

CASE STUDY

Sanitas: Face Mask Detection in Medical Facilities

Sanitas enforces PPE compliance, ensures safety of their staff and patients amid COVID-19 pandemic



Sanitas is a leading provider of diagnostic imaging services in Odessa, Ukraine. The company utilizes state-of-the-art CT and MRI medical scanners to detect a wide range of conditions, to support the health and well-being in the local population.

Challenge

Sanitas wanted to protect their staff and patients from aerosol transmissible diseases (ATD), such as the novel coronavirus, in its medical imaging centers. They needed an intelligent, automated system to monitor wearing face masks in real time, as a prevention measure.

Solution

[VITech Lab](#) creatively integrated their [PPE Detector](#) into Sanitas' monitoring system. The solution was customized to capture images of staff, patients, and visitors in real time and to check if they wear a face mask. Detected violations were reported for corrective action.

Outcome

Real-time notifications on any violations of PPE compliance allowed Sanitas to act immediately if anyone had entered the building and "clean" zones without a face mask. A faster reaction means less exposure to ATDs, a safer and cleaner environment for all.



97.6% accuracy of detecting PPE violations

Real-time detection of face masks on/off

Immediate reporting of PPE violations

The Challenge

As nations around the globe confronted the novel coronavirus pandemic in 2020, they realized how vulnerable their healthcare systems were. Governments implemented the best possible public health policies to stop the spread of the virus, yet both public and private care facilities were quickly overrun with patients; doctors and nurses had to work even longer shifts, often without the required personal protective equipment (PPE).

Ukraine was also hit by COVID-19. As of August 2020, there were no less than 120,000 COVID cases officially reported, with 2451 individuals dead. Despite the government's efforts to enforce mask wearing, social distancing and lockdowns, the virus continued to spread even at a larger scale.

In those settings, businesses had to act quick to stay afloat. Some of them provided masks and sanitisers, others decided to go beyond distributing PPE to take advantage of AI and machine learning to protect both their workers and customers. So did Sanitas.

With capabilities in place to CT scan lungs of COVID-19 patients, Sanitas expected a surge in customer traffic. Hence, they needed to come up with an effective and cost-efficient solution to check if doctors, nurses, and patients wear PPE, and specifically face masks. Given how contagious and easily transmissible the novel coronavirus is, however, Sanitas could not rely on human checkers. An automated solution was the option they were looking for.

What VITech Lab Did

Sanitas approached VITech Lab to design and build a solution that would identify PPE violations in real time and report those violations to the in-house epidemiological safety team. The idea was that AI-driven face mask monitoring in combination with hand-washing and social distancing would significantly reduce the risk of COVID-19 spread among employees and patients in their medical centers, thus enabling the company to stay operational and functional amid the crisis.

The VITech Lab team suggested that their PPE Detector for Laboratory Safety could be customized to meet Sanitas' requirements. At the core of the detector is a machine learning model that processes and analyzes images captured by CCTV cameras to spot individuals not wearing any of four objects: Coat, Glasses, Gloves, Mask. Notifications are dispatched when the absence of PPE is detected.

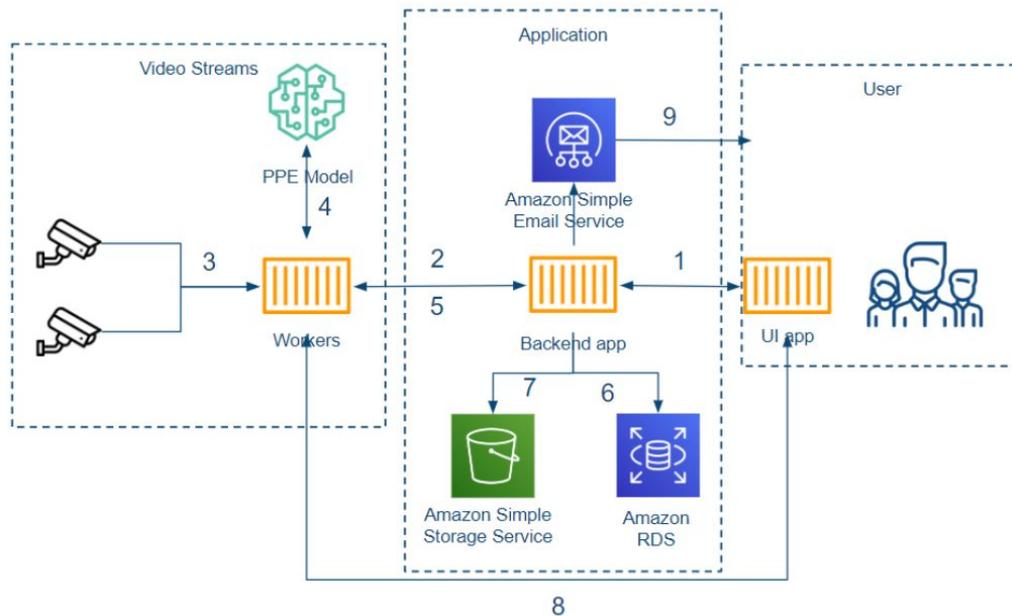
To begin with, VITech Lab reviewed Sanitas' monitoring solution and CCTV cameras. For the machine learning model to work efficiently, the cameras must catch video streams in high



quality with minimum latency. If so, video streams can be "sliced" frame by frame to push the individual high-resolution images for pixel-by-pixel ML analysis. Otherwise, the model will have low accuracy in image recognition, rendering the entire system useless.

Then, Sanitas' infrastructure and monitoring ecosystem was reviewed. It was critical for the client to make sure that a new cloud-hosted solution could be technically integrated into the existing system, to minimize spending.

After the initial analysis and review, the following architecture was proposed:



The architecture consists of three parts: User UI, Application backend, and Video streams processing using machine learning. Here's how it works:

- Users access the application's frontend — the user interface — to manage cameras and to receive video streams and violation alerts (1)
- Using the application, the user signals the backend app and the workers to start creating new video streams; i.e. switch on the cameras (2)
- The workers start receiving video streams in real time and pushing them to the PPE model (3)
- The workers push images from video streams to the Amazon SageMaker model endpoint where the PPE violations are detected (4)
- Images featuring PPE violations are sent to the backend application to be stored in either Amazon S3 or Amazon RDS (5, 6, 7)
- The UI gets URLs for every video stream with violations and calls the workers for review (8)
- Amazon SES is used for user password management and sending reports (9)

Sanitas agreed to implement the solution at one of its facilities and to scale the system organization-wide if it delivered high accuracy and enabled the epidemiological team to faster identify and react to PPE violations like not wearing a face mask in the building.

Value Delivered

Since the original machine learning model used in the [PPE Detector solution](#) was trained on 10K+ images of doctors, nurses and patients wearing/not wearing a face mask and other types of PPE, the solution designed and built for Sanitas demonstrated accuracy of no less than 97% in detecting PPE violations from the start.



The solution was integrated with Sanitas' existing monitoring system, ensuring that violations could be identified and reported without a significant investment in a new application/UI from the client.

Because the solution is hosted in the cloud, it can be easily scaled and implemented in new locations, if need be. Resource utilization was optimized for cost-efficiency — the client pays only when the solution is operational.

High accuracy, flexibility, and user-friendliness of the solutions allowed Sanitas to monitor its premises more efficiently. Building access areas, common facilities, and "safe zones" were under smart cameras' control — all individuals without a face mask were detected in real time and immediately reported to the in-house epidemiological team. Fast reaction proved critical to limiting the risk of exposure to SARS-CoV-2.

Before a safe and effective vaccine against COVID-19 becomes available, doctors, nurses and all individuals visiting healthcare facilities remain increasingly vulnerable to the virus. Proper protection with PPE, including face masks is of major importance. With a new, smart PPE detection system in place, Sanitas safeguards its staff and patients against contracting infection, which allows the company to stay operational and assist communities amid the pandemic.



Have any questions or ready to start?

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