

## Section 1: Administrative and Core Identity

### Project Title

AI-Powered Oral Cancer Detection using Image Processing and Machine Learning

### Team Members and Roles

Student Name	Role
H G Pratheek Gowda (Team Lead)	Software
Muskan S	Software
Pavan Kumar PK	Hardware
Prajwal M D	Hardware
Chinmayee Chougale	Data Analyst

### Student Status

Student Name	Department	Programme	Status
H G Pratheek Gowda	Computer Science & Engineering	B.E.	Graduated 2025
Muskan S	Computer Science & Engineering	B.E.	Graduated 2025
Pavan Kumar P K	Electrical & Electronics Engineering	B.E.	Graduated 2025
Prajwal M D	Electrical & Electronics Engineering	B.E.	Graduated 2025
Chinmayee Chougale	Information Science & Engineering	B.E.	Currently in 4 <sup>th</sup> Year

### Institution

University/College: Malnad College of Engineering, Hassan

### Project Duration

Project Dates: January 2025 – February 2026

### Key Adviser / Mentor

Dr. Geetha Kiran A, Dean (Corporate Affairs), Malnad College of Engineering, Hassan Grant Information

Grant Approved: ₹ 2,00,000

## Section 2: Visual Assets

### Profile Photo:



Pratheek Gowda



Muskan S



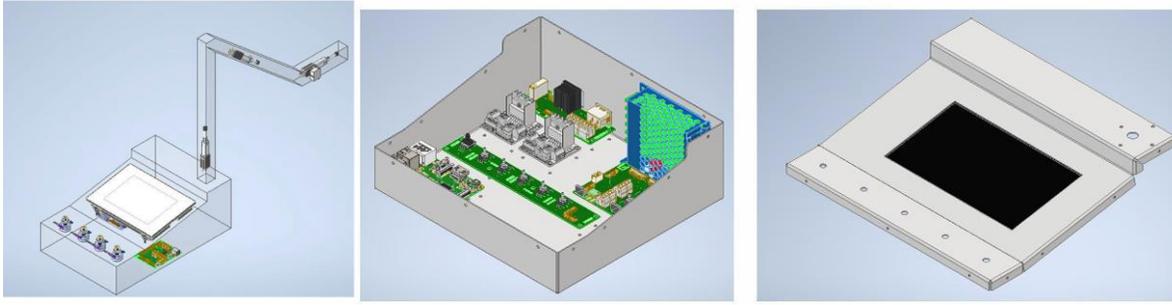
Pavan Kumar P K



Prajwal M D.



Chinmayee Chougale

**Project Image:****Process Photo:****Section 3: Project Narrative****One-Line Summary**

*An AI-enabled portable oral screening device that detects early signs of oral cancer and dental abnormalities using image processing and machine learning.*

**Problem Statement**

Oral cancer and dental diseases are major public health concerns, particularly in developing regions where access to specialized dental care is limited. Early detection significantly improves treatment success and survival rates, yet many cases are diagnosed at advanced stages due to lack of regular screening and limited diagnostic infrastructure. Rural and underserved populations face challenges such as shortage of dental professionals, expensive diagnostic equipment, and inadequate awareness. Traditional oral examination procedures are often manual, time-consuming, and dependent on specialist expertise.

To address these challenges, there is a need for an affordable, portable, and intelligent diagnostic solution capable of performing rapid preliminary screening of oral conditions. Such a system should assist healthcare providers in identifying suspicious lesions or abnormalities at an early stage, enabling timely medical intervention and reducing mortality associated with oral cancer.

**The Solution**

The proposed system is a portable AI-powered oral screening device designed to support early detection of oral diseases, including oral cancer. The device integrates a high-resolution intraoral camera, embedded computing platform, motion control mechanisms, and machine learning algorithms to capture and analyze images of the oral cavity.

The system is built around the Rockchip RK3566 System-on-Chip (SoC), which includes a quad-core Cortex-A55 CPU and a dedicated Neural Processing Unit (NPU) for real-time AI inference. The camera captures high-quality images of the oral cavity, while linear actuators and servo motors allow controlled positioning for systematic scanning. The captured images are processed using AI-based image processing algorithms to detect abnormal patterns such as lesions, discolorations, or tissue irregularities.

A 7-inch touchscreen interface allows healthcare professionals to view live images and AI analysis results instantly. The device operates on a Linux-based environment (Ubuntu) and supports connectivity options such as Wi-Fi and Ethernet for potential tele-dentistry applications.

The solution provides a cost-effective and portable diagnostic platform that can be deployed in clinics, rural health centers, mobile health camps, and telemedicine programs to facilitate early detection and preventive oral healthcare.

### Methodology and Key Technologies

The system integrates embedded hardware, computer vision, and machine learning techniques for automated oral screening. Key technologies include:

- Embedded AI platform based on Rockchip RK3566 SoC
- Neural Processing Unit (0.8 TOPS) for real-time inference
- High-resolution USB intraoral camera (1280x720)
- Image preprocessing and feature extraction techniques
- Machine learning models for anomaly detection
- Linear actuators and servo motors for automated scanning
- Ubuntu Linux operating system for AI deployment
- Wi-Fi and Ethernet connectivity for tele-dentistry integration

These technologies collectively enable accurate imaging, automated scanning, and real-time diagnostic assistance.

### Key Findings and Results

The developed prototype successfully demonstrates a functional AI-enabled oral screening system capable of capturing intraoral images and performing preliminary analysis. The integration of an embedded NPU allows AI inference directly on the device, enabling faster processing without dependence on cloud infrastructure.

The mechanical design with linear actuators and servo motors enables controlled movement of the camera arm for systematic scanning of different regions within the oral cavity. The device also incorporates a high-resolution display interface that allows practitioners to visualize live imaging and AI-assisted insights.

Initial testing indicates that the system can assist in identifying potential abnormalities in oral tissues, supporting dentists during preliminary diagnosis. Additionally, the portability and compact design make it suitable for rural screening programs, dental camps, and telemedicine applications. The prototype demonstrates the feasibility of integrating embedded AI and imaging technologies to improve accessibility and efficiency in dental diagnostics.

### Future Scope and Next Steps

Future work will focus on improving the accuracy and robustness of the AI detection models through training with larger and more diverse oral image datasets. Clinical validation in collaboration with dental professionals will be necessary to evaluate diagnostic performance and reliability.

Further enhancements include integration of cloud-based data storage, tele-dentistry capabilities, and automated reporting systems.