

Research project for the profile Computer Science

## Virtual reality exam room for ophthalmologic assessments

### Background

Many modern virtual reality devices come with built-in eye tracking capabilities, which opens up innovative use cases in the health domain. In this specific project, we will focus creating a "virtual reality exam room" for ophthalmologic (i.e., eye health) assessments. Such virtual environments would enable doctors to conduct remote examinations, or even be used for controlled data collection on site in the clinic as it would offer full control of what the patient sees where, irrelevant information should be suppressed, and in the case of children or patients with cognitive impairments, their attention could be better managed to obtain higher quality data. Furthermore, since VR headsets can be used at home, patients can be observed more frequently and over longer time periods while reducing costs and increasing comfort. These longer-term observations can be very informative for diagnosing a number of brain-health related issues as well as monitoring the efficacy of treatments.

### Goals / Methods / Approach

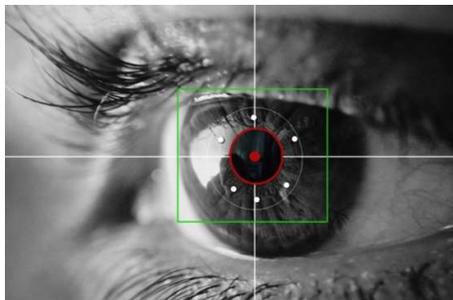
In the context of this master project, we envision an interactive virtual reality environment in which various eye examination scenarios are simulated and, in some cases, gamified to increase engagement and adherence. Optimization involves conceptualizing visualization and interaction paradigms, implementing prototypes following agile user experience (UX) and user centered design (UCD) principles, and validating these front-end designs in user experiments. A requirements analysis phase will be facilitated by interviewing practicing ophthalmologists. Once the virtual content is created and interactions are designed, we will conduct experiments to understand if the 'virtual exam room' functions as intended, if it is usable and engaging, levels of acceptance among doctors and patients, and if facilitates high quality data collection. You will work with the state-of-the-art virtual headsets. Most likely you will program in Unity, but if you prefer other technologies, there are no restrictions. You will have access to expertise provided by a company called MachineMD AG, where the R&D team is already conducting research in this domain (<https://www.machinemd.com/about>). There is a possibility of internship or part time employment with MachineMD during the thesis depending on interviews with the company, and the project may lead to a funded collaboration between the research team and the company.

**Required skills:** Experience in programming, analytical thinking, willingness to learn VR programming and 3D content creation, interest in statistical approaches to quantitative data analysis, visualization and interaction design, serious games, and scientific research.

**Others:** The project language is English but operational German is required for the user experiments. A collaboration is established between the FHNW team and MachineMD AG through this project.

### Tasks for the MSE candidate

The project can be implemented in 2 to 3 stages, e.g., Project 7 (requirements analysis, interaction and visualization concepts, first virtual exam room prototypes), Project 8 (user-centered design of multiple exam room scenarios, improved prototypes, initial user testing) and Project 9 (final prototypes, controlled experiments for validation)



**Study type:**  Full time  
 Part time 50%

**Project organization:** Single and/or in a project team both possible

**Projektfinanzierung:** --

**Workplace:** Windisch

**Advisor:** Prof. Dr. Arzu Çöltekin, [arzu.coltekin@fhnw.ch](mailto:arzu.coltekin@fhnw.ch)

image: worldviz.com