CS 832
HW3
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Analytic dashboard for gaze tracking system during remote learning

When delivering a talk, course, or presentation, the remote and hybrid options are widely used. Similarly, the participants have the option to watch the video of the session later, rather than joining the session in real time. This provides the capability to join these sessions from any place and at any time. However, with the lack of face-to-face engagements, the presenters are facing difficulties in understanding how the audience is engaging in their talk or presentation. For presenters, it is important to understand what aspects of their presentation caught the attention of the audience and what not, to improve their presenting style and content to better accommodate the engagement of the audience.

We can use an analytics dashboard that allows the participant to record their eye movements while viewing a video. Based on the eye movements that were tracked, this application will generate advanced gaze measures which indicate human visual attention. This interface allows the presenter to analyze the visual attention of participants while watching the video. The interface of an analytics dashboard for gaze tracking needs to be simple to be understood by an average user (not an expert in the eye tracking domain).

The analytics dashboard of this application has two types of visualizations for visual attention.
1. Visual attention over space - This visualizes how the participants' visual attention or focus changes on the screen (location). The parts of the screen where the participants spent a long time focusing (focal viewing) on and the parts of the screen where the participants had rapid eye movements (ambient viewing)
2. Visual attention over time - This visualizes how the participants' visual attention changes over time. The dynamics of the pattern of visual attention.

Personas
The application is to be used by both participants and presenters alike. Thus, we consider two personas as,
1. Participant - The person who views the video of the presentation done by the presenter and records their eye movements for further analysis.
2. Presenter - The person who analyzes the visual attention measures generated by the application based on the participant's eye movement. The presenter uses this analytics dashboard to understand how the visual attention of participants varies with respect to different aspects of their presentation.

Use cases
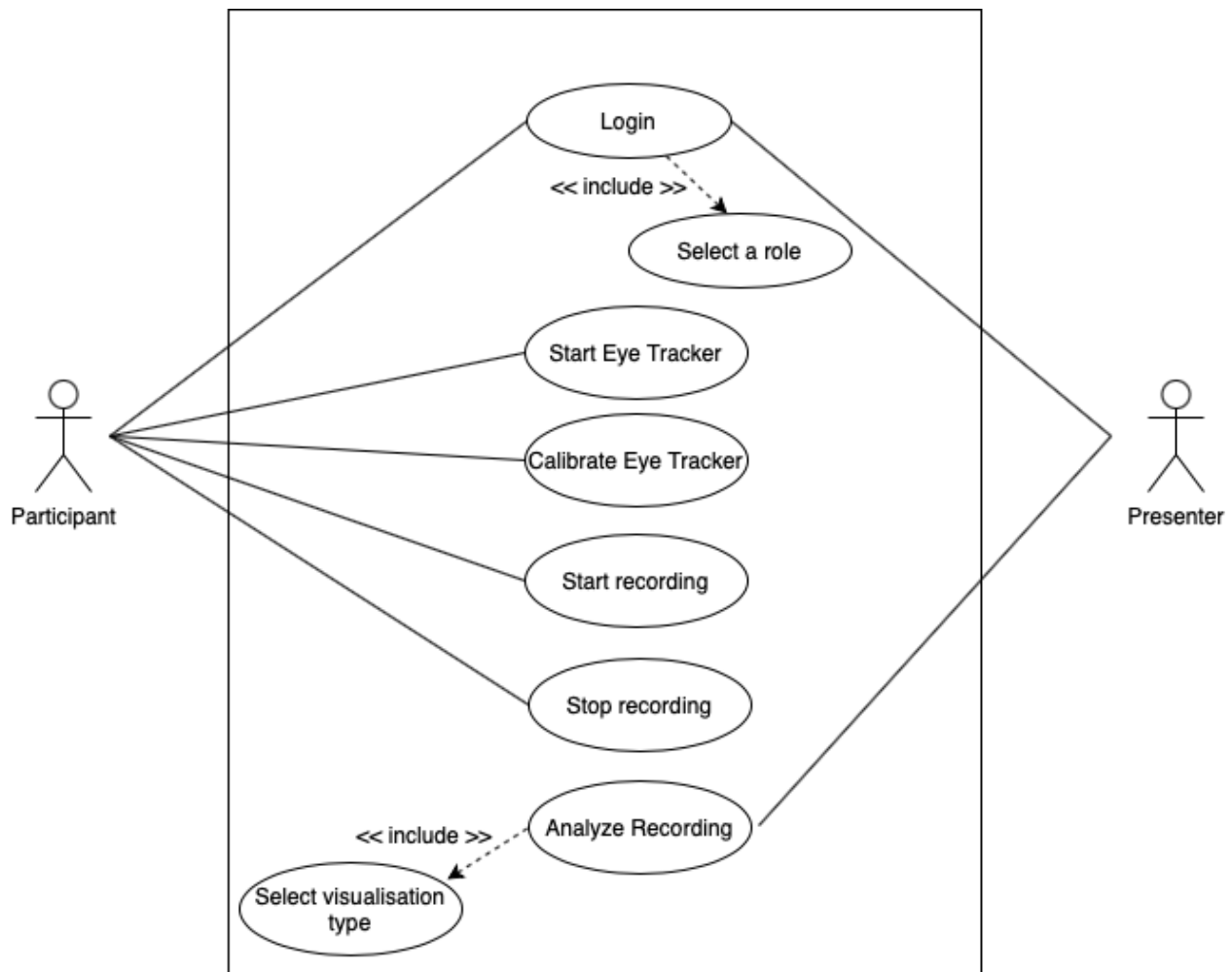
Figure 1: Use case diagram for analytics dashboard for gaze tracking system during remote learning

Participant: We consider any user whose data is collected through the eye-tracking app as a participant. The participants will perform actions which is related to recording eye movements while watching a video such as starting the eye tracker, calibrating the eye tracker, starting the recording of eye movements, and stopping the recording. (see Figure 1)

Presenter: We consider the user who uses/views data generated from the participants. The presenter will perform actions only associated with analyzing data as depicted in Figure 1. The presenter can choose the type of visualization they want to analyze (Visual attention over space or visual attention over time).

Hierarchical Task Analysis

There are two main task scenarios associated with this application.
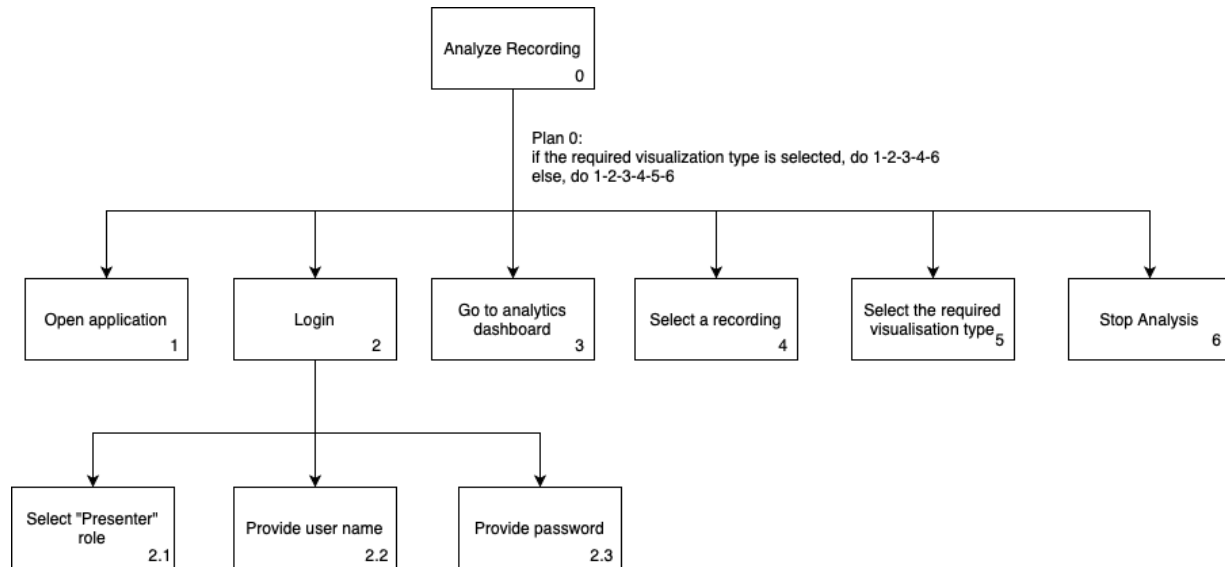
1. The participant viewing a video

This scenario explains the task where a participant views a video of a presentation done by the presenter and records their eye movements while viewing the video. If the eye tracker is calibrated the participant will do the tasks 1, 2, 4, and 5. Otherwise, the participant will go through all the tasks from 1-5 as shown in Figure 2.
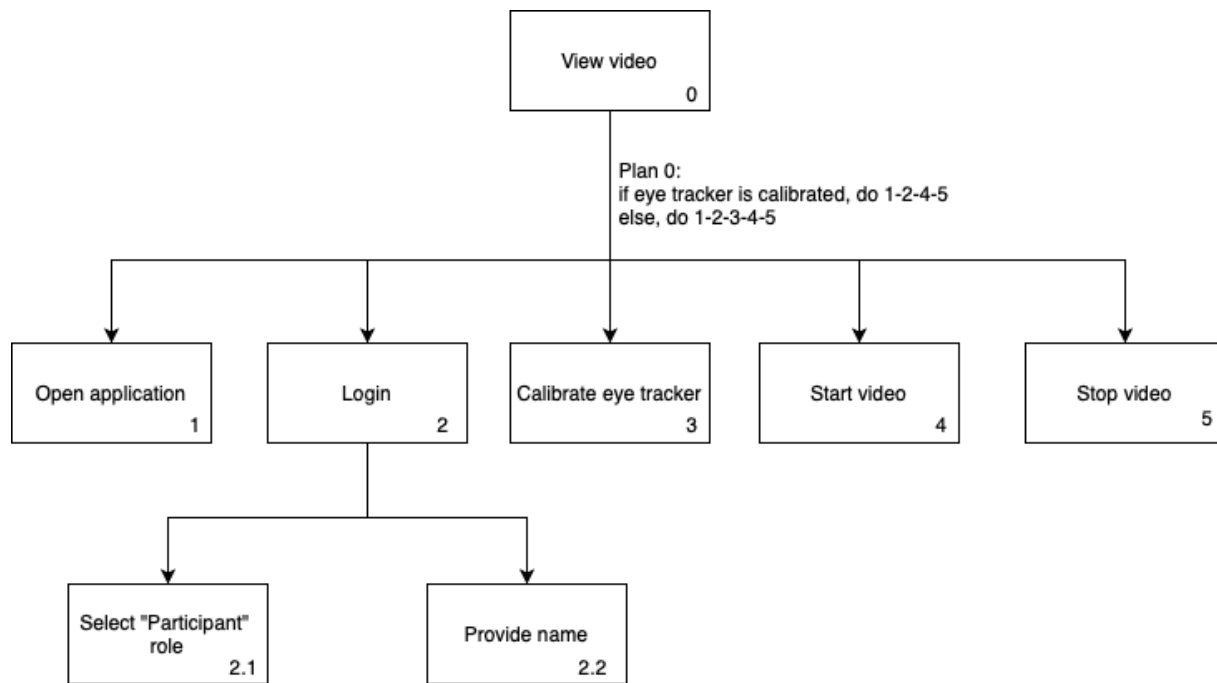
Figure 2: A graphical representation of the hierarchical task analysis for participant viewing a video

2. The presenter analyzing a recording

This scenario explains the task where a presenter is analyzing recorded gaze measures of participants while watching a presentation video. If the required visualization type is already selected the presenter will do the tasks 1, 2, 3, 4, and 6. Otherwise, the presenter will go through all the tasks from 1-6 as shown in Figure 3.

Figure 3: A graphical representation of the hierarchical task analysis for participant viewing a video

Wireframes

Please refer to the included video for transitions between the different screens mentioned below.

Login: The start page includes the option for the user to select their role as Participant and Presenter as depicted in Figure 4. Based on the role they select they will be directed to respective login pages (see Figure 5). Figure 5a and Figure 5b illustrate the login page for participants and the login page for presenters respectively.

Home: There are two types of home pages (see Figure 6). If the user logged in as a participant, then they will see the home screen that is shown in Figure 6a. Participant's home screen include shortcuts for the most used functions of the eye-tracker such as Calibration, Eye-tracking while watching video, and Logout. Moreover, the home screen also contains a link to user profile.

If the user logged in as a presenter, then they will see the home screen that is illustrated in Figure 6b. Presenter's home screen include shortcuts for analytic dashboard and logout. Similar to participant's home screen, this also contains a link to user profile.

Calibration: The screen comprises a sequence of targets used for calibration. The targets appear for a pre-defined period of time during which the application samples from the camera input for calibration. Once the calibration is done, the application will display the completion message to the participant. (see Figure 7)

Eye Tracking: The eye tracking with no recording screen allows the user to test the eye tracking and determine the necessity of recalibration (see Figure 8a). Then eye tracking with a recording screen will be used while viewing the video and the content on the screen will comprise the analysis (see Figure 8b).

Analytics Dashboard: The analytic dashboard screen will list the eye-tracking recordings while participants view videos ordered chronologically (see Figure 9).

Visualization of visual attention: This application has two types of visualizations for visual attention. As depicted in Figure 10a, the visual attention over the space screen visualizes how the participants' visual attention or focus changes on the video screen (location). The visual attention over time screen visualizes how the participants' visual attention changes over time.
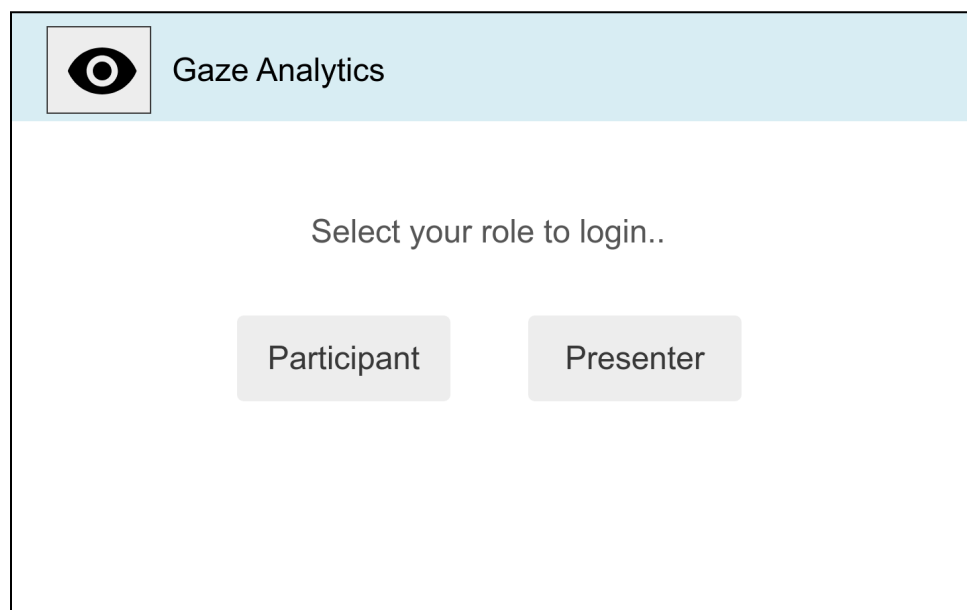
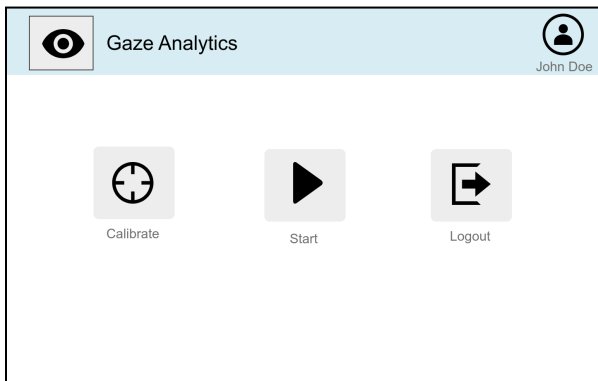**Figure 4:** Start page that will allow users to select their role
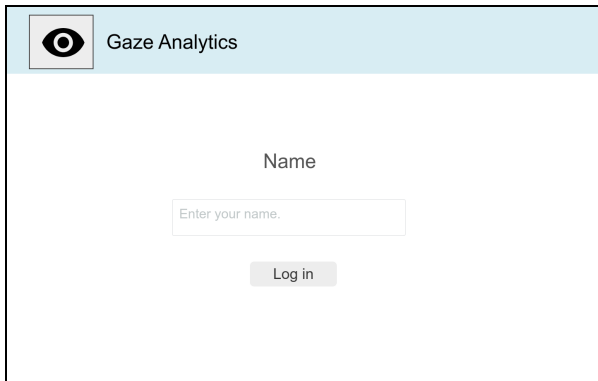
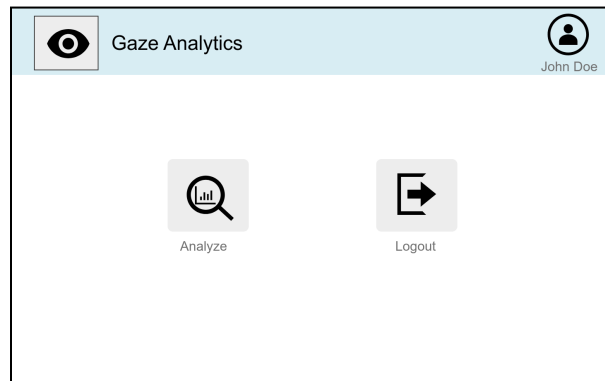**Figure 5a:** Login page for participant
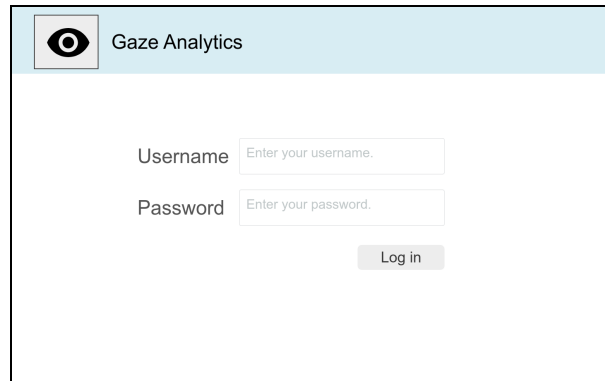
Figure 5b: Login page for presenter

Figure 6: Login pages of this application designed for different user types.
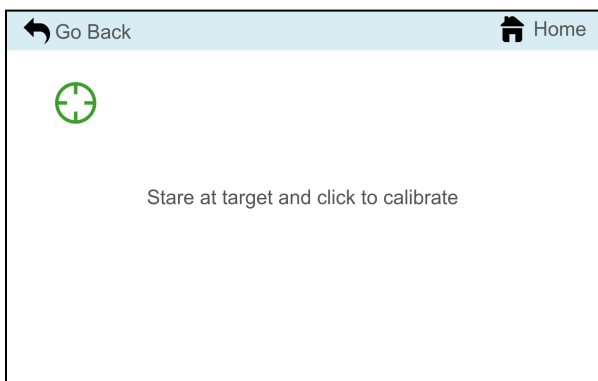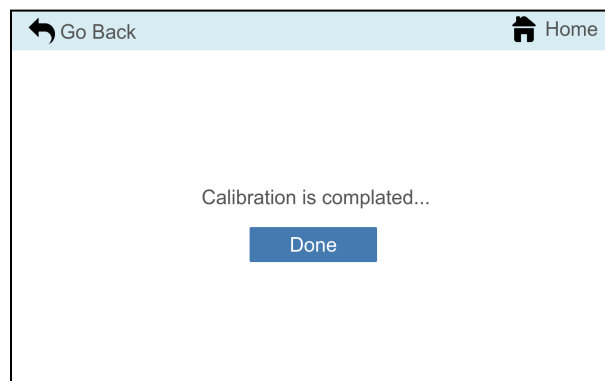

Figure 6a: Home screen for participant

Figure 6b: Home screen for presenter

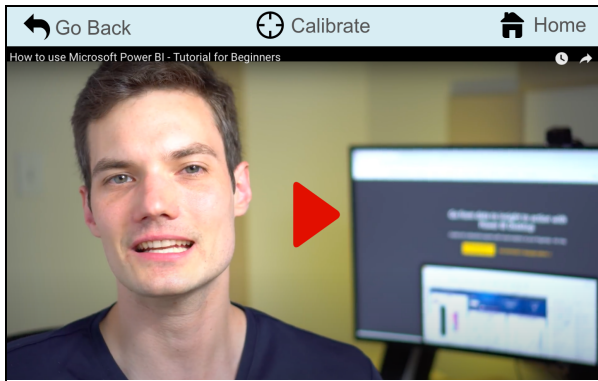**Figure 6:** Home screens of this application designed for different user types
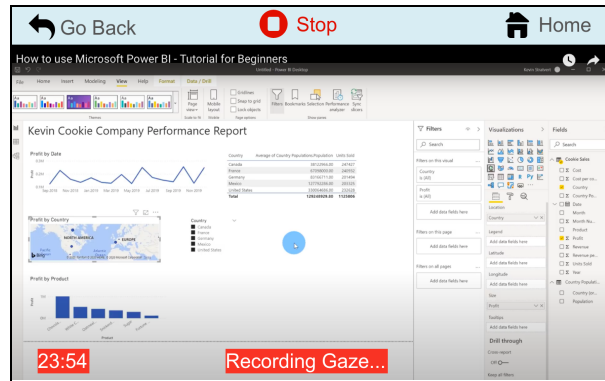

Figure 7a: Calibration

Figure 7b: Calibration completed message

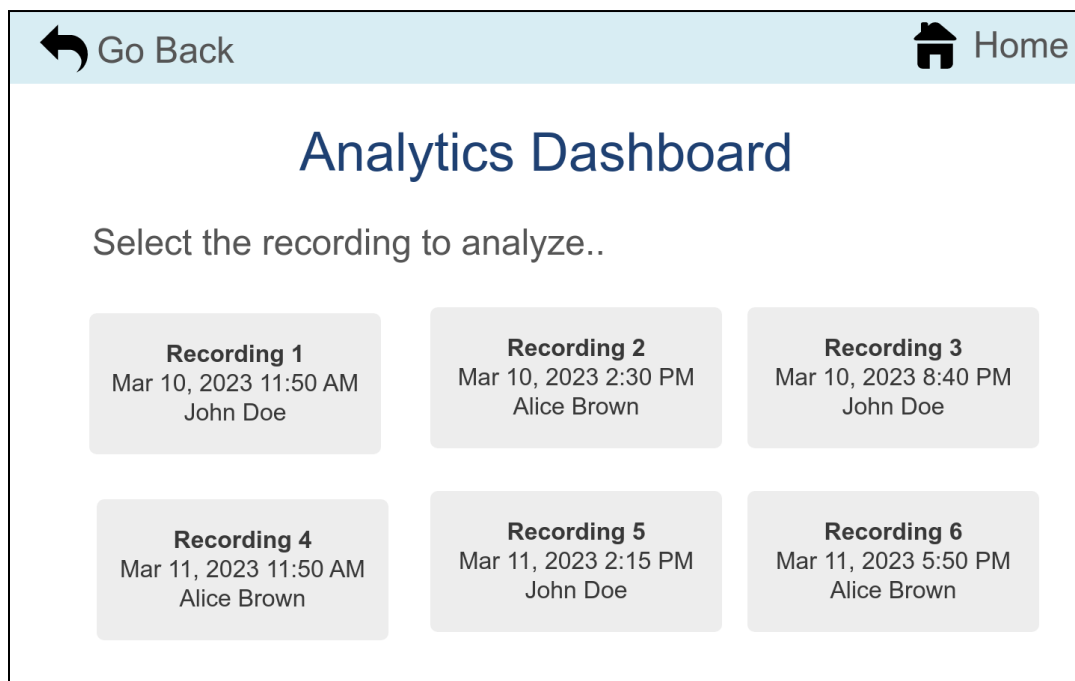**Figure 7:** Calibration of eye tracker for the participant
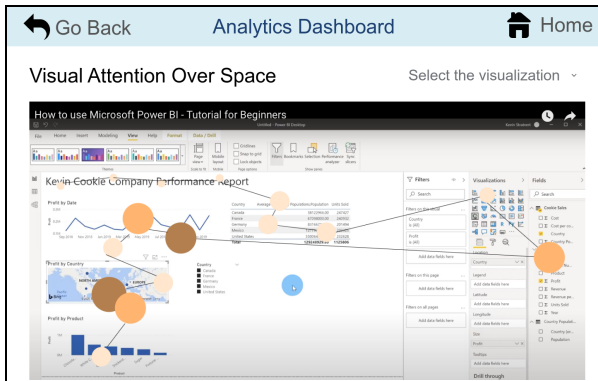
Figure 8a: Eye Tracking (No recording)

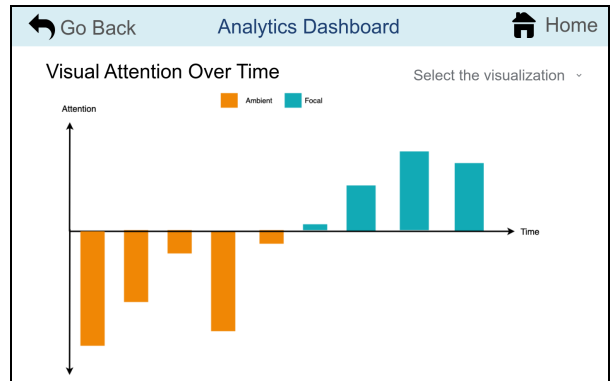**Figure 8b:** Eye Tracking (Recording)

Figure 8: Eye tracking while viewing the video

Figure 9: Analytics dashboard that lists eye-tracking recordings.

Figure 10a: Visualization of visual attention over space

Figure 10b: Visualization of visual attention over time

Figure 10: Visualization of visual attention of participants while viewing the video