Hospital Aid

FYP Proposal

Members:

Mr. Hassan Shahzad	18i-0441	CGPA : 2.94	i180441@nu.edu.pk
Ms. Sana Ali Khan	18i-0439	CGPA : 3.87	i180439@nu.edu.pk

Supervisor:

Mr. Syed Muhammad H. Mustafa

Table of Contents

Introduction:

For the final year project, we opted for a development-based project. The idea behind it is to take advantage of the camera video feed that already exists in hospitals and perform analysis on the image/video feed to automate several tasks/processes. This project was initially suggested to us by the software company Trees Technologies; we took their initial idea and narrowed the scope/features down to its current state to form a project that is not just realistic and achievable for us but also satisfactory for them.

Sponsors:

A brief description about the company that is sponsoring our project is as follows. The name of the company is **Trees Technologies.** Incorporated in 1991, Trees has over 25 years of software and consulting experience. Over the last 10 years, TT (Tree Technologies) from its diverse portfolio of software projects converged its experience to develop and energize **Olivecliq Healthcare Platform**.

Furthermore, the hospital that we are collaborating with is **Maryam Memorial Hospital Peshawar Road, Rawalpindi**. This was suggested to us by the company itself as they had already worked before with the hospital. The hospital management agreed to provide us the video recordings and live feeds from their cameras and will place further cameras as per our requirements.

The links to both, the company's website, Olivecliq's website and hospital's website are as follows:

- Trees Technologies: https://www.treesvalley.com/
- Olivecliq Healthcare Platform: https://www.treesvalley.com/olivecliq
- Hospital (Maryam Memorial Hospital): https://www.marham.pk/hospitals/rawalpindi/maryam-memorial-hospital/peshawar-road

Project Overview:

The main working of this project revolves around gesture/action/event detection, recognition and classification. Many hospitals, especially private ones, already have some form of basic surveillance. But what do they do with that? Monitor for possible security incidents, perhaps notice any abnormal medical incidents – but all this is done by manually viewing the footage.

Would it not be more efficient to have a system set-up that would be fed the live camera feed and could analyze it in real-time, note any abnormalities and alert the appropriate personnel? This would not just reduce the need for manual reviewing of the footage or manual supervision of a patient, but also allow for rapid detection and response. Additionally, our model would be much more consistent and efficient than a human, once it was trained to detect an abnormality/incident.

Our vision for this project is to develop an AI that could assist the hospital by being able to monitor their camera feed and detecting medical abnormalities in patients, especially those incidents that require immediate intervention. Moreover, any noted incidents over a particular time period could be neatly summed up and presented to the administration – they could quickly see which issues they are facing more frequently and perhaps try to remedy them or prepare more resources to address the issue.

Motivation:

A hospital is an environment that is busy, always in demand yet frequently understaffed. Our project would allow for hospital staff to perform less manual supervision and direct their energy towards other, perhaps more critical activities. A digital monitoring system is also undoubtedly more reliable and consistent. The appropriate staff would rapidly be notified of any incidents and be able to address them. Additionally, the administration would benefit from a neat summation and statistics of the incidents.

Scope and Features:

After a detailed discussion with the company, our supervisor and after analyzing the hospital environment and talking to their administration and staff, we finalized the following use cases / functionalities for our project:

1. Injection SOPs Monitoring
2. Fainting Detection
3. Vomiting Detection
4. Drowsiness Detection
5. Empty Station Detection
6. Covid SOPs Monitoring

1: Injection SOPs Monitoring:

This feature was again suggested by the company and the hospital itself. This will be checking if the nurse is following proper steps while giving someone injection. For example, in order to inject someone, you first need to decontaminate the area of insertion with alcohol wipes, insert the syringe, after removing the syringe, apply pressure with a cotton bud and then finally properly dispose-off the syringe. These steps need to be performed in the above-mentioned order. Our model will record the actions and if the order does not match, it would generate a report regarding the particular nurse.

2: Fainting Detection:

Another feature for our model would be to detect someone fainting. In hospitals, if a person faints, he/she needs to be put on a stretcher/wheelchair and attended to immediately. Hence, if such an incident occurs, the model would immediately alert the attendings to proceed towards the fainted person.

3: Vomiting Detection:

For this feature, we are targeting the already admitted patients. As patients are admitted to their rooms and there is not always a nurse there to monitor every single person, we would need a camera to monitor for any unusual activity and alert the nurses/staff. In this, we would detect if a patient vomited and if it is detected, the staff/doctor would be pinged accordingly so that appropriate attention is given.

4: Drowsiness Detection:

In the hospital environment, it is common for the medical staff to work long shifts. Them being alert and at their best is critical for the health of the patients. If the doctors or nurses were feeling drowsy, that could lead to incidents – to prevent that, our model will be trained to identify drowsiness in a person and inform the appropriate personnel to note it and attend to the situation.
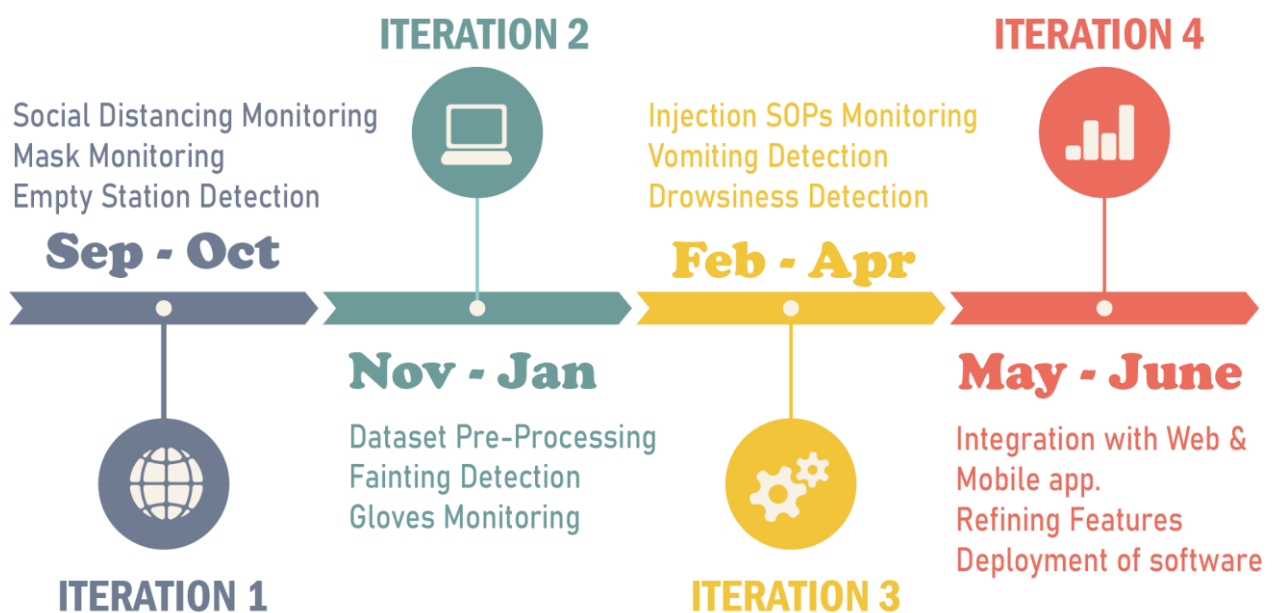
5: Empty Station Detection:

For hospitals, the nurse stations should never be empty as patients need to be observed and may need rapid aid at any time. Hence, our model will check if and when the nurse station is empty and generate a message/alert accordingly.

6: Covid SOPs Monitoring:

This feature is a much needed one as we have seen doctors getting diagnosed with this deadly virus and many of them passing away just due to treating their patients. For this feature, our model will detect different covid SOPs in the following order:

1. Patient is wearing a mask
2. Doctor is wearing proper surgical gloves
3. After the checkup, doctor takes off the gloves and disposes them.
4. The doctor washes/cleans hands with wipes
5. The doctor wears the gloves again.

Timeline:

ITERATION 2

ITERATION 4

Social Distancing Monitoring
Mask Monitoring
Empty Station Detection

Sep - Oct

Injection SOPs Monitoring
Vomiting Detection
Drowsiness Detection

Feb - Apr

Nov - Jan

Dataset Pre-Processing
Fainting Detection
Gloves Monitoring

May - June

Integration with Web &
Mobile app.
Refining Features
Deployment of software

ITERATION 1

ITERATION 3

Tools and Technologies:

As far as the tools are concerned, so far, we have planned on using the following:

Concepts:

Concepts	Hassan's Expertise (0 – 10)	Sana's Expertise (0 - 10)
Deep Learning	4	4
Computer Vision	3	2
App Development	10	8
Web Development	5	4

Tools:

Tools & Technologies	Hassan's Expertise (0 – 10)	Sana's Expertise (0 - 10)
Python	10	9
Flutter	8	8
Java	9	10
React JS	3	2
PyCharm IDE	10	10
Visual Studio Code	10	10
Android Studio	10	10
OpenCV	7	4
GitHub	9	8
Firebase	8	9

References:

- Gul, M. A., Yousaf, M. H., Nawaz, S., Ur Rehman, Z., & Kim, H. W. (2020). Patient monitoring by abnormal human activity recognition based on CNN architecture. *Electronics*, *9*(12), 1993. https://doi.org/10.3390/electronics9121993

- Yang, Y., Sarkis, R. A., El Atrache, R., Loddenkemper, T., & Meisel, C. (2021). Video-Based Detection of Generalized Tonic-Clonic Seizures Using Deep Learning. IEEE Journal Of Biomedical and Health Informatics, 25(8), 2997–3008. https://doi.org/10.1109/JBHI.2021.3049649

- Fall detection. imvia. (2020, April 20). https://imvia.u-bourgogne.fr/en/database/fall-detection-dataset-2.html

- Loey, M. (2021, February 15). COVID-19 Medical Face Mask Detection Dataset. kaggle. https://www.kaggle.com/mloey1/medical-face-mask-detection-dataset.

- Cabani, A., Hammoudi, K., Behnhabiles, H., & Melkemi, M. (2021). MaskedFace-Net – A dataset of correctly/incorrectly masked face images in the context of COVID-19. Smart Health, 19. https://doi.org/https://doi.org/10.1016/j.smhl.2020.100144