# Through the Looking Glass: A Study of the Next-Generation Smart Eyewear and Consumers' Attitudes Toward It

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***Abstract*—Ten years after the release of the first generation of smart glasses, the next generation is on the market, with drastic differences in marketing and price point. In this paper, we propose to investigate potential privacy and usability issues of this next-generation of smart eyewear. Our proposed project is multi-pronged: in the first stage, we propose to conduct a security and privacy analysis of such devices. The goal of this stage is to analyze what data these devices are collecting, as well as how and where such data are transmitted. In the second stage, we propose to conduct an online survey, aiming to determine consumers' exposure to and experiences with next-generation eyewear. We will also evaluate their attitudes toward such devices. In the third stage, we propose to conduct an experimental privacy and usability study. The goal of this study is to determine participants' changes in efficiency in accomplishing defined tasks with these devices, as well as their satisfaction and trust with respect to smart eyewear.**

## 1. Introduction

In 2013, the first-generation smart glasses, marketed as **Google Glass**, was made available to Google I/O developers at a price point of $1500 [4]. The availability of this new gadget drew significant public interest and related controversy (e.g., [2], [3], [9]). The majority of concerns were related to potential privacy, fairness, and access threats that such smart glasses might pose to the general public [2], [3], [9]. Several cities and local governments tried to address these concerns by regulating and outright prohibiting the use of smart glasses in certain venues and circumstances [5], [8]. Despite the initial interest, however, earlier versions of smart eyewear never achieved wide adoption [6], thus largely rendering moot concerns about these devices.

Ten years later, the next generation of smart eyewear, **Ray-Ban Meta** [10] and **Echo Frames** [1], are being presented to the general public. This new generation features a less futuristic form-factor, with a price point of around $300; these products are marketed as smart assistants, allowing a wearer to execute everyday tasks hands-free, while remaining present in and aware of their environment [1], [10].

Both the Echo Frame and the Ray-Ban Meta boast different features (e.g., Echo Frames do not seem to have video capture capabilities while the Ray-Ban Meta does [7]). Despite these different capabilities, this new generation of smart eyewear prompts a shared set of interesting research questions related to their security, safety, privacy, and usability.

The first and the most obvious question is: *will this new generation of smart eyewear, with its more accessible price point and broadly appealing form factor, become more ubiquitous than its predecessors?* Assuming that the answer is **"yes"**, it is worthwhile to investigate how consumers' attitudes toward such products have changed over the past ten years.

## 2. Our Research Proposal

In this paper, we propose to investigate the next generation of smart eyewear and consumers' attitude towards such devices, as well as potential security, privacy, and usability issues that such devices might pose. We envision our proposed project as a multi-stage investigation. In the first stage, we plan to conduct a traditional security and privacy analysis of such devices. The goal of this stage is to thoroughly analyze what data these devices are collecting, as well as how and where such data are transmitted. We plan to conduct a technical network analysis of both Ray-Ban Meta and Echo Frames, as well as an analysis of the devices' terms of use and privacy policies.

In the second stage, we propose to conduct an online survey, with the goal of determining consumers' exposure to and experiences with next-generation smart eyewear, as well as their attitudes toward such devices. We are especially interested in the questions related to consumers' attitudes toward privacy. When investigating consumers' attitudes, we plan to investigate the privacy concerns related to the wearer themselves (e.g., how do consumers compare their privacy risks when wearing a smart watch versus wearing smart glasses?). We will also survey participants regarding privacy concerns related to other people in the wearer's proximity. We are in the process of preparing this survey and obtaining IRB approval.

In the last stage of this project, we propose to conduct an experimental study. The goal of this study is to collect data about the following research questions:

- What are potential and perceived privacy risks that may arise from conducting everyday tasks, such as composing emails, with the help of smart eyewear?
- To what extent does the efficiency of performing everyday tasks change while using smart eyewear?
- How satisfied are participants while using smart eyewear to execute everyday tasks?

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