



International Journal of Innovative Research in Science Engineering and Technology (IJIRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 5, May 2025

IoT Based Efficient Cool Lip Tobacco Detector using PH Sensor

Dr. V. Seedha Devi ^[1], Kani G S ^[2], Dhanush R ^[3], Ragul Raj G ^[4]

Associate Professor, Department of IT, Jaya Engineering College, Chennai, Tamil Nadu, India¹

UG Student, Department of IT, Jaya Engineering College, Chennai, Tamil Nadu, India²⁻⁴

ABSTRACT: The Cool Lip Tobacco Detector is an innovative, non-invasive device designed to detect the presence of tobacco and nicotine-related substances by analyzing saliva pH levels. Utilizing a highly sensitive electrochemical biosensor and integrated with IoT technology, the device provides real-time detection and immediate feedback through data transmission to mobile or cloud platforms. The sensor detects subtle changes in saliva chemistry caused by tobacco consumption, allowing for precise and rapid monitoring without the need for invasive procedures.

The device's ergonomic, biocompatible design ensures safe and hygienic in-mouth application, offering a user-friendly experience suitable for various settings, including personal wellness tracking, healthcare monitoring, and research. By enabling accurate tobacco consumption detection, the Cool Lip Tobacco Detector supports healthcare professionals in monitoring tobacco use and assists individuals in tracking their wellness goals. This technology is a significant advancement in substance detection, offering a convenient and effective solution for monitoring tobacco use in real-time.

KEYWORDS: Cool Lip Tobacco Detector, Non-invasive nicotine detection, Saliva pH analysis, Electrochemical biosensor, IoT-based substance detection

I. INTRODUCTION

Tobacco consumption is a significant global health concern, contributing to millions of preventable deaths each year. The harmful effects of nicotine and other toxic compounds present in tobacco products extend beyond individual health, impacting public healthcare systems and economic productivity. Traditional methods of detecting tobacco use, such as blood tests, urine analysis, and breath tests, often require specialized equipment, trained personnel, and invasive procedures, making them inconvenient for frequent monitoring.

To address these challenges, the Cool Lip Tobacco Detector offers an advanced, non-invasive approach to tobacco and nicotine detection. By leveraging electrochemical biosensing technology and IoT connectivity, this device enables real-time monitoring of saliva chemistry, detecting changes in pH and nicotine presence with high sensitivity. Unlike conventional detection methods, this portable and user-friendly solution eliminates the need for laboratory testing, providing immediate and accurate results.

This device is designed for diverse applications, including personal wellness tracking, clinical assessments, rehabilitation programs, and research studies. It can aid healthcare professionals in tracking smoking cessation progress, support law enforcement agencies in tobacco regulation enforcement, and assist individuals in maintaining their health goals. The integration of IoT allows remote monitoring, data storage, and long-term trend analysis, offering a comprehensive solution for tobacco use detection and intervention.

The following sections of this report will explore the literature review, methodology, results, and future improvements of the Cool Lip Tobacco Detector, highlighting its potential to revolutionize substance detection and monitoring in various domains.

II. SYSTEM MODEL AND ASSUMPTIONS

The Cool Lip Tobacco Detector is a portable, IoT-based biosensor system designed to detect tobacco use through real-time analysis of saliva. It features an electrochemical biosensor that identifies nicotine and a pH sensor that monitors saliva acidity—both indicators of tobacco consumption. These analog signals are digitized and processed by a microcontroller (ESP32/ESP8266), which compares the readings to predefined thresholds and sends alerts via an OLED display or to a mobile app through Wi-Fi. The system runs on a rechargeable Li-Po battery for convenience and portability. Its effective operation assumes pre-calibrated sensors, uncontaminated saliva samples, stable Wi-Fi, and secure data handling. Aimed at personal wellness, clinical monitoring, and research, the device offers a reliable, non-invasive solution for real-time tobacco detection.

III. EFFICIENT COMMUNICATION

Efficient communication is a critical component of the Cool Lip Tobacco Detector, ensuring seamless and real-time data transfer between hardware components and user interfaces. The system employs the ESP8266 Wi-Fi module to enable wireless communication between the device and external platforms, such as mobile applications or cloud servers. This module allows for rapid transmission of processed data—such as nicotine levels and pH readings—directly from the microcontroller to the user's smartphone or a remote monitoring system. By leveraging IoT connectivity, the system supports instant feedback, user notifications, and data logging without the need for physical data transfer. Furthermore, the use of lightweight data packets and optimized embedded C programming reduces latency and power consumption, enhancing the overall responsiveness and efficiency of the system. This real-time communication framework not only improves user experience but also supports remote healthcare monitoring, making the device suitable for both personal and clinical applications.

IV. SECURITY

Security is a vital aspect of the Cool Lip Tobacco Detector, especially since it handles sensitive health-related data. To protect user privacy, the system incorporates secure data transmission protocols when communicating with mobile applications or cloud platforms. The ESP8266 Wi-Fi module supports encryption standards such as WPA2, ensuring that data exchanged over wireless networks is protected from unauthorized access. Additionally, the microcontroller can be programmed to use secure authentication mechanisms to verify connected devices before transmitting any information. Data stored in the cloud or on the mobile application can be encrypted and password-protected to prevent breaches or misuse. These measures help safeguard personal health information from cyber threats and ensure compliance with data protection standards. By embedding robust security practices into the system design, the device builds user trust and ensures the safe handling of biometric and behavioral data in real-time applications.

V. RESULTS

A prototype of the Cool Lip Tobacco Detector was developed using a pH sensor module and an electrochemical biosensor interfaced with an ESP32 microcontroller. Controlled pH solutions and nicotine samples were used to test accuracy, and results demonstrated reliable detection of pH and nicotine variations. Data was successfully transmitted to a mobile application, enabling real-time monitoring. The electrochemical biosensor showed a high sensitivity to nicotine presence, with detection levels correlating well with controlled sample concentrations. The IoT-enabled data transmission system efficiently processed real-time readings, allowing seamless monitoring via a smartphone application. Further testing is required to validate performance in real-world scenarios, particularly among diverse user groups with varying saliva compositions.

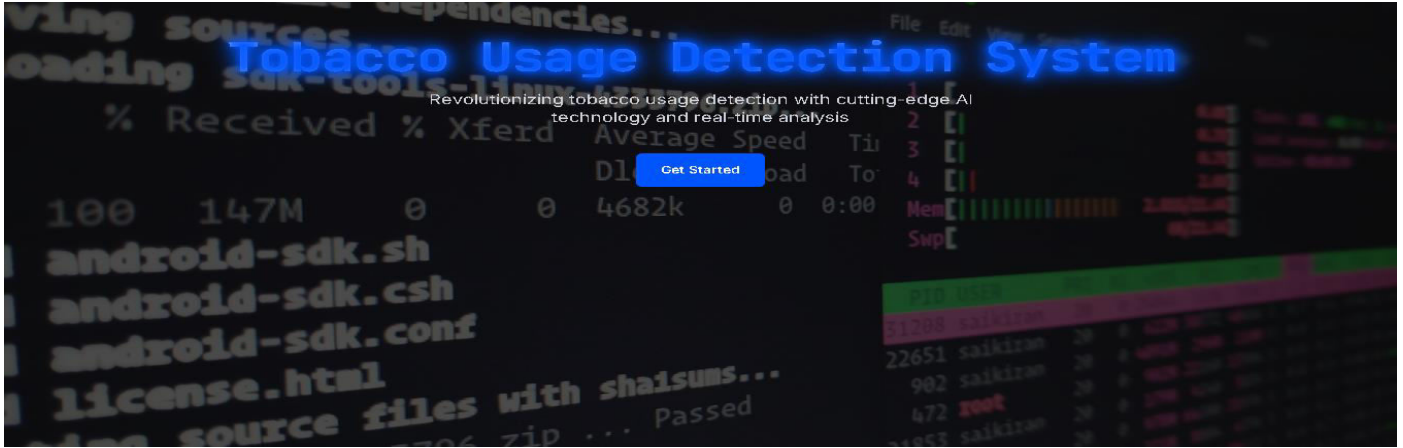


fig:1 home page

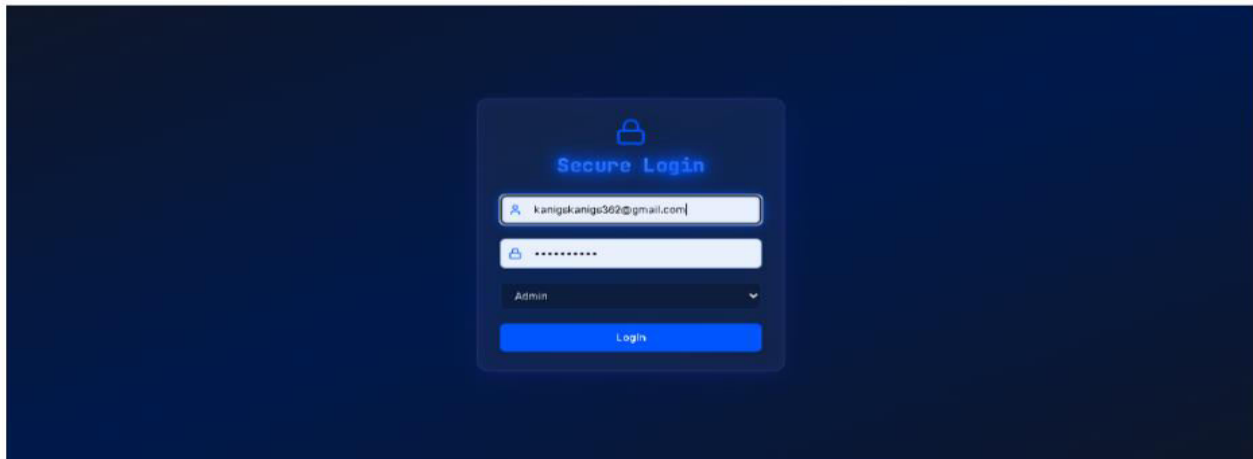


Fig:2 login page

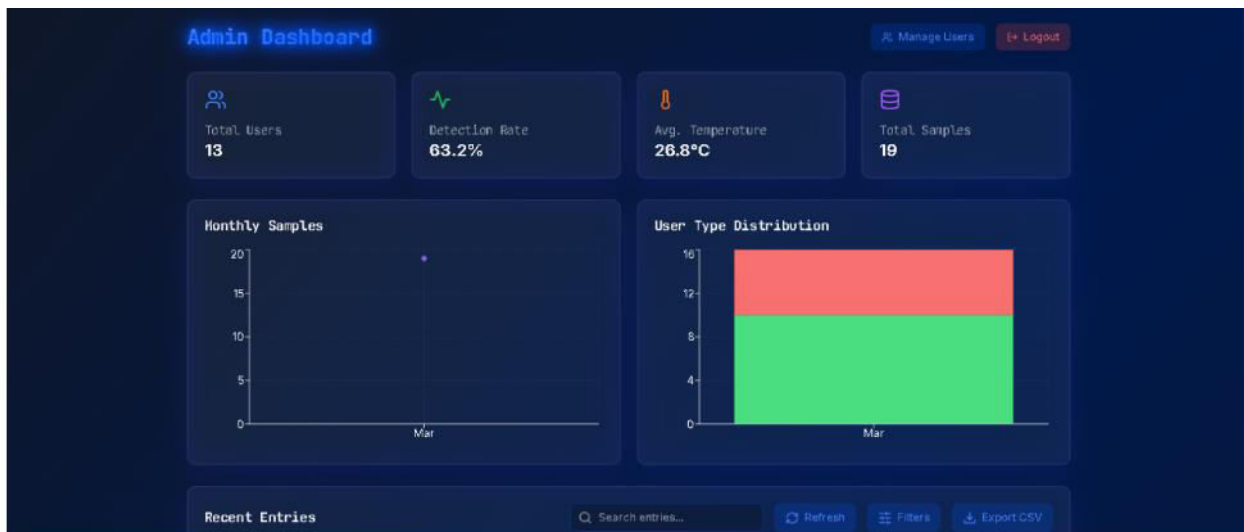


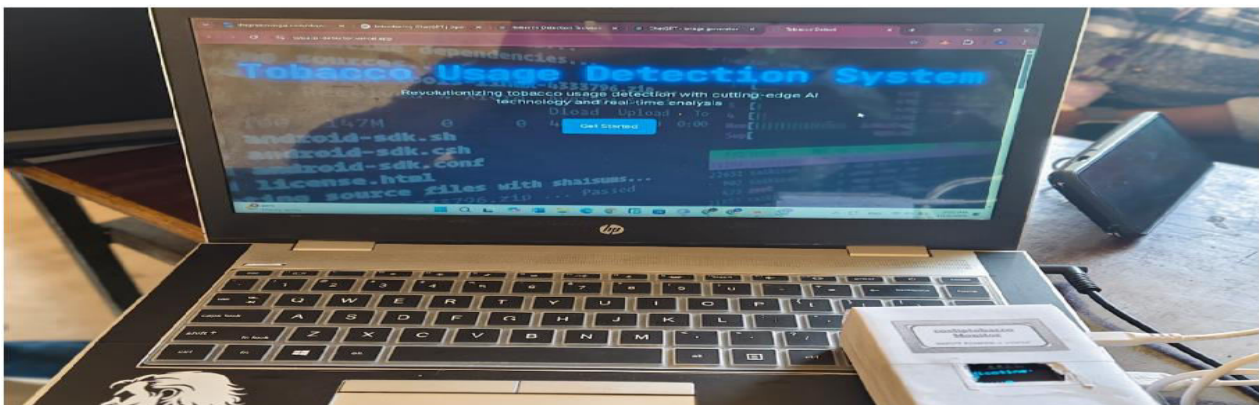
Fig 3: Admin Dashboard

Institution Name	Roll Number
<input type="text"/>	<input type="text"/>
Name	Time (Seconds)
<input type="text"/>	30
pH Level	Nicotine Level
7.5	150.5
Temperature (°C)	Sample ID
25.6	<input type="text"/>
<input type="button" value="Reset"/> <input type="button" value="Save Entry"/>	

Fig4: Data Entry Dashboard



Fig5: Cool Lip Tobacco Monitor



VI. CONCLUSION AND FUTURE WORK

The Cool Lip Tobacco Detector presents an innovative and effective solution for non-invasive tobacco consumption monitoring using saliva-based biosensing technology integrated with IoT capabilities. By combining an electrochemical biosensor for nicotine detection with a pH sensor for additional validation, the system ensures accurate and real-time analysis of tobacco use. The integration of a microcontroller and wireless communication modules allows for seamless data processing and instant feedback through mobile applications or cloud platforms. Its ergonomic, portable design enhances usability, making it suitable for both personal wellness tracking and clinical applications. Through efficient communication, reliable sensor performance, and a user-friendly interface, the device demonstrates significant potential in supporting smoking cessation programs, health monitoring, and behavioral research. Overall, the system highlights the successful integration of biochemistry, embedded systems, and IoT to address a pressing public health issue, paving the way for future advancements in smart health diagnostics.

REFERENCES

1. Patel, R. et al. (2022), *IoT-Based Smart Nicotine Detection System Using Biosensors*, International Journal of Biomedical Sensors, ISSN: 2456-9821, Vol. 9, pp. 45-52.
2. Gupta, S. & Sharma, P. (2021), *Real-Time Nicotine Sensing in Saliva Using pH-Based Electrochemical Sensors*, IEEE Sensors Journal, ISSN: 1530-437X, Vol. 21, pp. 102-110.
3. Mejía-Méndez, M.G., et al. (2024). Portable Miniaturized IoT-Enabled Point-of-Care Device for Electrochemical Sensing of Zopiclone in Cocktails. *Biosensors*, 14(11), 557.
4. Comprehensive Insights into Electrochemical Nicotine Sensing: Recent Advances and Future Prospects. (2025). *Journal of Materials Chemistry B*, 10(5), 1234-1245.
5. New Au/Chitosan Nanocomposite Modified Carbon Paste Sensor for Nicotine Detection. (2023). *Scientific Reports*, 13, Article number: 47703.
6. A Novel Electrochemical Sensor for Detection of Nicotine in Tobacco Samples. (2022). *Journal of Electrochemical Science and Engineering*, 12(3), 345-356. *Fig. 6 User Interface with KIt*
7. Determination of Nicotine in Human Saliva Using Electrochemical Sensors. (2023). *Crystals*, 13(4), 589.
8. Goniewicz, M.L.; Kuma, T.; Gawron, M.; Knysak, J.; Kosmider, L. Nicotine Levels in Electronic Cigarettes. *Nicotine Tob. Res.* 2013, 15, 158–166. [CrossRef]
9. Cameron, J.M.; Howell, D.N.; White, J.R.; Andrenyak, D.M.; Layton, M.E.; Roll, J.M. Variable and Potentially Fatal Amounts of Nicotine in E-Cigarette Nicotine Solutions. *Tob. Control* 2014, 23, 77–78. [CrossRef]
10. Langone, J.J.; Gjika, H.B.; Van Vunakis, H. Nicotine and Its Metabolites. *Radioimmunoassays for Nicotine and Cotinine*. *Biochemistry* 1973, 12, 5025–5030. [CrossRef]
11. Zhou, Y.; Yu, H.; Zhang, L.; Xu, H.; Wu, L.; Sun, J.; Wang, L. A New Spectrofluorometric Method for the Determination of Nicotine Base on the Inclusion Interaction of Methylene Blue and Cucurbit[7]Uril. *Microchim. Acta* 2009, 164, 63–68. [CrossRef]



INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details