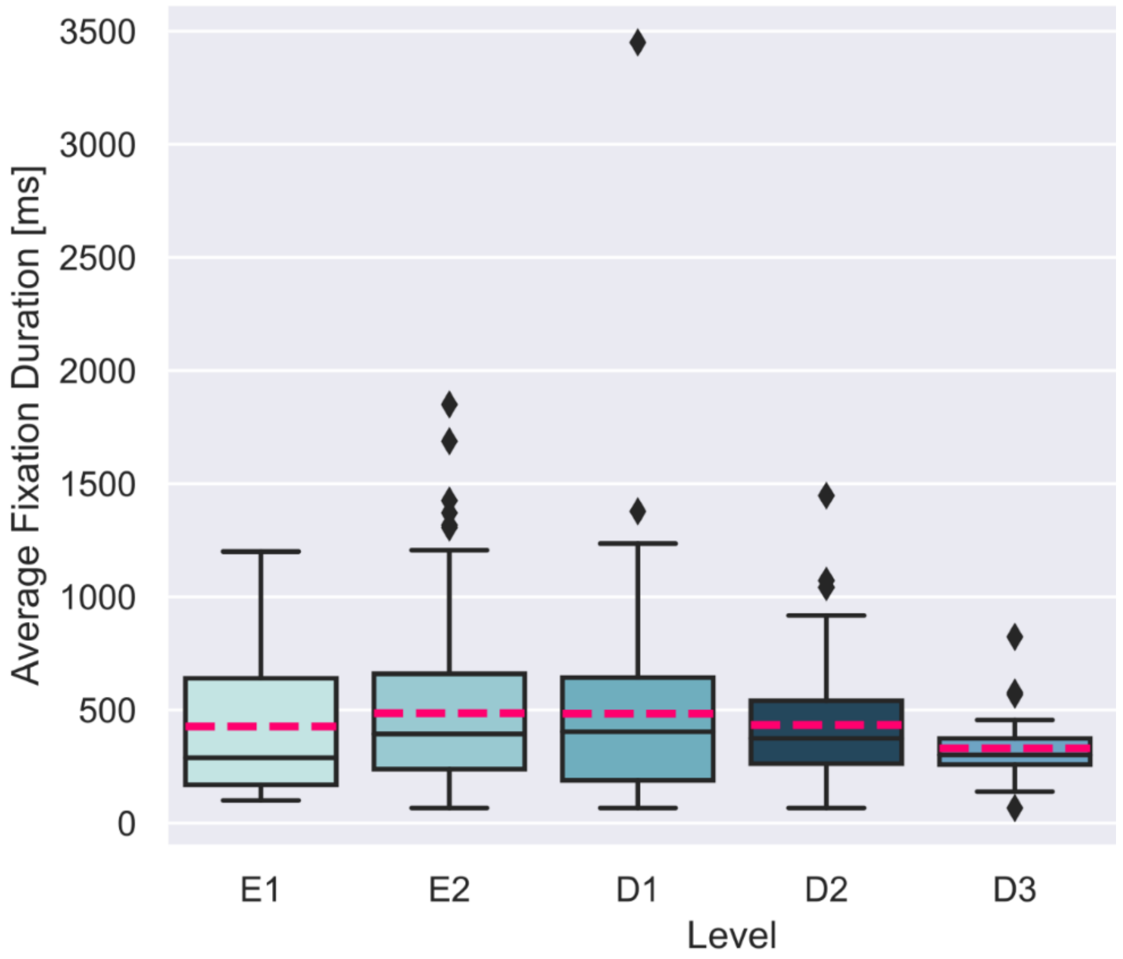
RESULTS

Results stratified by caries level

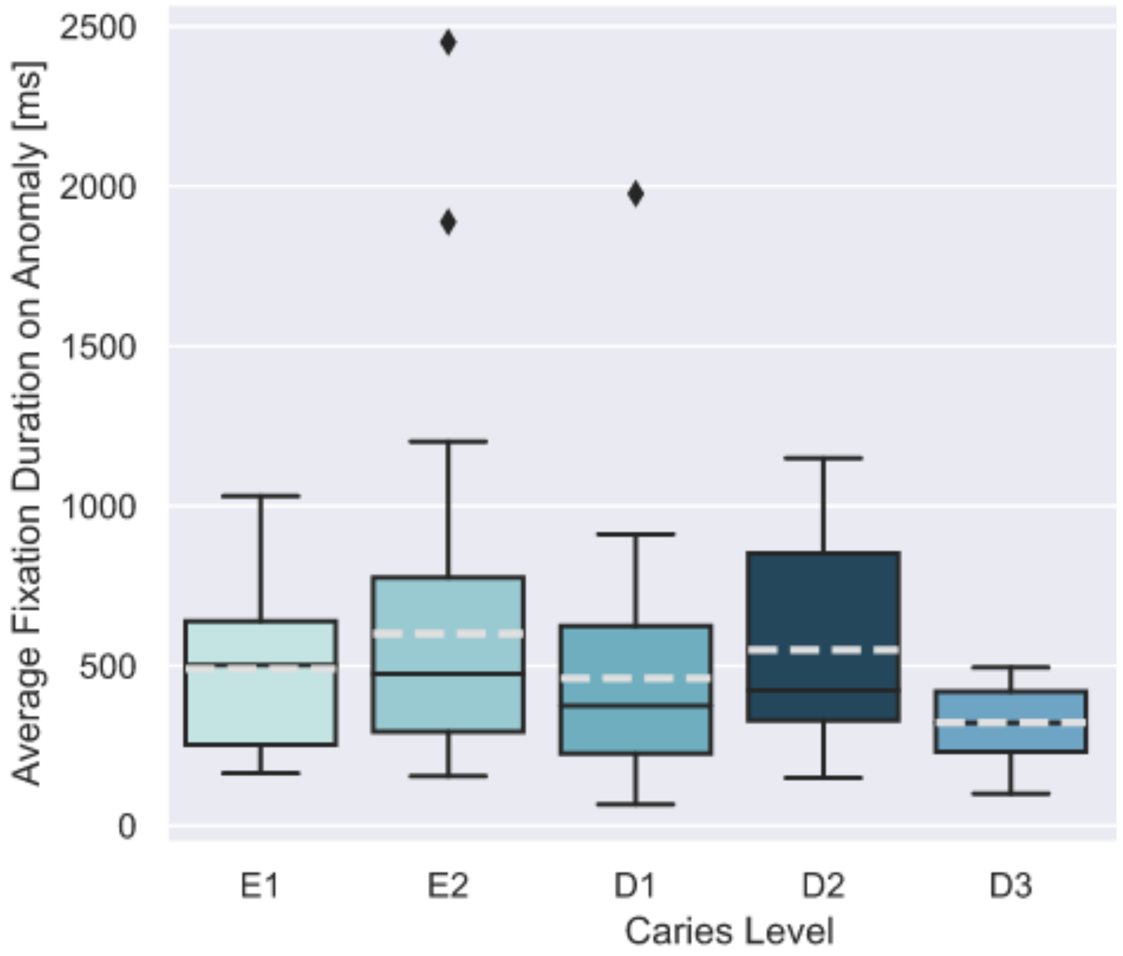
- Average fixation durations were highest for E1 and lowest for D3. Since D3 are the largest lesions and hence lesser time is required to diagnose them.

Average Fixation Duration, milliseconds

Dentists only



Dentists + AI



Applications of gaze pattern analysis

- Automated expertise recognition
- How to create more seamless user-AI interactions
- Has use in augmented or virtual reality

Next steps in our project

- Stratify the dentists by years of experience and see if patterns differ between them.
- Use ‘fixation frequency’ since viewing times are variable.

Quality checks on scan path data

- Gaze signal > 0.60
- Scrolling behavior: Erroneous data points were excluded

EYE TRACKING TOOL

- The remote eye tracker used was the *SmartEye Aurora* running at 60Hz and positioned under a monitor (1920 x 1080px).
- Participants were unconstrained and positioned approximately 70cm from the system.
- An initial n-point calibration and validation were performed. Gaze data was collected the whole duration of the experiment.
- Gaze data was then pre-processed using the *iMotions* software (version 8.2.22899.4).
- Event detection was the *iMotions* implementation of the I-VT algorithm, with a minimum fixation duration of 60ms and a velocity threshold of 30deg/s.
- The current analysis used the fixations reported from the software, which are interpolated between the left and the right eye.
- We interpret fixations as the areas of attentional focus related to the stimuli presented on the screen.