



**SEETRUE**  
TECHNOLOGIES



## Challenges and Opportunities for Robust Eye Tracking in XR

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Cohort 7 member

# Why eye tracking

## Attention monitoring and cueing

Inspection process monitoring

Vital signals

Vigilance & Fatigue

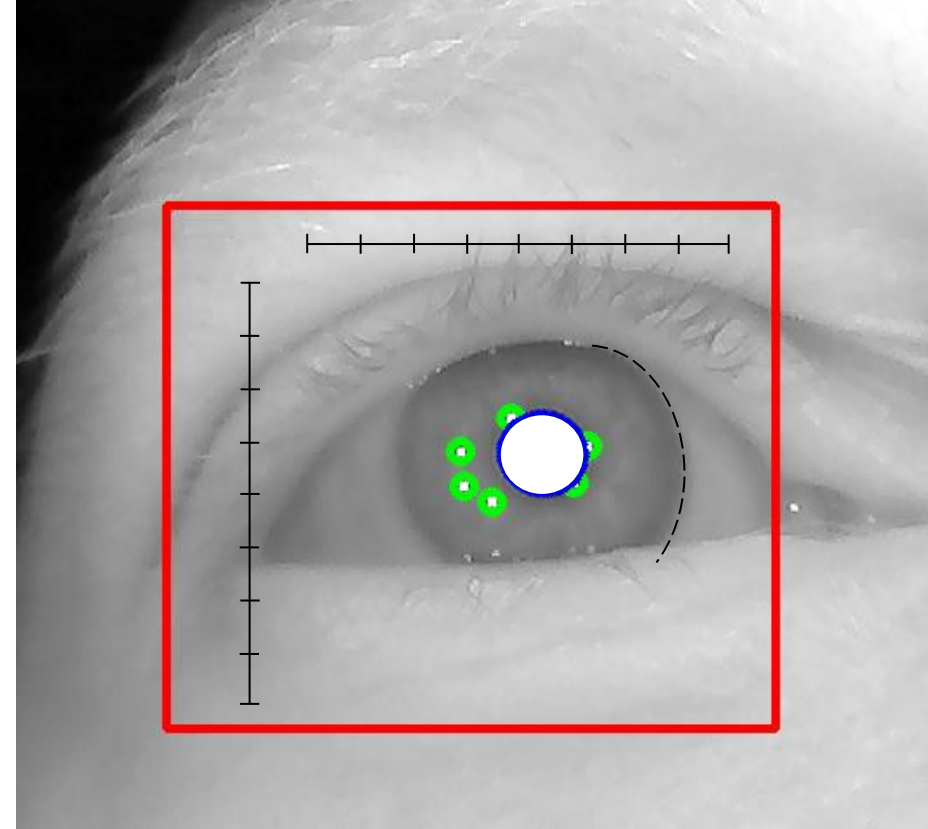
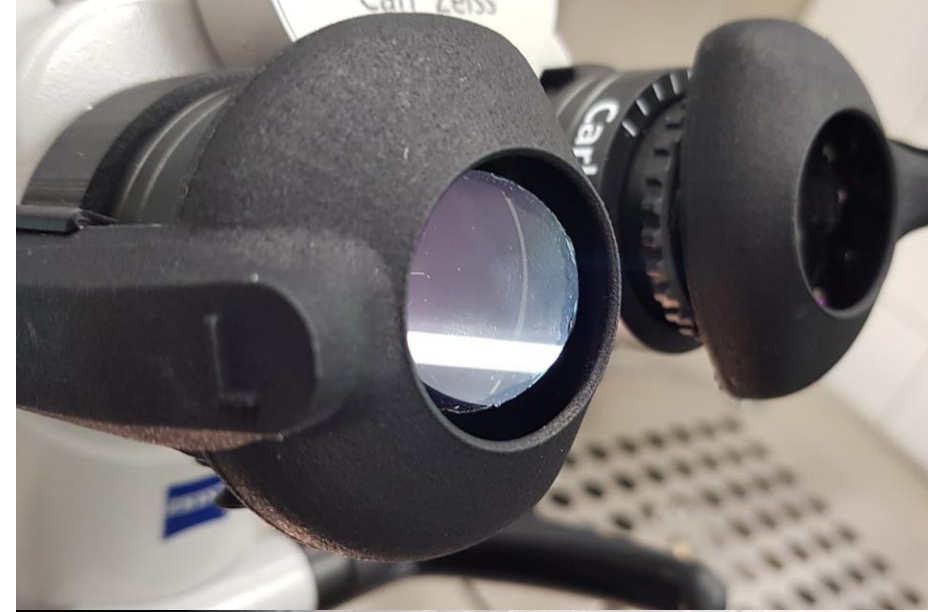
Eye and Brain health

## Display optimization & interaction in XR

Eye position and mobility

Vergence

Intelligent interaction and improved workflows





## ROBUSTNESS

Eye tracking that  
works with everybody and everywhere  
Does not require recalibration

## SPEED AND ACCURACY

Eye tracking that is  
fast and accurate

## INTEGRATION

Small footprint  
Industry-level access to  
medical-grade eye tracking  
data

# Full stack eye tracking

## SeeTrue core platform

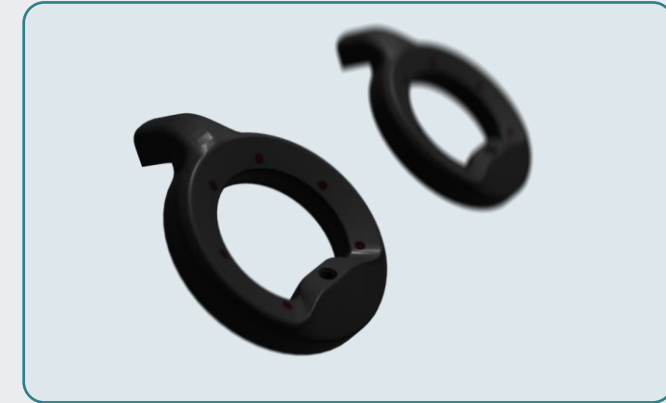
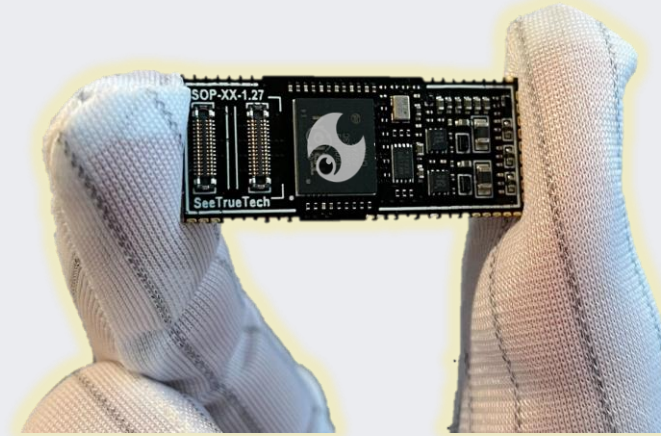
HARDWARE

- Miniature eye tracking sensors 3x3x3 mm
- Novel illumination units, 3-6 elements
- On chip intelligence preprocessing
- Optimized power consumption
- Serial gaze data to client platforms, no MIPI

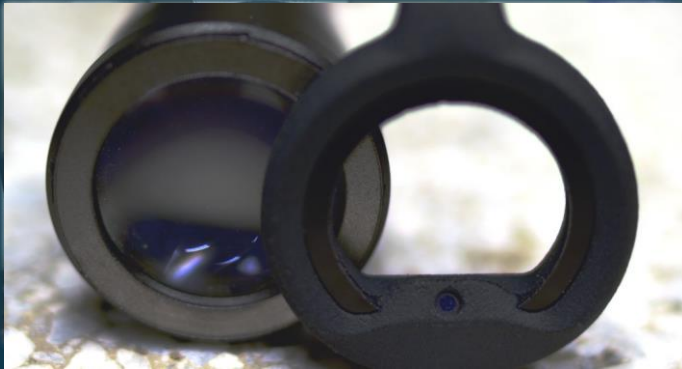
+

SOFTWARE

- Eye's digital twin, sophisticated 3D internal model
- Real measurements of eye position, pupil size, and gaze direction
- Optimized processing pipeline
- Easy to integrate through powerful API
- PC ,mobile, embedded, stand-alone
- OS independent clients, demo systems



# Novel eye tracking solutions based on SeeTrue core



**Add-on ocular tracker**

**Customers:** Medtech, skilled training, industrial processes, eye monitoring and diagnostics

In production and use, upcoming clinical use



**Fully embedded ocular eye tracker**

1-to-1 swap intelligent ocular for optical device manufacturers

Eye-tracking sensor for ocular devices



**Wearable implementation**

**Customers:** XR headsets, operator monitoring, vision care

Pre- production, first eval kits sent 12/2022, beta early access program, lending program

Independently benchmarked against market leaders





# Eye tracking for AR and operator monitoring



## Head-mounted eye tracking eval kit

Sensor size 3 x 3 x 3 mm

Custom illumination unit

Median accuracy 1.2 °, FPS 50-100Hz

Front facing aux camera

**Customers:** XR, Operator monitoring, Vision care

Eval kits available from 10/2022, early access program started 2023

Customization program



# Evaluation and dev-kits available

## TEST > DESIGN > MANUFACTURE

The fastest way towards integrated eye tracking

Customized jointly with customers

Integration with customer's systems

Fast cycle from requirements to the first prototype

Example clients provided – PC, Android

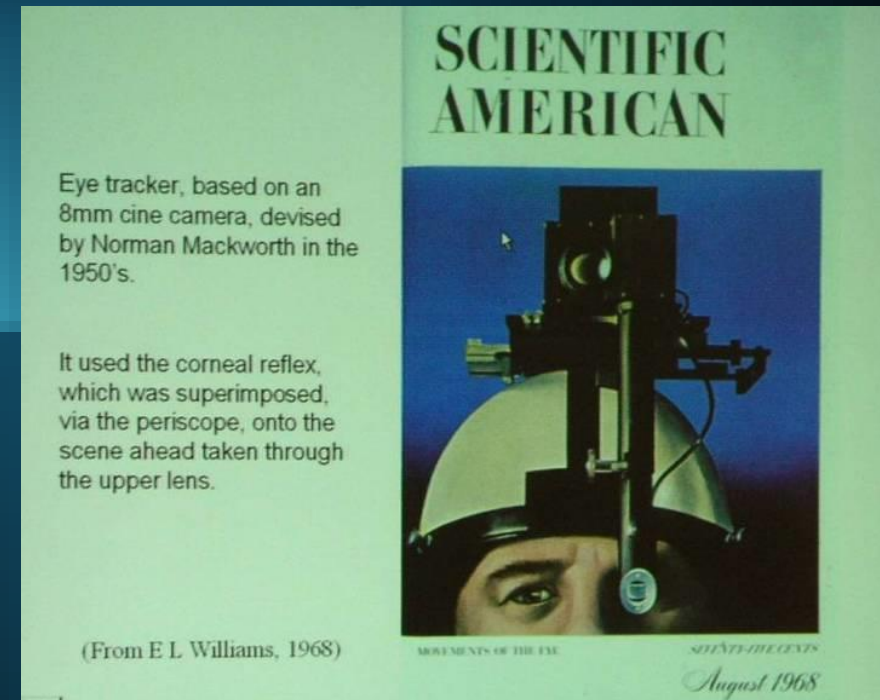
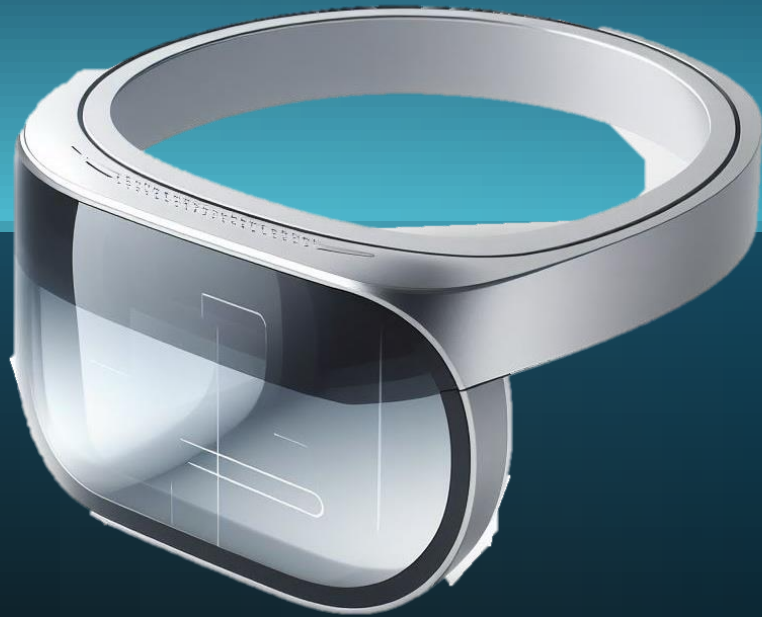
Full access to all data and network API

Software updates

Support during evaluation period

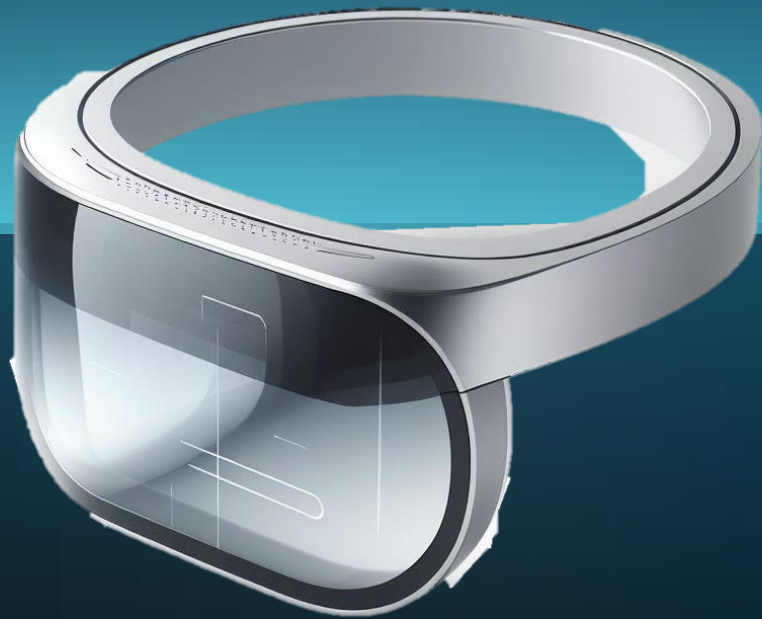


# Challenges and Opportunities for Robust Eye Tracking in XR





# Challenges and Opportunities for Robust Eye Tracking in XR



Footprint & Power consumption

Weight

Integration with other modules

Compute requirements

Population coverage

Slippage compensation

Calibration

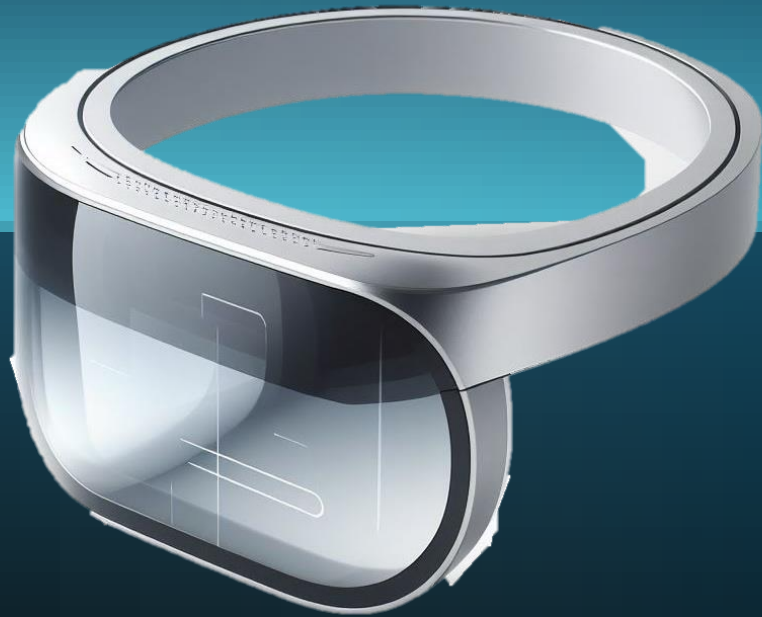
Accuracy, Latency, FPS

FOV

Ambient light robustness

Privacy

# Challenges and Opportunities for Robust Eye Tracking in XR



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# Miniaturization and power consumption

Several candidate solutions exist / under development

## Event cameras

Asynchronous and independent sampling

20-40 mW + LED

Up to 1500 fps

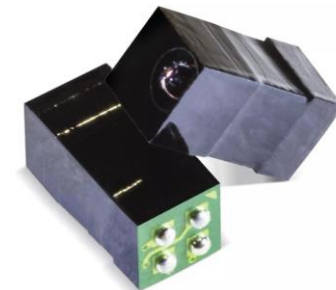
## MEMS + IR / VCSEL

Highly integrated emitters and sensors

10-30 mW

Up to 4000 fps

amr OSRAM

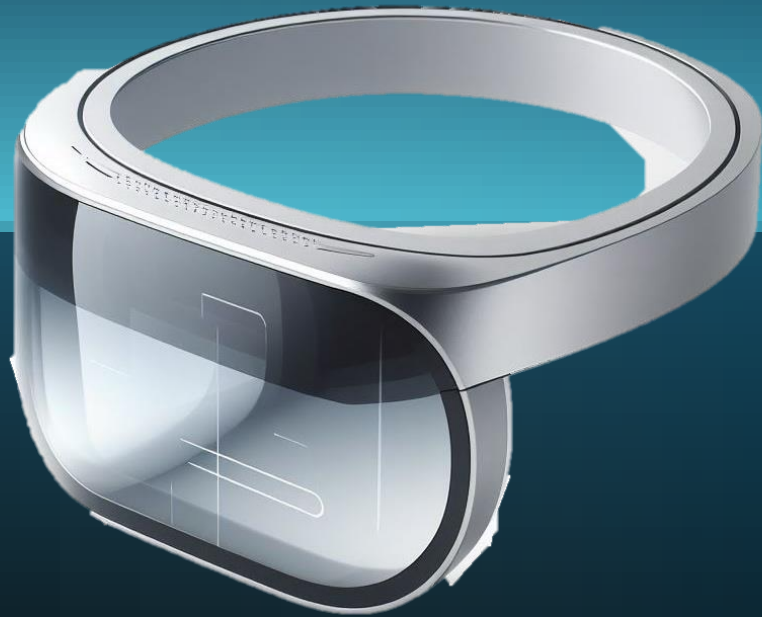


1 mm<sup>2</sup>  
58 fps  
12mW

Stoffregen, T., Daraei, H., Robinson, C., & Fix, A. (2022). Event-based kilohertz eye tracking using coded differential lighting. In *Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision* (pp. 2515-2523).

Meyer, J., Schlebusch, T., & Kasneci, E. (2022). A Highly Integrated Ambient Light Robust Eye-Tracking Sensor for Retinal Projection AR Glasses Based on Laser Feedback Interferometry. *Proceedings of the ACM on Human-Computer Interaction*, 6(ETRA), 1-18.

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# Compute

## Typical eye tracking pipelines

- Heavy on real-time data processing
- Large machine learning models
- GPU usage
- Require MIPI or similar

## Current platforms already overcrowded

- Multi-sensor integration
- CPU usage already high
- Available ports limited

# Join us to Solve the Challenges for Robust Eye Tracking in XR

Footprint & Power consumption	Slippage compensation
Weight	Calibration
Integration with other modules	Accuracy, Latency, FPS
Compute requirements	FOV
Population coverage	Ambient light robustness
	Privacy

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