**Literature Survey on Facial Recognition Systems for Proctoring**

**I. Analysis of Key Papers**

**Paper 1: "Edge-optimized Facial Recognition for Reliable Proctoring on Resource-Limited Devices" (Johnson et al., 2022)**

**Key Contributions of the Paper**

* This paper presents edge-eye optimized facial recognition for proctoring, which has reduced bandwidth usage by 92% compared to Cloud-based approach.
* The implementation of real-time proctoring with multiple devices with live facial detection. This was a lightweight facial recognition system for student devices.

**Drawbacks:**

* Poor Performance under Changing Light Conditions like recognition accuracy fell to 76.3% under low light and had problems with harsh backlight and glare, where students had to manually adjust the camera.
* Less Processing on Lower-End Devices Performance suffered on less than 2GB RAM machines, resulting in frame rates going below 10fps on low-end computers and very high battery consumption on tablets.

**Our Solution:**

* Real-Time Student Monitoring: We present OpenSeeFace for real-time head pose and gaze estimation with enhanced proctoring accuracy using low system requirements.
* Head Position Estimation: Dlib is used for accurate estimation of the student's head position, thereby enabling tracking to be more robust and less hardware dependent.

**Paper 2: "Demographic Performance Disparities in Facial Recognition Proctoring Systems" (Johnson et al., 2022)**

**Key Contributions:**

* Facial Recognition Demographic Bias Analysis: The research analyzed the differential facial recognition performance in online exam proctoring software among demographic groups (e.g., race, gender, age) and identified substantial biases impacting accuracy for some groups.
* Mitigation by Dataset Augmentation: To mitigate these biases, the research proposes enhancing training sets to be diverse and representative so that the facial recognition systems will perform just as well for all demographic groups.

**Identified Drawbacks:**

* The primary limitation of this system is substantial demographic performance differences, having increased false rejection rates for dark skin and religious heads.
* The lack of diversity in the training data in this architectural solution will restrict the samples being trained on lighter backgrounds and cultural clothing.
* The Rigid authentication requirements require the students to pose their head on a fixed position and the adaptivity through different head positions.

**Our Solution Enhancements:**

Real-Time Environmental Calibration and Setup

Using OpenCV and WebSocket, we'll create an interactive environment wizard for providing real-time feedback regarding the optimal position of the camera and light detection. It's a feature to adjust the environment for proper facial recognition regardless of the lighting conditions.

2Adaptive, Resource-Efficient Interface:

By combining Flask and JavaScript, we will build a dynamic, responsive user interface that reacts according to device capability. This encompasses progressive resolution scaling and resource-aware modes, delivering seamless performance even on low-power devices.

Demographic Fairness and Strong AI Training:

 Using OpenSeeFace, dlib, and Flask, we will emphasize creating a varied training pipeline using synthetically generated data to combat demographic and lighting variation. This will involve fairness-aware training, dataset balancing, and use of the optimal model architecture for improved accuracy across all segments of users.