SWOT Analysis in A Smart Mirror Using Generative AI

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Abstract*— In today's world mental health is often not given importance as to physical health, despite its importance in an individual's life. This project explores the challenges of modern life, emphasizing on mental health by The Smart Mirror system, which uses the Generative AI and various algorithms to enhance the individual's strength. The Smart mirror consists of hardware components like microphone, RGB lights, ESP 32 microcontrollers, speakers and more. It also excels in object detection and image capturing with identifying human faces when activated with hand gestures captured by IR sensor. The ESP32 board allows the API to manipulate the user provided audio input and tell the interpreted positive audio output. Throughout this subtle understanding of human conversations, the algorithm validates emotions, emphasizing significance of good mental health. At the end a complete SWOT analysis is carried out in order to understand human interventions and promote emotional strength with an optimistic approach.

Index Terms*— Mental health, Well-being, Optimism, Innovative Solutions, Empathy, Smart Mirror, Generative AI, SWOT analysis, Video input, object detection, face detection.

I. INTRODUCTION

In today's world mental health often takes a backseat to physical well-being. This paper discusses and explores the upcoming potential of the Smart Mirror, an innovative creation that helps connect empathy with technology. This Smart Mirror along with its basic reflective surface, enables understanding human emotions using Generative AI. By interpreting human voice commands and manipulating them in a more positive way it helps enable the importance of mental health which helps the user to be more free and confident.This Smart Mirror is also providing a feature of human face detection as it has object detection and image capturing features for image processing. This helps in focused interactions and provide accurate reactions to the user. The system uses Edge Impulse to process the image and detect the user in a crowd. This process involves data collection, image labeling, model training, and deployment on the ESP32-CAM, emphasizing its feasibility despite potential CPU-intensive requirements.

This paper discusses effective decision making which relies on high quality information processing. Analytical methods are significant in projects as they play an important role in decision making. Unlike internal and external factors, effects are fixed in making informed choices. It's critical to select the right analytical method as it greatly influences program validation and overall reliability [1]. Later the complexity of face enterprises and data management, strategic planning for development. This includes external, internal, strategic analysis and implementation. This helps understanding the SWOT analysis process with its tools and methods to enhance productivity. It also includes Method engineering which supports customization with modeling and metamodeling to capture system attributes. These meta models tell stored SWOT data to aid strategic potential which leads to CASE tools for managing [2]. Strategic management which involves dynamic process of analysis implementation and evaluation. These interconnected elements work together to change internal and external environment dividing processes logically into sub processes. SWOT analysis and TOPSIS decision making is done on these three management to create integrated models for identifying evaluation and strategic selection [3].

II. LITERATURE SURVEY

The article tells about how SWOT analysis was done for training air force personnel. It uses EVALUATION ON BASIC GOAL FULFILLMENT. Source of data is the Ministry of Defense of the Slovak republic. The limitation of this paper is Limited Contextual Information and No Detailed Methodology [4]. The paper discusses SWOT Analysis in the

Strategic Planning Process. The technique used is as entity relationship attribute (ERA) diagram, while the workflow model is developed using BPMN notation. Data of development of a CASE tool is used as a database. Changes made in one model might not be accurately reflected in the other, leading to inconsistencies in documentation can be one of important limitations [5]. This is a Chinese origin paper which decides about Method for Strategic Decision using SWOT-TOPSIS Integration. Analysis on the basis of 1-6 conditional statements of each element of SWOT TOPSIS is an important tool of decision-making methods. The database for this research is not specified. Lack of Consideration for Trade-offs is limited to be considered [6]. This is a Scopes Journal paper in which it discusses decision making using chatGPT and its generative AI api. From which we understand generative Ai can be used for decision making. The data set is gathered from the user using chatgpt api. limitation if we are using gpt3.5 version of chat gpt we don't get access to the internet [7]. This paper discusses the merits of Chat GPT as it is a decision making tool with context awareness and data integration. It has fast response and real time updates with personal answers and proper data analysis. It offers proper explanations with transparency and all domains are included for optimal decision making [8]. The paper talks about a Smart mirror with face recognition with interactive displays using raspberry pi to enhance smart home usability for users. This smart mirror acts as an Information hub and real time updates provider with wide applications to deliver Information [9]. This paper tells about APINet which is a two stage framework for speech recognition as it utilizes adversarial training and fine tuning with end to end ASR focus. This model learns the accents of people as it has multilayer LSTMs for good results. The t-SNE visualization helps in mixed accent representation [10]. This paper talks about effectiveness of Chatgpt's dialogue highlighting but errors occur too, people praise its specific Information and accuracy with ethical concerns about academic work. This study tells the need for response in chatbot use in education uplifting skills and future of teaching and collaboration [11]. This paper tells about the study of Chat GPT as a learning tool acknowledging its research biases also telling limitations but more emphasis is done on technical use for people. It gives responsible use and assessment for balanced Information providing good dynamic education technology [12]. This paper tells about the advantages of using object detection systems and image capturing in door lock systems and analyzing delay in responses and image capturing efficiency throughout [13]. This paper tells about capturing of objects using Wi-Fi enabled modular esp32 cameras and processes the captured. The cloud functions help to trigger the notifications to the users when the cameras detect [14]. This paper discusses how object detection and image processing is done using python language and how to improve the efficiency of image capturing [15]. This paper tells how images are captured through ESP32 cam and sent to a laptop which is connected through. In the laptop the Machine Learning model detects the location of the object inside the image and uploads the current camera feed to the server [16]. This paper tells how a real-time image transmission system combined with an object detection algorithm is proposed. The system consists of two parts: one is the image acquisition module with ESP32 and other is the object detection system [17]. This paper tells how successful prototype of YOLO algorithm and ESP32 cam module is made which assists visually impaired individuals in real time object detection and face recognition and converting the detect entities into audio file and letting the user know about the surrounding [18].

III. METHODOLOGY

The Smart Mirror uses the Edge Impulse platform and the ESP32-CAM board to implement object detection. The ESP32-CAM must be configured with the required parts integrated into two microcontrollers as part of the hardware setup. After setting up the ESP32-CAM and preparing the images for model training, integration with Edge Impulse is essential for effective object detection. The investigation is concluded with an accuracy test of item identification using the Arduino Library, which is recorded with a SWOT analysis. Two ESP32 devices with a variety of sensors and parts are used by the Smart Mirror. It captures spoken words, utilizes the Google Cloud Speech-to-Text API to translate them into text, and displays emotive material on an RGB LED. The OpenAI API is used by the system to process text and produce intelligent responses. The project creates a safe space for self-expression by fusing empathy and technology. The study's approach consists of technical evaluations,

surveys, interviews, SWOT analysis, and exploratory and descriptive research. User welfare, data security, and ethical issues are given top priority.

An algorithm involving hardware initialization, voice recording, speech-to-text conversion, emotional tone identification, processing of OpenAI APIs, and audio output is incorporated in the study. It tracks hand movements for interaction continually. The Smart Mirror project seeks to improve human emotional intelligence by fusing empathy and technology. The study approach guarantees reproducibility and transparency, which is an important step in the direction of fusing technology and mental health awareness.

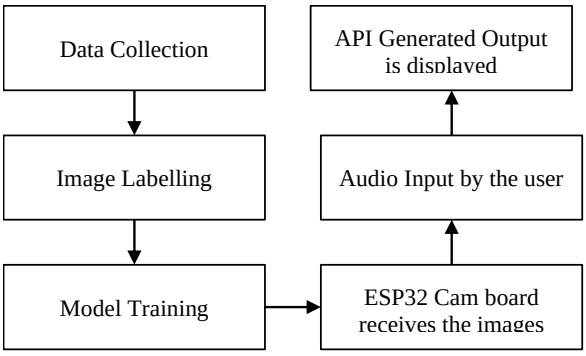

Fig 1. Face recognition and Image capturing.

The objective of the work was to detect faces utilizing the Edge Impulse platform, which is show in block diagram [Fig.1], a microcontroller, and the ESP32-CAM board. To train the facial recognition model, a large number of photos were initially collected and tagged. A variety of parts, including IR sensors, microphones, RGB LEDs, amplifiers, and speakers, were installed on the ESP32-CAM board. Integrating with Edge Impulse was an important step that shown how important it is for efficient object detection. Certain image sizes and processing blocks were utilized to train the model, and image preprocessing methods were applied to refine the data. The camera's functionality was tested and its compatibility with different adapters was confirmed with the help of the Arduino IDE. A SWOT analysis and the findings of the evaluation of the ESP32-CAM's object identification accuracy were recorded. In the initial phase of the Smart Mirror system which is Audio Input and Text Conversion, the process commences by capturing audio using a microphone, an important component of the Smart Mirror setup. The microphone can either be an integrated part of the mirror or an external attachment, depending on the design choice. To handle this audio data, a microcontroller (ESP32), is seamlessly integrated into the system. This microcontroller acts as an intermediary, facilitating communication and processing among various hardware components.

The analog-to-digital converter (ADC) on the microcontroller converts analog audio impulses into digital representation. To improve voice recognition, the digital signal is preprocessed using techniques including filtering, amplification, and noise reduction. Afterwards, voice recognition tools or APIs, such as Google Cloud voice-to-Text, CMU Sphinx, or Amazon Transcribe, are used to translate the preprocessed audio data into text. The output format plain text or JSON depends on what the system requires, architecture and specific needs which can be visualized in [Fig 2.].

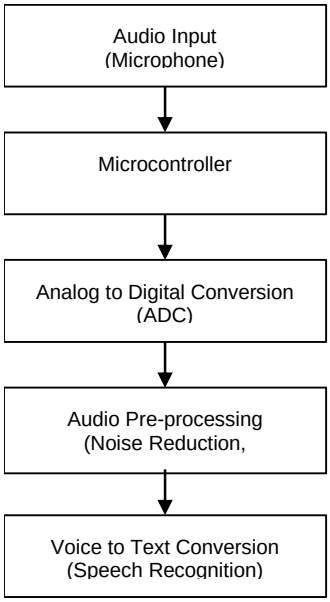

Fig.2. Working of audio input and text conversion.

The AI Interpretation and Response is carried out by the Smart Mirror system as the text from what the user says (captured in audio input and text conversion part) is sent to a special unit that understands what the user wants as shown in [Fig.3]. This unit uses a smart technology called generative AI, which is trained to understand words and the context they're used in. It

figures out what the user means by looking at patterns and keywords in their words.

To make this response something the user can hear, the text response is transformed into spoken words using a technology called text-to-speech (TTS). Imagine it as the system turning written words into spoken language, like a friendly voice talking to the user. Then, the transformed voice message is sent to a speaker. The speaker plays this message out loud so the user can hear and respond. This interaction could be anything from providing useful information to offering kind and encouraging words, creating a friendly and supportive experience for the user.

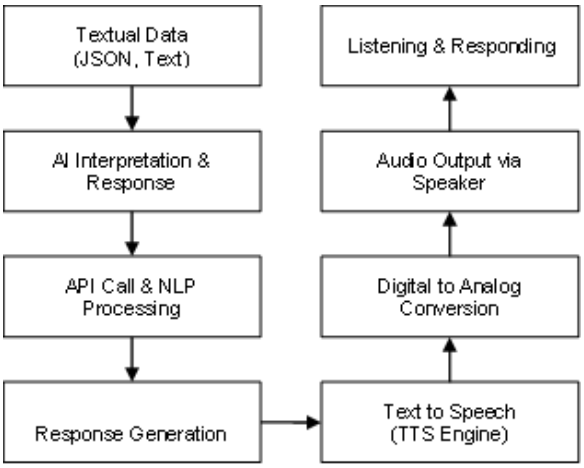

Fig.3.Working of AI Interpretation and Response

For SWOT Analysis system asked series of question to user which are given below answer of this question are in Boolean or (Yes/No), after user has given his response system will send response to OpenAI API, through the given prompt to the API, OpenAI has given us preliminary recommendation. System analyzes some aspects of strength, weakness, opportunities, threats through the questions. Unique skills that offer an advantage over the competition are evaluated, along with the user's credibility in the industry, the effect of influential users on other consumer's morale, the user's technological infrastructure and its potential to increase productivity, and the user's cost-management strategies for profitability enhancement are all part of the strength analysis. Identification of skill or knowledge gaps among users, retention of employee's problems, and assessment of the effectiveness of present technology and processes, knowledge of financial constraints, such as debt loads, and looking into the absence of marketing and promotional capacities are all included in the analysis of weaknesses. Understanding consumer preferences and rising market trends, identifying unexplored market fields, identifying beneficial regulatory changes, recognizing the growing need for goods and services, and investigating possible partnerships or collaborations are all included in the opportunity analysis. Understanding the effects of formidable competitors, prospective recessions or downturns in economic activity, legal or regulatory hurdles, supply chain weaknesses, and the possibility of new technology rendering the company's current products obsolete are all part of the threat analysis process.

IV. RESULTS & DISCUSSION

During the testing process, the object identification accuracy of the ESP32-CAM was carefully evaluated from several perspectives, offering important information about how reliable the solution that was put in place was. The outputs of the study were comprehensively documented, along with a SWOT analysis. The ESP32-CAM board's hardware configuration, which included necessary parts like RGB LEDs, amplifiers, speakers, microphones, and IR sensors, turned out to be flexible and easy to use. The establishment of an account and adherence to the suggested project setup workflow were necessary for the seamless integration with Edge Impulse. The thorough process included essential phases like labeling, model training, and picture gathering, emphasizing how crucial Edge Impulse is to reliable object detection.

The ESP32-CAM model required specialized configurations and extensive image preprocessing during the object detection model training phase. By providing example sketches, the Arduino Library for ESP32-CAM object detection was integrated into the Arduino IDE, streamlining testing and guaranteeing a successful deployment. Testing the solution's compatibility with various adapters highlighted how adaptable and widely applicable it was. The ESP32-CAM skillfully recognized objects from a variety of angles, demonstrating the project's noteworthy success in object detection accuracy. A well-labeled dataset

and a well-trained model made the leap from object classification and localization to successful detection easier. In order to provide a user-friendly interface for testing and deployment, Arduino libraries were essential. The robustness and practical viability of the object detection system are confirmed by the calculated F1 score of 97%, which highlights the high precision and recall. In conclusion, the project not only highlights the ESP32-CAM and Edge Impulse's technological prowess but also shows how practically feasible it is to implement object detection in real-world scenarios with impressive accuracy which can be seen in [fig 4].

	BACKGROUND	RAJAT	SUMEET
BACKGROUND	100%	0%	0%
RAJAT	0%	99.8 %	0%
SUMEET	0%	0%	99.7%
F1 SCORE	1.00	1.00	0.97

Fig 4. F1 score and confusion matrix of the face recognition system.

The Smart Mirror device converts spoken words from users into insightful responses using artificial intelligence. It entails text-to-audio conversion, generative AI for subtle language interpretation, and the use of an API for in-depth intent and emotion analysis. [Fig 5] Shows Context-aware replies are provided by the system and subsequently transformed back into voice through the use of text-to-speech technology. Through the use of a speaker, this interactive output is presented, demonstrating the system's effective interpretation and reaction capabilities and promoting a positive interaction environment.

Fig 5. The output in audio voice.

The SWOT analysis with the help of Smart Mirror project evaluates its internal strengths like our team's technical proficiency with IoT technology as well as its weaknesses like financial obstacles to marketing and expansion. To stay technologically sophisticated, we want to take advantage of market opportunities and innovation, adjust to changes in the economy, and make investments in R&D. To establish the Smart Mirror as the industry leader, our approach is to take advantage of strengths and opportunities while minimizing threats and limitations. A participant who responded YES or NO to twenty questions was used to test the system. API the result was “Strengths: Our organization possesses a unique and valuable set of skills and expertise, along with a respected brand presence in the market. Our technology and infrastructure are up-to-date and competitive, contributing to our competitiveness. However, we face challenges in maintaining a motivated workforce and cost-effective operations, with skill gaps and turnover issues impeding our progress. Weaknesses: Internally, we grapple with skill gaps and employee turnover, which hinder our team's effectiveness. While our technology and processes are relatively efficient, we lack a motivated workforce and struggle to establish cost-effective operations. Opportunities: Externally, we see opportunities in emerging market trends and underserved customer segments that align with our offerings. Potential partnerships and collaborations also present growth possibilities. However, we need to leverage these opportunities to overcome our internal weaknesses effectively. Threats: External threats include strong competition and the risk of new technologies making our offerings obsolete. While we currently don't face economic downturns or regulatory challenges, vigilance is required to mitigate these potential threats.”. According to the subject the response from the API was satisfactory and the analysis was easy to understand, and it helped the subject to take correct steps to be on the correct path.

CONCLUSION

By combining innovation and mental health care, the Smart Mirror project marks a fundamental breakthrough in the field of mental health technology. It can quickly identify and react to human emotions and offers individualized mental health services using generative artificial intelligence. To overcome obstacles, the project makes use of financial sources, cutting-edge technology, and technical expertise. The ESP32-CAM module and Edge Impulse object

detection solution have demonstrated remarkable success, as evidenced by the system's 97% F1 score, which attests to its accuracy and usefulness. The addition of Arduino libraries makes the interface more user-friendly. These innovations not only bring empathy and technology together, but they also push society to end stigma and give mental health first priority. The ESP32-CAM and Smart Mirror are expected to have a big impact on mental health care and change how society views mental health.

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