**Smart Operation Theatre**

Dr Cai Yiyu

Dr Huang Lihui

Abu Bakr Azam  
School of Mechanical and Aerospace Engineering

Dr Luke Tay

Singapore General Hospital

***Abstract******-*** During surgeries, there's a risk of medical gauzes being left inside patients’ bodies, leading to “Gossypiboma” in patients and legal problems for hospitals. The current prevention method of this is a manual tally of the 100s of gauzes going in and out of bodies by nurses, which is time-consuming and diverts resources from patient care.

In partnership with Singapore General Hospital (SGH) we have developed an AI-based system for gauze counting in surgical settings. Utilizing real-time video surveillance and object recognition technology powered by YOLOv7, a Machine Learning(ML) model was designed to monitor gauzes on two designated trays labelled "In" and "Out". Gauzes are tracked from the "In" tray, prior to their use in the patient's body & in the "Out" tray post-use, ensuring accurate counting and verifying that no gauze remains inside the patient at the end of the surgery. We have trained it using numerous images from Operation Theatres & augmented it to satisfy all possible scenarios.

This study has also addressed the shortcomings of previous project iterations. Previously, the project employed two ML models: one for human detection and another for gauze detection, trained on a total of 2800 images. Now we have an integrated model capable of identifying both humans and gauzes, using a training set of 11,000 images. This has led to improvements in accuracy and increased the frame rate from 8 FPS to 15 FPS now. Incorporating doctor’s feedback, the system now also supports manual count adjustments, enhancing its reliability in actual surgeries.