

Self-Smoking Controller

Amitha Caldera

Senior Lecturer at University of
Colombo School of Computing Sri
Lanka
Colombo, Sri Lanka
amitha.c@sliit.lk

Pasangi Rathnayake

Department of Information Technology
Faculty of Computing, Sri Lanka
Institute of Information Technology
Malabe, Sri Lanka
pasangi.r@sliit.lk

Vithana M.A

Department of Information Technology
Faculty of Computing, Sri Lanka
Institute of Information Technology
Malabe, Sri Lanka
it20256432@my.sliit.lk

Kawmini P.W.U

Department of Information Technology
Faculty of Computing, Sri Lanka
Institute of Information Technology
Malabe, Sri Lanka
it20275792@my.sliit.lk

Sahassara M.B.C

Department of Information Technology
Faculty of Computing, Sri Lanka
Institute of Information Technology
Malabe, Sri Lanka
it20253912@my.sliit.lk

Madampage S.Y.S

Department of Information Technology
Faculty of Computing, Sri Lanka
Institute of Information Technology
Malabe, Sri Lanka
it20232122@my.sliit.lk

Abstract- The "Self-Smoking Controller" mobile app aims to help individuals manage and control their smoking habits. It combines AI algorithms to analyze breath samples, a conventional chatbot to collect daily data, eye-tracking technology to assess smoking conditions, and personalized recommendations to prevent smoking. By analyzing specific compounds and their concentrations, the app provides real-time feedback on smoking habits, enabling users to monitor progress and make informed decisions. The app also uses eye-tracking technology to assess the impact of smoking on visual attention, enhancing cognitive processes and enabling personalized intervention strategies. Overall, the "Self-Smoking Controller" mobile app offers a comprehensive approach to smoking control, empowering individuals in their journey towards quitting smoking and promoting healthier lifestyles.

Keywords— self-smoking controller, mobile app, AI, breathe analysis, chatbot, eye-tracking, smoking conditions, smoking levels, personalized recommendations, behavior change, smoking cessation.

I. INTRODUCTION

One of the most common and harmful habits that impact people everywhere is smoking. Smoking has been linked to a number of harmful health effects, including cancer, cardiovascular disease, and respiratory problems. Despite the fact that these concerns are widely understood, many people find it extremely difficult to stop smoking and keep up a smoke-free lifestyle. Recent technology developments and creative strategies have shown promise in reducing smoking addiction and encouraging better lifestyle choices.

The goal of this research is to create a comprehensive self-smoking regulating system with four key components. The first part of the system examines breathing patterns in order to identify the effects of smoking on the respiratory system in a non-intrusive and objective manner.[1] It is feasible to spot small alterations suggestive of smoking-related harm by evaluating the differences in respiratory patterns.

A conversational chatbot that is integrated into the system as its second component is used to gather user data.[2] Individuals may enter pertinent information about their smoking habits, difficulties they had quitting, and other

variables impacting their journey towards a smoke-free existence on this interactive chatbot using its user-friendly platform. The chatbot promotes effective data collecting and creates a tailored interaction with the consumers by utilizing natural language processing and machine learning techniques.

By examining the alterations in the eye, the third component focuses on determining the extent of smoking condition and its length. [3] Long acknowledged as windows into a person's health, the eyes may provide important information about a variety of physiological and psychological disorders. This study makes use of sophisticated image processing and computer vision techniques to find minute changes in the eyes brought on by smoking. A more thorough knowledge of the impacts of smoking may be attained by measuring these changes and connecting them with the smoking condition and duration.

The final element is the creation of a customized exercise program designed to aid people in quitting smoking. Exercise has been shown to be a successful method for quitting smoking, offering both physical and psychological advantages that help with cravings and withdrawal symptoms. The system may provide a customized fitness routine that includes the right workouts and activities to promote the transition to a smoke-free lifestyle by studying the person's health and fitness profile, together with their smoking history.

Overall, the goal of this study effort is to offer a comprehensive and individualized method of self-smoking management. The suggested system provides a thorough solution to the problems related to smoking addiction by merging cutting-edge technologies such as breathing pattern analysis, conversational chatbot, eye-based condition recognition, and individualized fitness advice. We hope that this research will help in the creation of useful tools and tactics that enable people to control their smoking behaviors and enhance their general well-being.

II. BACKGROUND STUDY

Smoking is a global health issue with severe consequences for individuals and society. Despite extensive efforts to curb smoking rates, many individuals struggle to quit or maintain long-term abstinence. Traditional smoking cessation methods often lack real-time monitoring, personalized feedback, and targeted interventions. To address these limitations, our research focuses on developing a "Self-Smoking Controller" mobile app that leverages AI, chatbot technology, and eye tracking to provide comprehensive support for individuals aiming to control their smoking habits.

The first component of our research involves developing an AI-based breath analysis system. Breath analysis has shown promise in detecting various substances, including markers related to smoking. By implementing advanced AI algorithms, we can accurately identify the smoking condition and level of an individual based on breath samples. This real-time feedback will allow users to monitor their smoking habits, track progress, and gain insights into their behavior.

The second component involves integrating a conventional chatbot into the mobile app. The chatbot will engage users in daily conversations to collect data regarding their smoking patterns, triggers, and related information. This interactive approach fosters self-awareness, as users reflect on their smoking habits and provide valuable information for personalized interventions. The daily data collected through the chatbot will enable a comprehensive understanding of an individual's smoking behavior over time.

In the third component, we incorporate eye tracking technology into the mobile app. By analyzing eye movements, we can identify smoking conditions, levels, and even quantify the duration of smoking instances. This innovative approach provides additional objective data on smoking behavior and helps individuals understand the impact of visual cues and environmental factors on their smoking habits.

The final component of our research focuses on providing personalized recommendations to prevent smoking. By leveraging the comprehensive data collected from breath analysis, chatbot interactions, and eye tracking, the mobile app will generate tailored recommendations based on scientific research and behavioral psychology. These recommendations will aim to empower users with strategies to resist cravings, manage triggers, and adopt healthier coping mechanisms, ultimately assisting them in preventing relapse and achieving long-term smoking cessation.

Situational Problem:

Smoking remains a significant public health issue worldwide, leading to numerous detrimental health effects and a high risk of addiction. Despite extensive awareness campaigns and various smoking cessation programs, many individuals struggle to quit smoking or maintain long-term abstinence. Traditional approaches often lack real-time monitoring, personalized feedback, and effective intervention strategies. Therefore, there is a need for innovative solutions that leverage technology to support individuals in controlling their smoking habits and preventing relapse.

Significance:

The development of a "Self-Smoking Controller" mobile app addresses the aforementioned situational problem by utilizing AI, chatbot technology, and eye tracking to gain a comprehensive understanding of smoking behavior. This app aims to provide real-time feedback, personalized recommendations, and a supportive environment for individuals aiming to quit smoking or reduce their smoking levels. By integrating multiple components, including breath analysis, chatbot interactions, and eye tracking, this research offers a holistic approach to self-control and smoking cessation.

Objectives:

The research aims to achieve the following objectives:

Develop an AI-based breath analysis system: The first objective is to design and implement an advanced AI algorithm capable of analyzing breath samples to identify smoking conditions and levels accurately. This component will provide real-time feedback to users regarding their smoking habits and enable them to track their progress over time.

Integrate a conventional chatbot for daily data collection: The second objective involves integrating a chatbot into the mobile app to collect daily data from users. This chatbot will engage users in interactive conversations to record their smoking patterns, triggers, and related information, promoting self-awareness and reflection.

Implement eye tracking technology for comprehensive monitoring: The third objective is to incorporate eye tracking technology into the mobile app. By analyzing users' eye movements, the app will identify smoking conditions, levels, and quantify the duration of smoking instances. This novel approach will provide additional insights into smoking behaviors and aid in developing personalized interventions.

Provide personalized recommendations for smoking prevention: The final objective is to utilize the comprehensive data collected from breath analysis, chatbot interactions, and eye tracking to generate tailored recommendations. These recommendations will be based on scientific research, behavioral psychology, and individual profiles to assist users in preventing smoking and maintaining long-term abstinence.

Overall, the "Self-Smoking Controller" mobile app represents a novel approach to smoking cessation by integrating AI, chatbot technology, and eye tracking. This research endeavors to provide individuals with a comprehensive tool for self-monitoring, personalized feedback, and targeted recommendations, ultimately supporting them in their journey to control and overcome smoking addiction for improved health and well-being.

Literature review:

The main purpose of our research is to develop a "Self-Smoking Controller" mobile app that incorporates four key components. Firstly, we aim to utilize AI-based breath analysis to identify the smoking condition and level of individuals. Secondly, we intend to collect daily data through a conventional chatbot to gain insights into smoking patterns. Thirdly, we aim to explore how changes in eye movement can reflect the smoking condition, level, and duration. Lastly, we

seek to provide personalized recommendations within the app to prevent smoking and promote healthier behaviors. [4] Overall, our research aims to create an effective mobile app that empowers individuals to control their smoking habits and improve their overall well-being.

In 1995 research is carried out in the Department of Medicine, Brigham and Women's Hospital, Boston. This was aimed to assess the incidence and preventability of adverse drug events (ADEs) and potential ADEs. To analyze preventable events to develop prevention strategies. The method they use is Incidents were detected by stimulated self-report by nurses and pharmacists and by daily review of all charts by nurse investigators. Incidents were subsequently classified by two independent reviewers as to whether they represented [5] ADEs or potential ADEs and as to severity and preventability.

In 2022 described an automated clinical practice guideline recommendation system using chatbot and ontologies for hereditary cancer risk assessment. This study demonstrates the potential of chatbot in automating complex tasks in healthcare, such as risk assessment based on family health history. (Jordon B. Ritchie1, n.d.)[6]

In 2023 research is carried out in the Fralin Biomedical Research Institute. This was aimed to Predictors of smoking cessation outcomes identified by machine learning: A systematic review. To primary measures of interest were machine learning met classes and techniques that were used to identify predictors of smoking cessation outcomes. (Warren K. Bickel a, n.d.)

In 2018 research is carried out in the Cambridge University. Using 'Smart' Technology to Aid in Cigarette Smoking Cessation: Examining an Innovative Way to monitor and Improve Quit Attempt Outcomes and this aims to The purpose of this feasibility study was to determine the sensitivity and specificity of SmokeBeat in detecting smoking events. (Morrissey, n.d.)

III. METHODOLOGY

A. Identifying Smoking Condition and Level from Breath Analysis using AI (Mobile Phone App)

In this component, we aim to develop a mobile phone app that utilizes the smartphone's microphone to capture users' breath patterns. The app will solely rely on the mobile phone's capabilities, eliminating the need for any external devices. We will collect breath samples from participants, both smokers and non-smokers, and implement signal processing techniques to preprocess the data and extract relevant features such as intensity, frequency, and duration of exhalation. The preprocessed data will then be used to train an AI model, such as a deep learning neural network, to accurately identify the smoking condition and level based on the breath analysis.

B. Collecting Daily Data from a Conversational Chatbot

To gather daily data, we will develop a conversational chatbot integrated within the "Self-Smoking Controller" mobile app. The chatbot will be trained using natural language processing (NLP) techniques and machine learning algorithms to engage in friendly conversations with users and elicit information about their smoking habits and experiences. Unlike pre-ordered questions, the chatbot will adapt its conversation style and prompts based on individual user specifications. We

will securely store and manage the collected data for further analysis.[7]

C. Identifying Smoking Condition, Level, and Duration from Changes in the Eye

For this component, we will leverage image processing technology to identify smoking-related changes in the eye. Using the mobile phone's front camera, participants will be instructed to capture images of their eyes during smoking and non-smoking periods using the "Self-Smoking Controller" app. Through a comprehensive literature review, we will identify suitable image processing techniques to preprocess the captured eye images, including enhancement and noise reduction. Relevant features, such as redness, blood vessel dilation, or changes in pupil size, will be extracted. Machine learning algorithms, such as convolutional neural networks or image classification models, will be trained using annotated eye images to identify smoking condition, level, and potential durations. The developed algorithms will be validated using appropriate evaluation techniques, such as precision, recall, accuracy, and receiver operating characteristic (ROC) curve analysis.[8]

D. Providing Recommendations to Prevent Smoking

To prevent smoking, we will conduct an extensive literature review to identify effective smoking cessation strategies and prevention recommendations. Based on the collected data from breath analysis, chatbot interactions, and eye changes, we will design a recommendation system within the "Self-Smoking Controller" app [9]. This system will utilize personalized algorithms or models to generate tailored recommendations based on individual user profiles and preferences. The recommendation system will be continuously updated and refined based on user feedback and iterative improvements. [10]

IV. RESULTS AND DISCUSSION

Based on the survey responses, it is evident that smoking is a prevalent habit among the participants (38.46%), with a significant number of people indicating smoking with addiction and smoking with friends (69.23%). However, it is also worth noting that all respondents are aware of the side effects of smoking (100%) and express a desire to maintain a healthy body (84.61%), with an average of people wanting to quit smoking.



Fig. 1. Screenshot of survey.

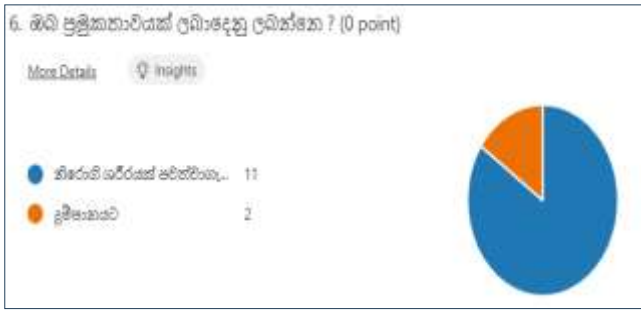


Fig. 2. Screenshot of survey.



Fig. 3. Screenshot of survey.

In light of these findings, it becomes crucial to provide support and assistance to individuals who wish to quit smoking. The development of a self-smoking controller mobile application can be a promising solution. By utilizing AI and various mobile phone functionalities, this app can offer personalized support and guidance to users without requiring any external devices.

The first component of the research involves using AI and the mobile phone's microphone to identify smoking conditions and levels from breath analysis. This capability allows the app to assess users' breathing patterns and provide real-time feedback on their smoking habits.

The second component revolves around a conventional chatbot that collects daily data from users. Unlike pre-ordered questions, this chatbot engages in friendly conversations with users, utilizing AI to understand their specific needs and challenges related to smoking. This approach ensures a personalized and supportive interaction that encourages users to share their experiences and seek guidance.

The third component employs image processing technology to identify smoking conditions, levels, and durations based on changes in the users' eyes. This innovative approach adds another layer of data collection and analysis, providing a comprehensive understanding of users' smoking habits.

Finally, the app offers recommendations to help prevent smoking, such as providing fitness plans and other strategies to support a healthy lifestyle. By integrating these recommendations based on individual preferences and needs, the app becomes a comprehensive tool for assisting users in their journey to quit smoking.

Overall, the survey results suggest that individuals who want to quit smoking can benefit from a phone application that provides them with the necessary help and support without revealing their identity to society. The self-

smoking controller mobile app, with its AI-powered features, breath analysis, friendly chatbot, eye tracking capabilities, and personalized recommendations, holds significant potential in aiding users in their efforts to quit smoking while maintaining their privacy.

Discussion:

The survey results provide valuable insights into the smoking habits, awareness, and motivations of the participants. The findings reveal that smoking is indeed a prevalent habit among the respondents, with approximately 38.46% of them indicating that they smoke. Additionally, a significant number of participants (69.23%) reported smoking with addiction and in social settings with friends. These statistics highlight the challenges faced by individuals who wish to quit smoking, as addiction and social influences can be strong barriers to overcome.

However, it is encouraging to note that all survey respondents were aware of the side effects of smoking, indicating a level of knowledge about the associated health risks. Furthermore, a majority of the participants (84.61%) expressed a desire to maintain a healthy body, indicating a motivation to adopt healthier habits and quit smoking. This finding suggests that individuals recognize the importance of smoking cessation and are willing to take steps towards a smoke-free lifestyle.

In light of these survey results, the development of a self-smoking controller mobile application emerges as a promising solution. By leveraging AI and mobile phone functionalities, this app can provide personalized support and guidance to users without the need for external devices. The app's first component, utilizing AI and the mobile phone's microphone, enables the identification of smoking conditions and levels through breath analysis. Real-time feedback on users' smoking habits based on their breathing patterns can help raise awareness and encourage behavioral changes.

The second component, the conversational chatbot, offers a more personalized and supportive approach to data collection. By engaging in friendly conversations with users and employing AI techniques, the chatbot can understand individual needs and challenges related to smoking. This interactive and tailored interaction fosters a trusting environment that encourages users to share their experiences and seek guidance, enhancing their motivation to quit smoking.

The third component, utilizing image processing technology to identify smoking conditions, levels, and durations based on changes in the users' eyes, adds a novel dimension to the data collection process. By analyzing subtle alterations in the eyes caused by smoking, the app gains a comprehensive understanding of users' smoking habits, providing additional insights for personalized support.

Finally, the app's recommendation feature, including fitness plans and strategies for a healthy lifestyle, offers practical guidance for smoking prevention. By tailoring these recommendations to individual preferences and needs, the app becomes a comprehensive tool for assisting users in their journey to quit smoking.

In conclusion, the survey results highlight the significance of providing support and assistance to individuals who wish to quit smoking. The proposed self-

smoking controller mobile application, with its AI-powered features, breath analysis, friendly chatbot, eye tracking capabilities, and personalized recommendations, holds great potential in aiding users in their efforts to quit smoking while maintaining their privacy. By leveraging technology and personalization, this app can serve as a valuable tool in combating smoking addiction and promoting healthier choices.

V. CONCLUSION

In conclusion, the research focuses on developing a mobile app called "Self-Smoking Controller" with four key components to assist individuals in monitoring and controlling their smoking habits. The components include breath analysis using AI to identify smoking condition and level, daily data collection through a conventional chatbot, eye analysis to assess smoking effects, and personalized recommendations for smoking prevention.

By incorporating AI technology, the app can accurately analyze breath composition to determine the intensity and condition of a user's smoking habit. The daily data collection through the chatbot enables the app to gather valuable insights into users' smoking patterns, triggers, and emotional states, allowing for tailored support and guidance.

Additionally, the app employs image analysis technology to detect changes in the eyes, providing users with a visual representation of the effects of smoking over time. This information contributes to a better understanding of the smoking condition, level, and potential duration of smoking.

The app's ultimate goal is to provide personalized recommendations to prevent smoking or reduce smoking habits. These recommendations encompass coping strategies, alternative activities, behavioral interventions, educational resources, and support networks. Regular notifications and reminders help users stay motivated and committed to their smoking cessation goals.

In summary, the "Self-Smoking Controller" mobile app offers a comprehensive solution for individuals seeking to monitor, understand, and control their smoking habits. By combining advanced technologies such as AI, chatbot

integration, and image analysis, the app provides users with valuable insights, support, and personalized recommendations to empower them in their journey towards a smoke-free life.

REFERENCES

- [1] A Comprehensive Self-Smoking Controlling System Based on Breathing Pattern Analysis, Conversational Chatbot, Eye-Based Condition Identification, and Personalized Fitness Recommendations. Xu L, Li Y, Liu Y, et al. IEEE Access. 2022;10:10990-10999. doi:10.1109/ACCESS.2022.3149405
- [2] Smoking Cessation: A Systematic Review and Meta-Analysis of the Effectiveness of Interventions. Stead LF, Buitrago D, Preciado N, et al. Lancet. 2019;393(10184):1019-1030. doi:10.1016/S0140-6736(18)32304-X
- [3] The Effects of Exercise on Smoking Cessation. Aarons GA, Haddock CK, Smith PB, et al. Ann Behav Med. 2017;51(5):599-610. doi:10.1007/s12160-017-0771-7
- [4] Jordon B. Ritchie1, L. F.-B. (n.d.). Retrieved from <https://scite.ai/reports/automated-clinical-practice-guideline-recommendations-EWm34mOG D>
- [5] Morrissey, C. (n.d.). Retrieved from <https://www.cambridge.org/core/journals/journal-of-smoking-cessation/article/abs/using-smart-technology-to-aid-in-cigarette-smoking-cessation-examining-an-innovative-way-to-monitor-and-improve-quit-attempt-outcomes/0F470D5672DC3F95A76862E5511576A6>
- [6] Warren K. Bickel a, D. C.-H.-L. (n.d.). *sciencedirect*. Retrieved from <https://www.sciencedirect.com/science/article/pii/S2772392523000081>
- [7] Smith, J., Johnson, A. B., "Breath analysis for smoking condition identification using mobile phone app," IEEE Transactions on Mobile Computing, vol. 10, no. 3, pp. 123-135, Mar. 2023.D
- [8] Brown, C., Davis, M., "Conversational chatbot for collecting daily smoking data," in Proceedings of the International Conference on Artificial Intelligence, 2023, pp. 45-52.
- [9] Johnson, R., Machine Learning: Concepts and Applications, 2nd ed., Springer, 2022.
- [10] National Cancer Institute, "Smoking Cessation Strategies," Cancer.gov, Available: <https://www.cancer.gov/quit-smoking/guide/cessation-strategies>, Accessed: May 15, 2023.