IEEE COMPSOC

HACKHUB

FLAGSHIP EVENT 2025

Domain: Artificial Intelligence and Machine Learning

College: Sri Eshwar College of Engineering, Coimbatore

Team Name: Ctrl+Alt+Elite

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PROBLEM STATEMENT

Surgical skill assessment is crucial for ensuring patient safety and improving surgical outcomes. However, traditional methods of evaluation are **subjective**, **time-consuming**, and **reliant on expert reviewers**, leading to inconsistencies in training and limited scalability.

With the increasing availability of surgical video data and advancements in AI, there is an opportunity to develop an **automated, real-time surgical skill assessment system**. Such a system can provide **objective, data-driven feedback** to surgeons, enhancing training efficiency and reducing the risk of errors during procedures.

There is a pressing need to address these challenges by creating an **AI-powered platform** that analyzes surgical videos to assess skill levels, track hand movements, evaluate instrument handling, and provide actionable insights for improvement.

OUR SOLUTION

We propose an **AI-driven surgical skill assessment platform** that leverages **computer vision** and **deep learning** to provide real-time, objective feedback to surgeons.

Key Features:

- **Real-Time Analysis**: Tracks hand movements, instrument handling, and decision-making during surgeries.
- **Skill Assessment**: Evaluates surgical performance using metrics like precision, speed, and error rates.
- **Actionable Feedback**: Provides personalized recommendations for skill improvement.
- **Scalable Training**: Enables consistent and efficient training for surgeons.

Technology Stack:

- **Computer Vision**: YOLO for instrument detection and tracking.
- **Deep Learning**: PyTorch for model training.
- **Data Preprocessing**: OpenCV and FFmpeg for video frame extraction and normalization.

UNIQUENESS & INNOVATION

Our AI-powered surgical skill assessment platform stands out through its **innovative features** and **unique approach** to addressing challenges in surgical training and evaluation:

1. **Real-Time Feedback**:
   - Provides **instant, actionable insights** during surgeries or training sessions, unlike traditional offline analysis methods.

2. **Comprehensive Skill Assessment**:
   - Combines **multiple metrics** (e.g., hand movement efficiency, instrument handling, decision-making) for a holistic evaluation of surgical skills.

3. **Scalable and Accessible:**
   - Designed for cloud based deployment, enabling widespread adoption in surgical settings.

WHY YOU SHOULD CHOOSE US

1. Commitment to impact:

- We are passionate about improving surgical training and patient outcomes through innovative technology.

2. Reliable Project Execution:

- We follow a **structured development process**, ensuring timely delivery and high-quality results.

3. User-Centric Design:

- We prioritize the needs of surgeons and medical institutions, ensuring our solution is intuitive, practical, and easy to integrate into existing workflows.