Challenges:

Given the current technological, clinical, and ethical landscapes, a variety of limitations and challenges must be overcome to realize a number of healthcare benefits from AI-leveraged smart mirrors on a large-scale.

Current hardware is not advanced enough to effectively realize all the potential monitoring opportunities. On one hand, detecting features for dermatology and motion tracking can be done effectively with simple cameras and advanced computer vision techniques. On the other hand, characterizing eye conditions at the standards of ophthalmology or detecting digital biomarkers, such as systolic blood pressure, via deep learning still requires better devices. Technology solutions exist for capturing retinal fundus images using mobile phones and a hand-held ophthalmoscopy lens. The technical challenge is to create a mirror camera that can acquire retinal fundus photos automatically without requiring the aid of an additional lens. Imaging technology in this area is progressing fast and it is likely that in the next few years such cameras may be available. The ability to process multiple computer vision tasks without substantial latency requires more powerful logical boards than what is broadly accessible. Advances in neural engines optimized to run deep learning inferences, together with continuous improvements on GPUs, are likely to have a big part in realizing the envisioned AI-leveraged smart mirror architectures.

The rapid pace of software development created a variety of tools that must be optimized to ensure that trustworthy measurements and the efficient capture of data translate into actionable insights. Most importantly, the reliability and accuracy of the metrics provided by computer vision and machine learning models must be established with large-scale clinical and field trials. Many of the promising technologies reported in the literature require further evaluation. Images collected outside of the lab, i.e., “in the wild,” are likely to be affected by environmental factors, such as different lighting and/or imperfect user positions. Model tuning and sensitivity analysis remain underexplored areas in the context of real-world data. Inaccurate measures might create dangerous precedents if factored into medical decision making, with false negatives causing missed conditions and false positives leading to overtreatment and/or unnecessary anxiety. Similarly, wrong recommendations during physical therapy or gym exercises may lead to longer recoveries or new injuries. Consequently, it is important to establish the appropriate standards and regulations that components and algorithms of a smart mirror must meet.

A major promise for how smart mirrors stand to positively influence healthcare is through the passive collection of a large amount of longitudinal data. While preliminary findings support the analysis of longitudinal data for establishing proper baselines and the continuous monitoring of several conditions relevant for health, e.g., heart conditions, hypertension, and diabetes,[42](https://www.nature.com/articles/s41746-018-0068-7#ref-CR42) evidence is lacking on how this type of information can be used to change from reactive to preventative medicine. Several initiatives aim to examine this question and establish necessary evidence for shifting healthcare through passive monitoring. The All of Us research program (formerly known as Precision Medicine Initiative),[46](https://www.nature.com/articles/s41746-018-0068-7#ref-CR46) the MyHeart Counts project[47](https://www.nature.com/articles/s41746-018-0068-7#ref-CR47) and the Stanford Azumio Activity Inequality study[48](https://www.nature.com/articles/s41746-018-0068-7#ref-CR48) are all collecting and analyzing large-scale longitudinal measures (from wearable devices) alongside other types of biomedical data from cohorts of 50,000 to one million people. These studies also include clinical and biomolecular information for corroborating health outcomes from more traditional measures. We believe that these initiatives offer the appropriate design framework for uncovering new ways in which longitudinal data can be used to proactively improve healthcare. The lessons from all these efforts will then help build the best practices for more convenient and passive at-home monitor solutions, such as the smart mirror.

The adoption of AI-leveraged smart mirrors might raise some ethical concerns due to the personal nature of the data collected, as well as the actionable steps from this information. Some individuals might not be interested in knowing everything about their health status, but only on some aspects. For example, a user could only be interested in monitoring cardiovascular activities, and not in knowing the Alzheimer’s risk. Strict policies on which extent passive monitoring is performed might be required. In particular, the ability for the users to personalize their smart mirrors by turning on/off some measurements is likely to be a factor in the success of smart mirrors for the house.

MoivTIONS:

As technology advances, we have a tendency to still realize a lot of and a lot of uses for it that may

previously be unimaginable. Originally, technology was primarily helpful for

performing tasks humans struggle with, however, nowadays it's employed in even the foremost

mundane tasks in a trial to simplify our lives. With the industrial revolution,

we have been ready to save time in an exceeding variety of ways; but, as media

consumption has raised, we have a tendency to also lose time. because of this, saving time in our daily

routines is often useful. a way technology has been enforced to avoid wasting

time is by integrating computers into various components in our home, thus

creating “Smart Home” devices. The “Smart Mirror” project relies upon this

concept.

The smart Mirror can merge technology with a mirror to supply users with info

while they use their mirror. the first motivation behind the smart mirror is to

improve the quality of life. Providing info to users within the most convenient manner

possible maybe a driving motivation behind the bulk of technological development

for smartphones and tablets. The smart mirror can give convenient info

to users on their mirror a day. permitting the user to multitask by intense

media whereas making ready for the day can save folks time nationwide. The goal of

the mirror is to supply folks with the info they'll need within the morning

while preparing for the day or at night before attending to bed. this may save users

time a day and facilitate to confirm they're conscious of vital details for his or her day.

A user is going to be ready to check their calendar for any forthcoming events, peek at the

the weather forecast, and to not mention, consult the mirror for ancient personal

appearance changes.

The motivation for this project stems from multiple sources. within the Iron Man films, the

main character utilizes holographic displays around the home to perform a variety

of activities. a few years back, Corning released a video regarding their product

called Glass that is meant to permit a sensible surface anyplace within the home.

While these examples, and a mess of others, square measure well on the far side the scope of this

mirror, their realization conjointly looks to be into the longer term. One benefit to the

smart mirror is that, whereas it doesn't give the advanced capabilities of those

examples, it's without delay possible. Another driving considers this project is that the indisputable fact that

smart home technology has been developed for several components of the house however smart

mirrors square measure lacking. whereas their square measure lots of tinkerers come to announce round the

web, no absolutely accomplished implementation has been marketed to users up to now

Functional Requirements The following requirements define the goals of the project outlined in the introduction. The functional requirements define features that must be done for the project to be considered a success, while the nonfunctional requirements define how the functional requirements are achieved. Requirements are categorized into critical, recommended, and suggested. Critical requirements are absolutely necessary, recommended are highly desirable, and suggested requirements are not necessary but would be very nice to add. Design constraints are criteria that the solution must adhere to. The constraints are set by the client and are non-negotiable. 2.1 Functional Requirements Critical: 1. Must be able to display information on screen 2. Must be controlled by something without requiring direct input 3. Must be connected to the web to receive incoming data 4. Must be module-based and contain sample default modules 5. System defaults in low power sleep mode 6. Must be able to scale to multiple screen sizes Recommended: 1. Controlled by alternative input methods 2. Live RSS feed displays 3. Integrate more advanced web modules, perhaps a browser 4. Sleeps when certain time has passed Suggested: 1. Allow users to integrate their own web modules 3 2.2 Non-Functional Requirements Critical: 1. A simpler user interface than a computer 2. System has good performance for users 3. System maintains good reliability for users 4. Display disappears and becomes a mirror Recommended: 1. A friendly user interface that works by selecting modules 2. System remembers user name and can reply to user by name Suggested: 1. Ability to augment a reflection