Universität Hamburg
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# Egocentric Eye Movement Analysis


- TIM ROLFF, 03.02.2022

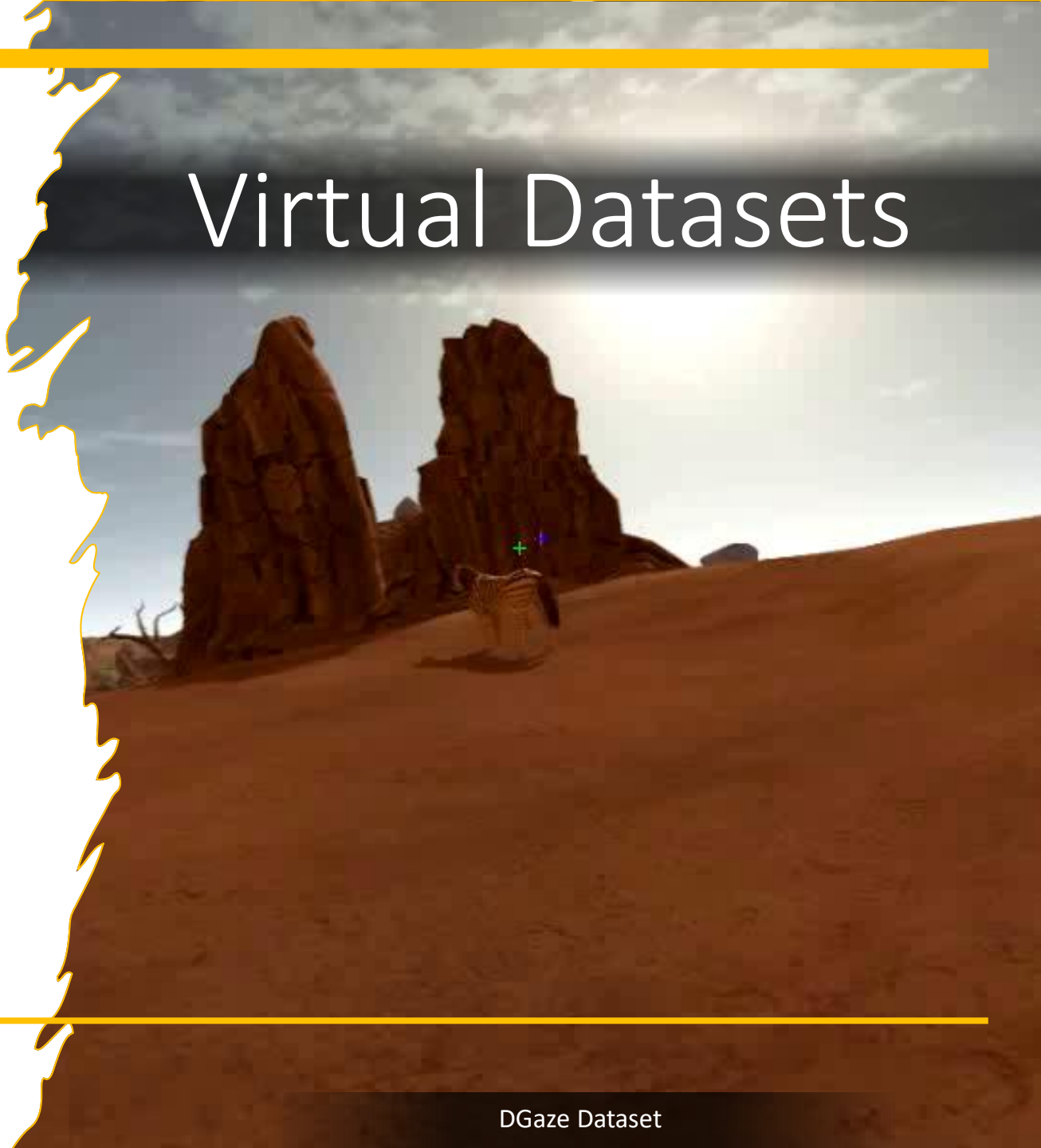
# Gaze & Gaze-Event Forecasting

- Prediction of (plausible) Gaze Points
  - Latency reduction
  - Foveated rendering
  - Gaze Contingent Rendering
  - Redirected Walking
  - Gaze Simulation

Hu et al., DGaze: CNN-Based Gaze Prediction in Dynamic Scenes, IEEE VR, 2020

# Virtual Datasets

- Mostly videos of the environment with:
  - Gaze, IMU data of head unit and other datapoints
- Often no additional information on:
  - Depth-maps, Optical Flow, Saliency, …



DGaze Dataset

Hu et al., DGaze: CNN-Based Gaze Prediction in Dynamic Scenes, IEEE VR, 2020

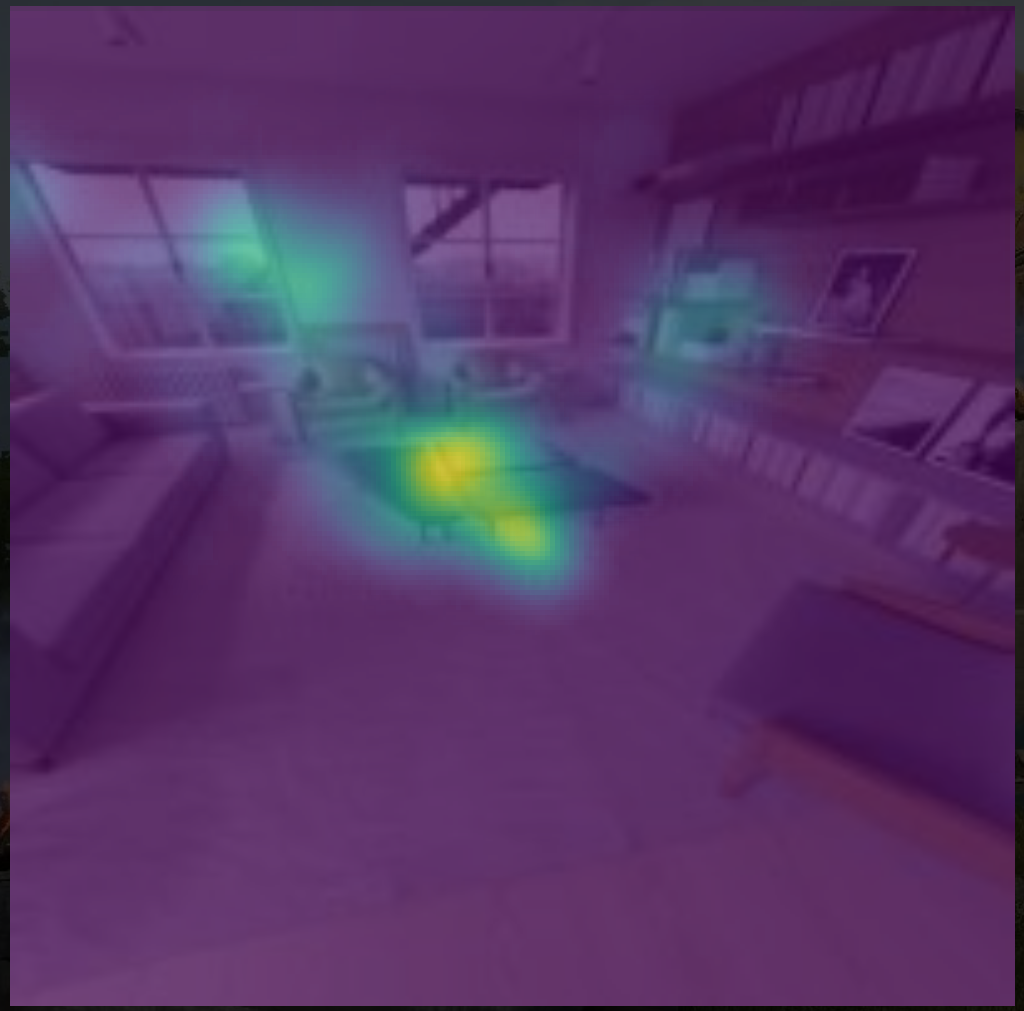
# Recent Research

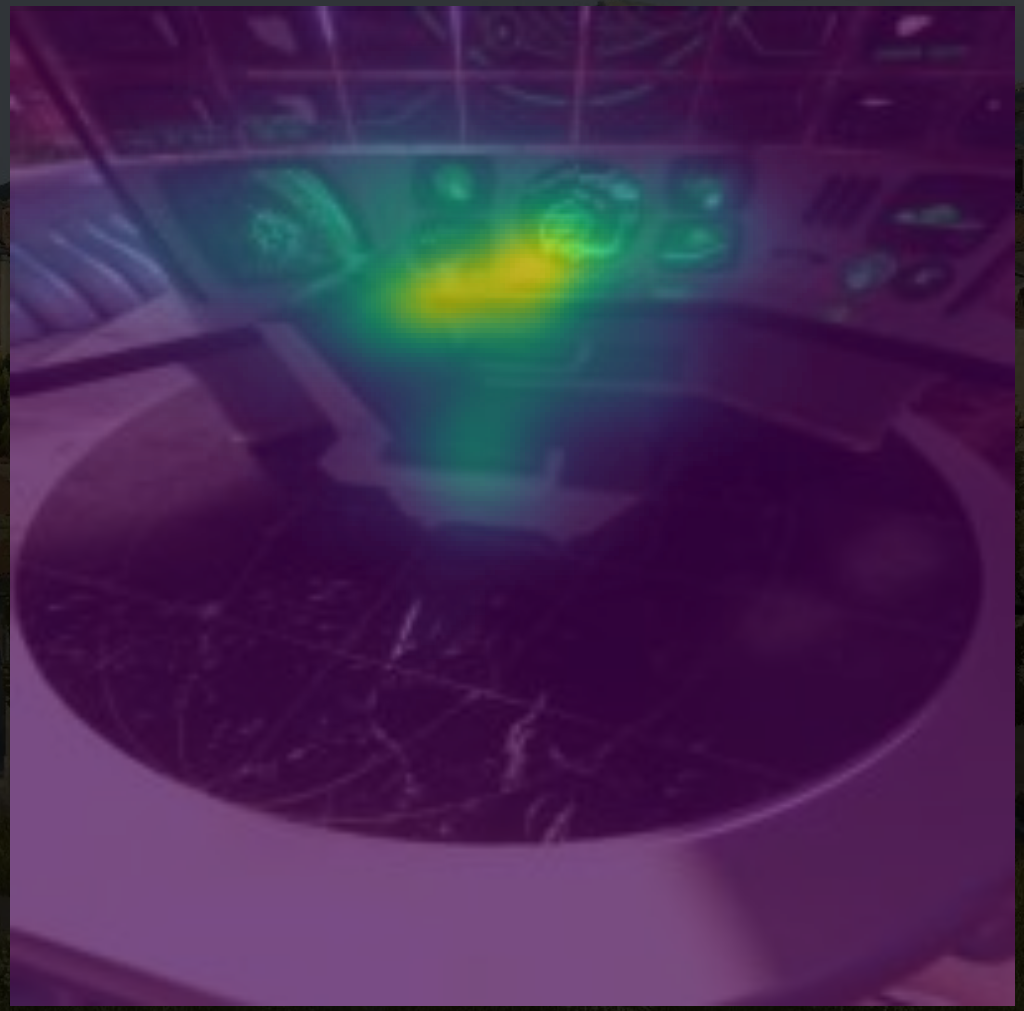
- Estimation of fixation maps under free viewing conditions
  - Maps gaze of different participants onto a “new” stimulus.
- Utilize fixation maps for training or as ground truth

# Recent Research

- High variation of visual stimulus even for the same environment
- May depend on past actions and participants
  - Viewpoint
  - Application state
  - Random events
  - Physical height

Gaze Mapping for Immersive Virtual Environments based on Image Retrieval, Submitted to Frontiers in Virtual Reality - Technologies for VR





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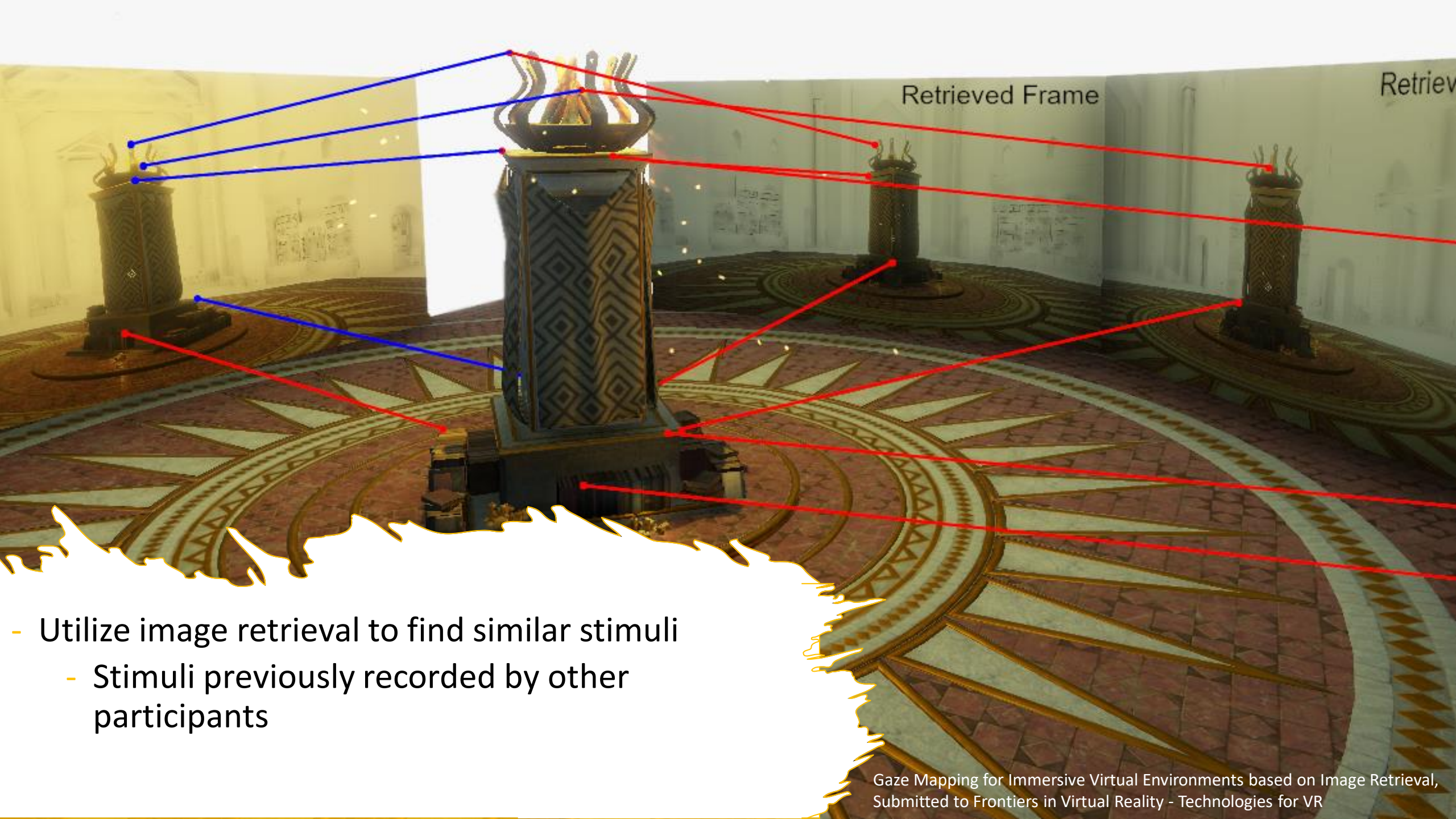
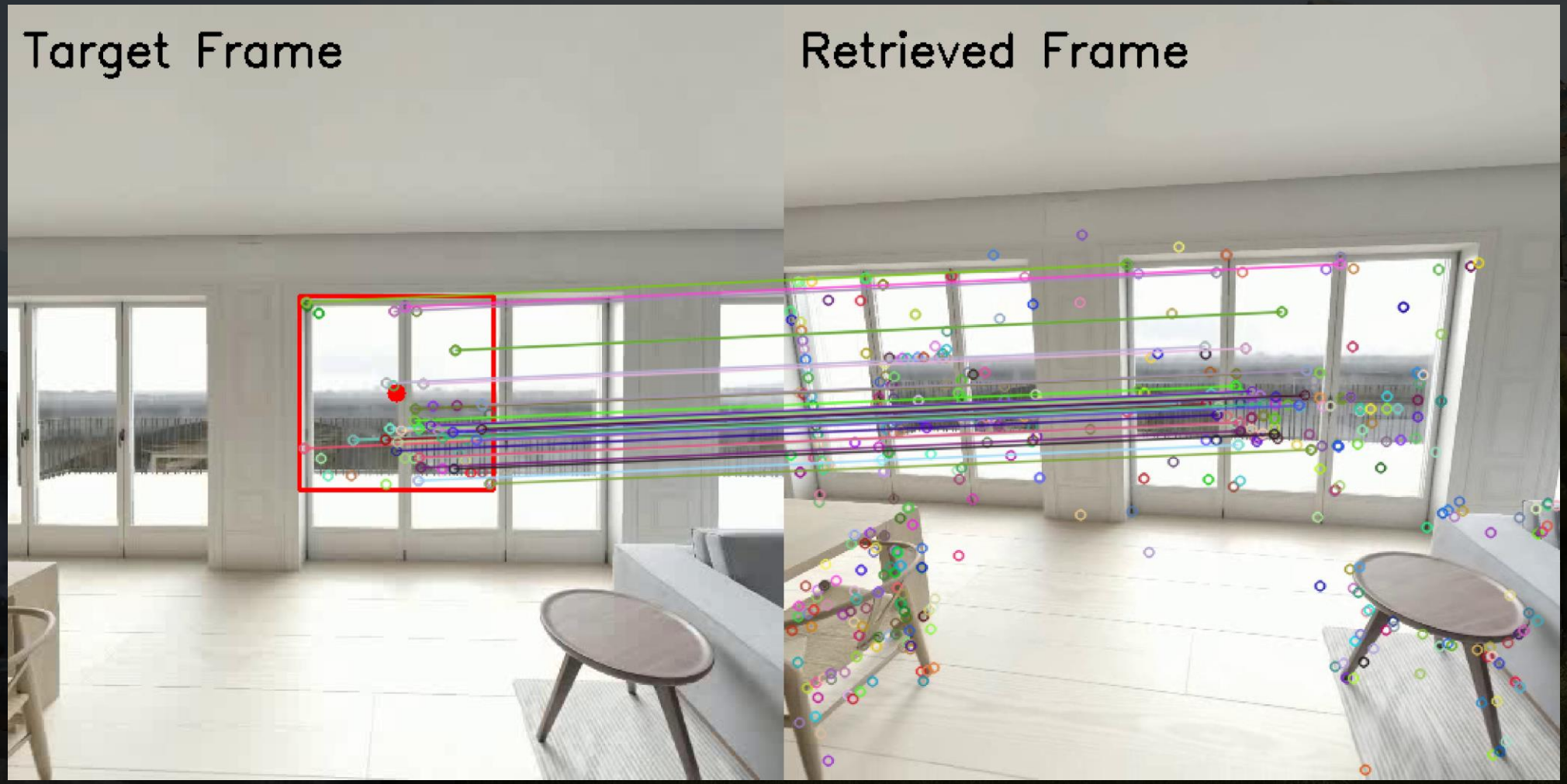



- Utilize image retrieval to find similar stimuli
  - Stimuli previously recorded by other participants

Gaze Mapping for Immersive Virtual Environments based on Image Retrieval, Submitted to Frontiers in Virtual Reality - Technologies for VR



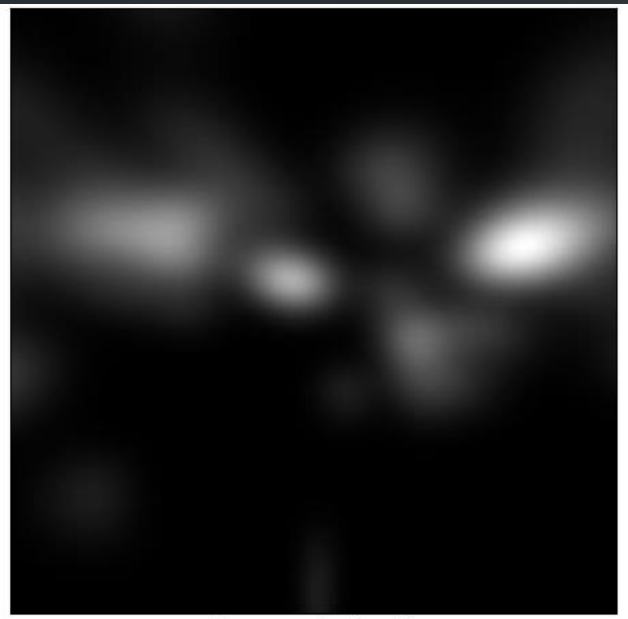

Gaze Mapping for Immersive Virtual Environments based on Image Retrieval, Submitted to Frontiers in Virtual Reality - Technologies for VR


Gaze Mapping for Immersive Virtual Environments based on Image Retrieval, Submitted to Frontiers in Virtual Reality - Technologies for VR

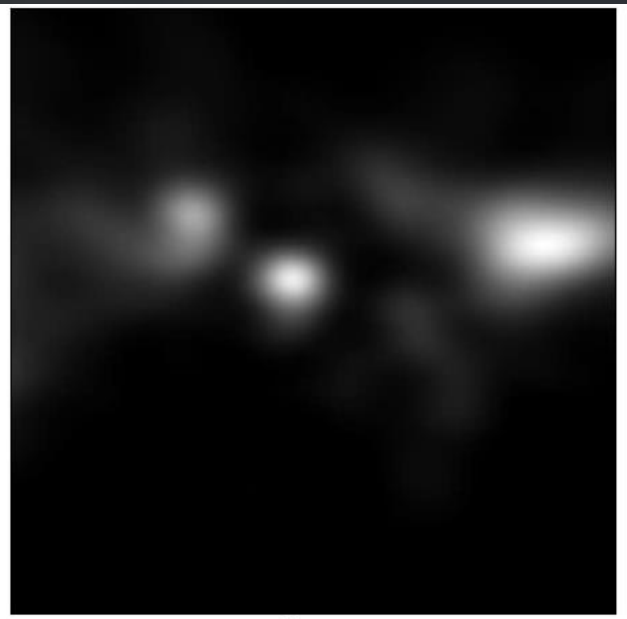

Retrieved Frame
Target Frame
Retrieved Frame


Retrieved Frame
Target Frame
Retrieved Frame

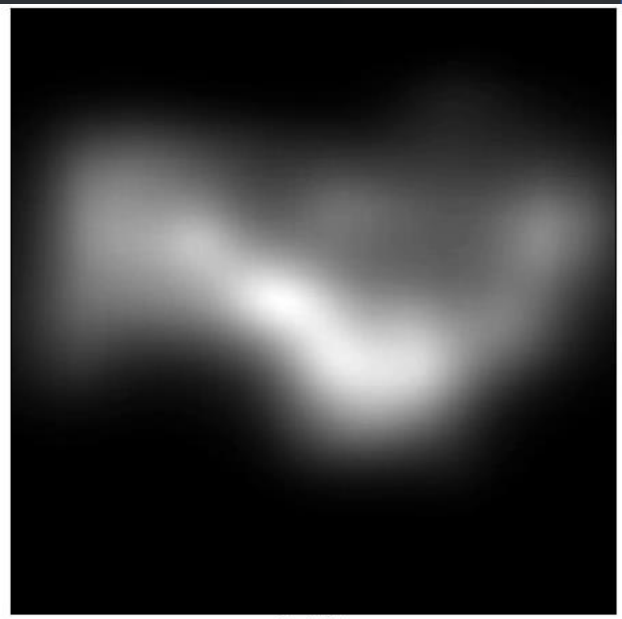
Input



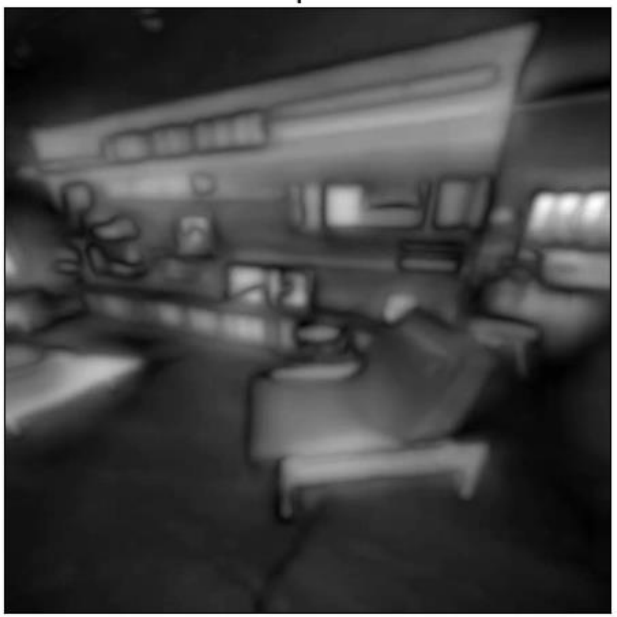
Ground Truth



Ours



SAM



VOCUS2

MB

MB+

BMS

# Custom Dataset

- Visual stimulus
  - Diffuse & Physically Based Renderings
  - Motion Vectors
  - Depth-Maps
  - Semantic, Panoptic and Instance Segmentations
  - Bounding Boxes
  - Fixation / Saliency Maps
- Full 3D environment
  - Object Positions
  - 2D & 3D Gaze data
- Positions of head and hands
  - User interactions
- Tasks, Audio, …


Questions?