

Title of the Talk: Gazing into the Future: Exploring Recent Trends in Eye Tracking and their Impact on Extended Reality and Privacy

Abstract: Recent developments in computer graphics, hardware technology, and machine learning enable pervasive eye tracking and its applications – e.g., gaze-based interaction, foveated rendering, and assistive technologies in stationary and highly mobile settings. Based on the viewed stimulus, it is possible to infer plenty of different information by using human eye movements and visual scanning patterns, for instance, activities, health status, or expertise, to count a few. Such inferences include privacy risks that have not been studied extensively. This talk will introduce the basics of eye tracking, its applications, including those in extended reality, and its use in different domains. Then, possible privacy risks, as well as existing and potential solutions, will be discussed. Lastly, reflections from user privacy concerns toward such setups will be examined.

Date: Friday, March 8, 2024

Time: 11:00 A.M – 12:00 Noon

Location: Via Zoom / Virtual

Number Of Participants: 81

Biography: Efe Bozkir is a postdoctoral researcher at the Technical University of Munich and the University of Tübingen, Germany. He obtained his Ph.D. in Computer Science in 2022 from the University of Tübingen, where he worked at the Chair for Human-Computer Interaction. Following his Ph.D., he conducted research on usable privacy and security at CyLab Security and Privacy Institute of Carnegie Mellon University between August 2022 and January 2023 as a visiting postdoctoral researcher, and he was supported by the Cluster of Excellence – Machine Learning for Science. Before those, he received his M.Sc. and B.Sc. degrees from the Technical University of Munich and Istanbul Technical University in 2016 and 2014, respectively. His research revolves around eye tracking, human-computer interaction, extended reality, machine learning, and privacy, focusing on computational techniques and human factors.

Zoom Meeting: <https://ullafayette.zoom.us/j/91708500879>

Objective of the talk: The objective of this talk is to explore the recent trends in Eye tracking and its applications, including in extended reality and its use in various domains.

Summary: Today's seminar is conducted by Dr. Efe Bozkir about the recent developments in eye tracking and its Impact on Extended Reality and Privacy. In this seminar, he explained various contents focusing on Basics of eye tracking-which tells us what kind of data do we have to access to and eye movement detection, Possibilities including the ones in XR-mainly for authentication and human-wellbeing, Eye tracking in security and privacy applications, privacy-preserving eye tracking and understanding privacy concerns in eye-tracked augmented reality. He also explained about Differential privacy for eye tracking. He explained the FPA extensions with chunk-based CFPA and Difference-and chunk based FPA(DCFPA). Then Dr. Efe explained about privacy protection through laws. Privacy laws require usability which includes clear and plain language and should be concise and easily accessible.

Outcome of the talk: This talk provided possible privacy risks, as well as existing and potential solutions regarding eye tracking and its applications.

Glimpses of the talk:

The screenshot shows a Zoom meeting window. The main content is a slide from Technische Universität München (TUM) titled "Visual attention and cognition in VR classrooms". The slide includes a table of velocity and duration thresholds for different eye-tracking events, and several box plots comparing metrics like Mean Fixation Duration (ms) and Mean Saccade Amplitude (deg/s) across different conditions (Stationary HMD, Fixation, Saccade, Sitting positions, and Graphical representations).

Event	Velocity thresholds	Duration thresholds
Stationary HMD	$v_{\text{fix}} < 7^\circ/s$	-
Fixation	$v_{\text{head}} < 7^\circ/s$ & $v_{\text{gaze}} < 30^\circ/s$	$100\text{ms} < \Delta < 500\text{ms}$
Saccade	$v_{\text{gaze}} > 60^\circ/s$	$30\text{ms} < \Delta < 80\text{ms}$

Participants visible in the meeting include Md Istiak Jaman Ami, Monica Lanclos, and Sh Shafeie.

The screenshot shows a Zoom meeting window. The main content is a slide from Technische Universität München (TUM) titled "Visual attention and cognition in VR classrooms". The slide lists the motivation, experiments, and key challenges of the study.

- Motivation:** Understand visual attention and cognitive processes of students in different classroom manipulations; sitting positions, avatar visualization styles, and hand-raising behaviors (20%, 35%, 65%, 80%) of virtual peers (2x2x4).
- Experiments with students** ($M_{age} = 11.5$, $N = 381$, between-subjects design)
- Fixations, saccades, pupil diameters, object-of-interest information.**
- Key challenges:** noisy real-world data (perhaps due to age), small virtual objects.

The slide also includes images of "Front and back conditions" and "Realistic and cartoon avatars".

Participants visible in the meeting include Shovon Paul, Ali Mohammadjafari, and Jesse Marin.



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UNIVERSITÄT TUBINGEN Gazing into the Future: Exploring Recent Trends in Eye Tracking and their Impact on Extended Reality and Privacy Technische Universität München

Visual attention and cognition in VR classrooms

- **Motivation:** Understand visual attention and cognitive processes of students in different classroom manipulations; sitting positions, avatar visualization styles, and hand-raising behaviors (20%, 35%, 65%, 80%) of virtual peers (2x2x4).
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

Front and back conditions Realistic and cartoon avatars

Efe Bozkir

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Pramod Gobburi Pramod Gobburi	Alaaddin Göktuğ Ayar Alaaddin Göktuğ Ayar	Mohsen Riahi Alam Mohsen Riahi Alam	Karen Hoyt Karen Hoyt	Arman Riaz Ochi Arman Riaz Ochi
Mahshid Benchari Mahshid Benchari	 Md. Shafiqur Raihan Shafi	Thirumala Maheswara Red... Thirumala Maheswara Reddy	Subigya Gautam (c00540115) Subigya Gautam (c00540115)	 Yitoshee Rahman
Shreeya Pandey Shreeya Pandey	Jesse Marin Jesse Marin	Mohammad Masudur Rah... Mohammad Masudur Rahman	Shelby Williams Shelby Williams	 Ali Mohammadjafari

Lower hand

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Zoom Meeting Interface:

- Participants: 59
- Grid of participants:
 - M. Hassan Najafi
 - Efe Bozkir
 - Vulavala Venkata NagaSaiDatha Pava...
 - yaldagheisi
 - rabil noor
 - Bharath Ravuri
 - Newsha
 - Adarsh V
 - Reeti Pradhananga
 - Bryce Turney
 - Niloofer H.K
 - Shihabuz Zaman
 - Srikanth Parsi
 - Ashim Sharma
 - Pramod Gobburi
- Buttons: Lower hand, Leave
- System tray: 78°F Mostly cloudy, 6:16 PM 3/5/2024

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Zoom Meeting Interface:

- Participants: 59
- Grid of participants (all with hand icons):
 - Krishna Rauniyar
 - Thirumala Maheswara Red...
 - Ashok Polavarapu (C00539...
 - alex durio
 - Sai Krishna Yalamanchili(C...
 - Liqun Shan
 - Md Somir khan
 - Amirhossein Jamarani
 - Faeze Banitaba
 - Sercan
 - roberto salazar
 - Ashikur Rahaman
 - Aayush Palsania
 - Xingli Zhang
 - VISHNU SAI PERAM_C00551...
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