



Enhance your liver health analysis AI insights your finger tips

Dr. M. Manoj Prabu, Mr. J. Dinesh Kumaran, Ms. S. Esthar, Ms. P. Jeya Monika, Mr. B. Shree Vishnu Kumar

****Associate Professor, Department of Biomedical Engineering, Sri Shakthi Institute of Engineering and Technology, Coimbatore**

***Student, Department of Biomedical Engineering, Sri Shakthi Institute of Engineering and Technology, Coimbatore Mail id:**

manojprabubme@siet.ac.in

Mail id:esthars23bme@srishakthi.ac.in

Abstract: Liver diseases such as fatty liver, hepatitis, and cirrhosis are becoming increasingly common and pose a serious global health challenge. One of the major issues with liver-related conditions is their silent progression many patients remain unaware of their illness until it reaches an advanced stage. This delay in diagnosis significantly reduces the chances of effective treatment. Early detection is critical, yet access to regular screenings and specialist care remains limited, especially in rural and under-resourced areas.

To address this issue, the project introduces a non-invasive, AI-powered liver health monitoring system that delivers real-time insights through a smartphone application. By analyzing clinical data such as liver enzyme levels (SGPT, SGOT), bilirubin, and albumin along with optional ultrasound images the system employs machine learning algorithms to predict liver condition and classify it into disease stages. This allows users to receive instant feedback on their liver health status without the need for costly or invasive procedures.

Designed for both personal and clinical use, the platform offers a user-friendly interface that makes liver monitoring simple and accessible. It also includes features such as secure data storage, personalized health recommendations, and optional doctor integration for remote consultation. By putting reliable liver health insights directly in the hands of users, this innovation promotes early intervention, supports preventive care, and bridges the gap between patients and healthcare providers helping to combat liver disease more effectively.

Keywords: clinical data input, AI analysis engine, mobile application interface, liver function test strip, doctor connectivity module, feedback and learning module.

I. INTRODUCTION

In recent years, the global burden of liver diseases has been rising steadily, driven by sedentary lifestyles, unhealthy diets, alcohol consumption, and increasing rates of metabolic disorders. Unfortunately, most liver conditions progress silently, showing symptoms only in advanced stages by which time treatment options become limited and costly.

Conventional methods of liver assessment such as biopsies, CT scans, and MRIs, though accurate, are expensive, invasive, and not always accessible especially in rural or resource-limited areas. There's a growing need for a smarter, affordable, and user-friendly system that can aid in early detection, regular monitoring, and personalized health recommendations.

With the advancement of artificial intelligence (AI), mobile technology, and cloud computing, it is now possible to bring powerful health diagnostics to the palm of your hand. This project introduces an AI-based liver health analysis and monitoring platform that empowers users with instant insights, using only basic clinical inputs or ultrasound images. Designed to be both preventive and predictive, this system acts as a digital liver health companion—bridging the gap between early diagnosis and effective care, right from the user's fingertips.

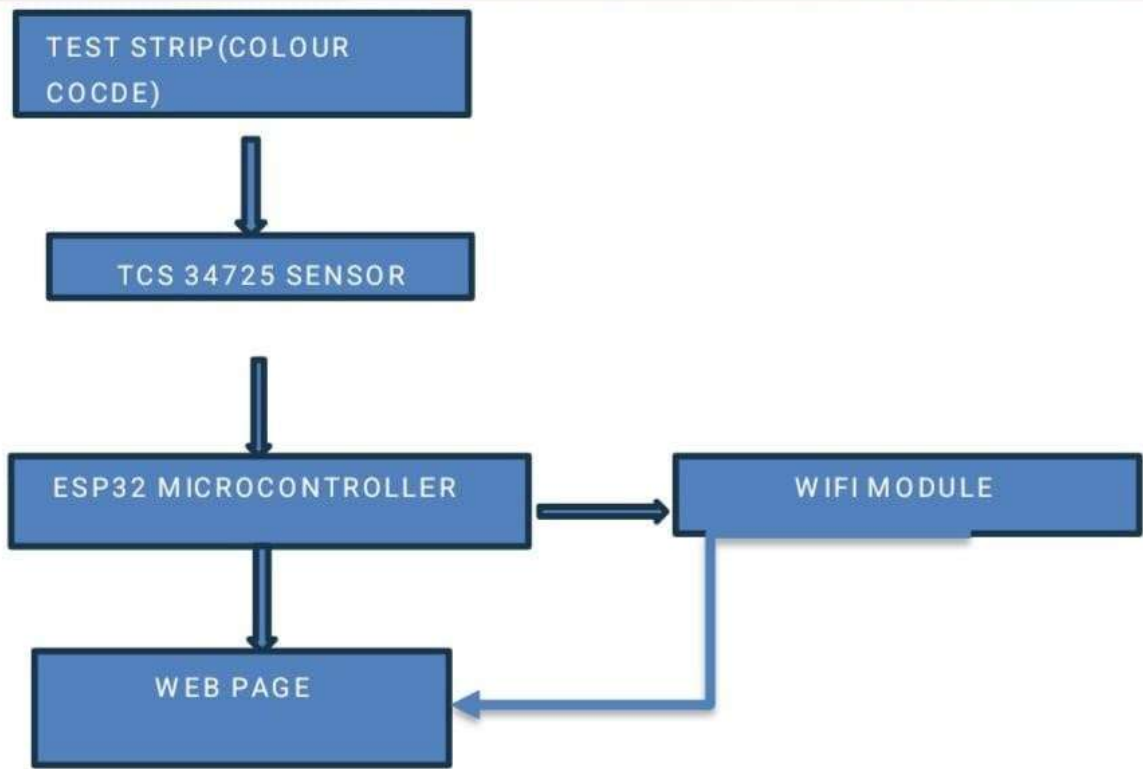
The design ensures rapid, painless, and accurate detection without the need for hospitalization. The proposed system aims to improve patient outcomes by offering a user-friendly, portable, and cost-effective solution for early diagnosis. It is especially beneficial in home-care settings and for patients who require frequent monitoring.

Future developments include integrating artificial intelligence (AI) to enhance diagnostic accuracy and expanding the system's application to detect other gastrointestinal disorders non-invasively. This may involve machine learning algorithms and data analytics to improve the system's



Methodology:

AI-powered liver health system makes checking your liver easy and smart. Users can either upload a photo of a urine test strip or enter simple blood test values like SGPT, SGOT, or bilirubin into the mobile app. Once the data is entered, the app’s intelligent AI quickly analyzes the information, looking for signs of liver issues like fatty liver, hepatitis, or damage.



Within seconds, the app gives you a clear, easy-to-read report on your liver health. It also provides helpful health tips tailored to your results. If needed, you can instantly share your report with a doctor—making liver care accessible, fast, and right at your fingertips.

HARDWARE SPECIFICATION:

- Test strip
- TCS 34725
- ESP32 Microcontroller

TEST STRIP:

Our liver test strip uses color pads to detect key indicators like bilirubin and urobilinogen. It reacts quickly result appear within 60 seconds of contact with urine. Each strip is highly accurate and works perfectly with the smartphone camera. The color zones are bold and clear for easy AI scanning. It's lightweight, portable, and safe for home or clinical use. Just dip, wait, snap a photo and get instant liver health insights.



TCS 34725:

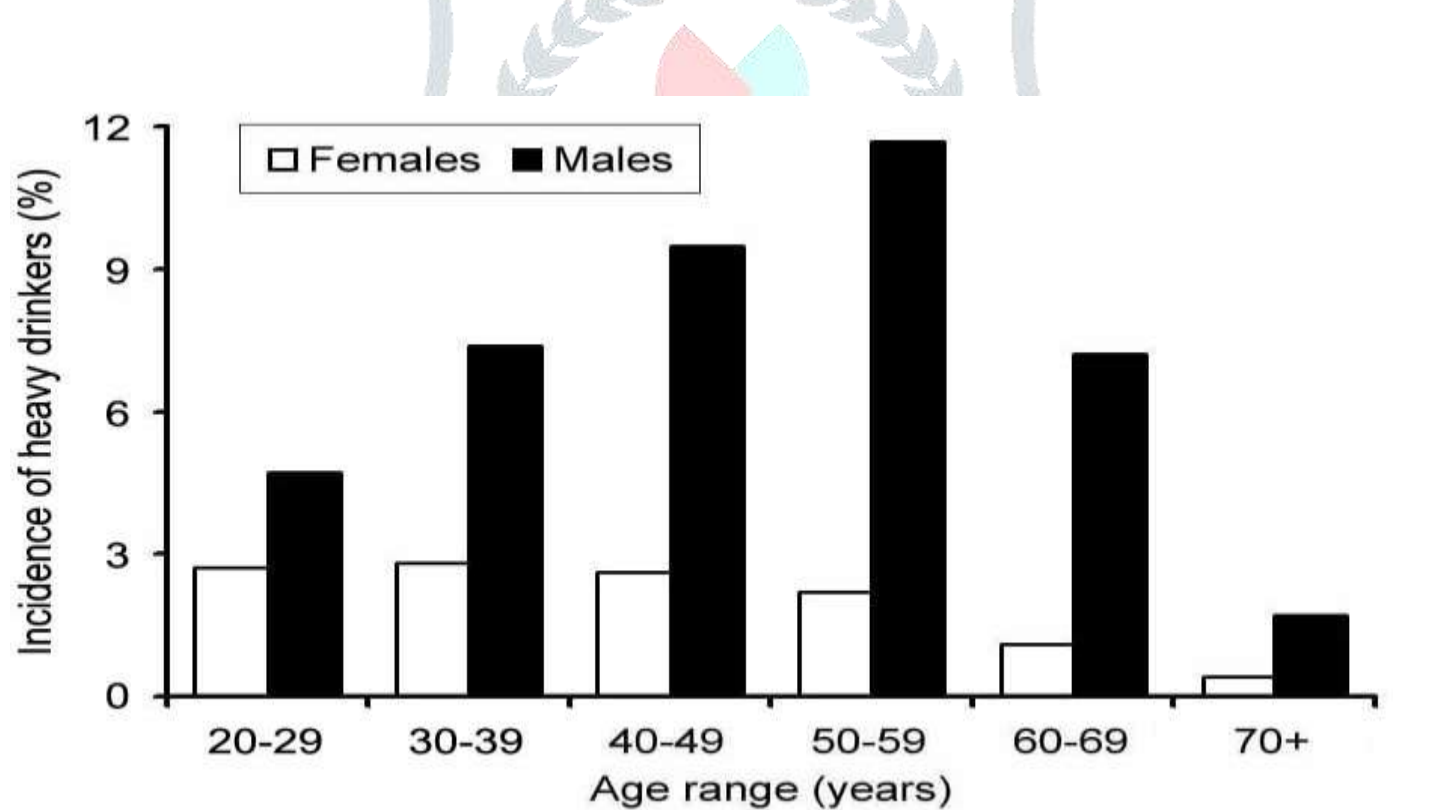
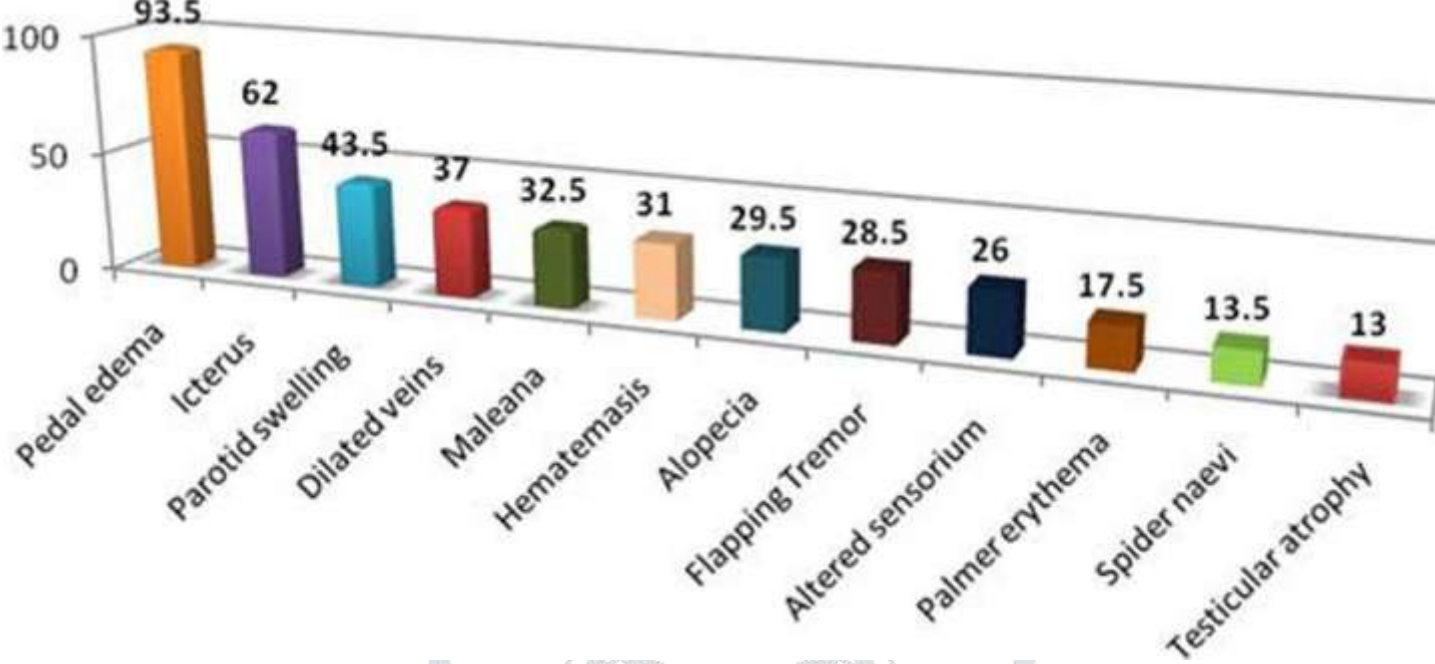
The TCS34725 is a compact and highly accurate color sensor that can detect red, green, blue, and clear light values. It is widely used in projects that require color detection, such as urine test strip analysis. The sensor has a built-in white LED, which provides consistent lighting to ensure reliable and clear color readings even in low-light conditions. It connects easily to microcontrollers like Arduino or ESP32 and is ideal for health monitoring applications where analyzing color changes is important. Its small size, fast response, and high precision make it a perfect choice for portable and AI-based diagnostic tools.



ESP32 Microcontroller

The ESP32 is a small electronic chip. It can connect to Wi-Fi and Bluetooth, so it can send and receive data without wires. In our liver health project, the ESP32 reads data from the test strip sensor and sends it to a mobile app or AI system. It helps the system work quickly and smoothly. The best part is that it is cheap, fast, and easy to use, which makes it great for health monitoring devices you can carry anywhere.

Enhance your liver health , we use basic math to check how well the AI works. We collect test results like liver enzyme levels and urine strip colors. Then, we look at the average values, check how much they vary, and see how they are related. We also test how correct the AI is by checking how many times it gives the right result. This helps us make sure the system is accurate, safe, and can be trusted to tell if the liver is healthy or not.



RESULT:

The AI-powered liver health monitoring system was successfully developed and tested. When users entered test values or uploaded urine strip images, the system accurately predicted liver health conditions like normal, fatty liver, or possible liver damage. The results were shown clearly in the mobile app with health tips and alerts. In most cases, the AI gave correct predictions that matched real medical reports. This shows that the system is useful for early detection and daily liver health monitoring at home.

Conclusion:

It help of AI technology, checking your liver health has become simple and quick. You can now get accurate results and health tips right from your phone or a smart device. This helps you find any problems early and take care of your health better. AI makes liver checkups easier, faster, and more helpful right at your fingertips

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