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AutiCare: An AI-Powered Web Platform for Early Autism Screening and Caregiver Support

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Abstract - Autism Spectrum Disorder (ASD) is a neurodevelopmental condition that affects communication, social interaction, and behavioral patterns. Developmental outcomes are greatly improved by early detection and intervention, but many families do not have access to professional guidance and structured screening tools. In order to help caregivers with early autism screening, behavioral monitoring, and intervention support, this paper introduces AutiCare, an AI-powered web application.
Within a single digital platform, the system incorporates behavioral data tracking, educational materials, caregiver-therapist collaboration tools, and a machine learning-based screening model. A Streamlit frontend, a Python backend with a trained Random Forest classifier, and a SQLite database for safe data storage make up the three-tier architecture.
The application employs a questionnaire-based screening method whereby the trained model analyzes behavioral responses to categorize autism risk levels as Low, Medium, or High. Improved caregiver awareness and organized behavioral monitoring are indicated by prototype evaluation through user testing.
The findings show that, in addition to professional clinical evaluation, AutiCare can function as an easily accessible digital support tool for early autism awareness and preliminary screening.

Keywords - ***Autism Spectrum Disorder, Machine Learning, Digital Health, Early Screening, Behaviour Tracking, Streamlit Application***

I. INTRODUCTION

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder that affects behavior, social interaction, and communication throughout life. According to estimates from the World Health Organization, one in every 100 children globally suffers from ASD. Improving cognitive, behavioral, and social development outcomes requires early detection and intervention.
Despite growing awareness, many caregivers still have trouble getting professional advice or early screening tools, particularly in rural or resource-constrained areas. Parents frequently observe behavioral changes in their kids, but they don't have easy access to resources to assess developmental issues.
By enabling easily accessible screening and monitoring tools that can help clinicians and caregivers, digital health technologies offer a chance to close this gap.
This study presents AutiCare, an AI-driven screening and assistance system intended to:

1. Offer early ASD behavioral screening
2. Monitor patterns of developmental behavior
3. Provide caregivers with educational materials.
4. Facilitate cooperation between professionals and parents.

To provide risk-based screening insights, the system integrates behavioral questionnaires, machine learning algorithms, and a web-based interface.

The key objectives of the proposed system are:
1. To provide an accessible and easy-to-use platform for early ASD screening.
2. To enable continuous monitoring of behavioral patterns in children.
3. To provide caregivers with educational resources and guidance.
4. To facilitate communication and collaboration between caregivers and professionals.

II. LITERATURE REVIEW

Prior research emphasizes the significance of digital health interventions and early autism screening.

In clinical settings, screening instruments like the Modified Checklist for Autism in Toddlers (M-CHAT) are frequently used to detect possible symptoms of ASD. However, caregivers outside of healthcare settings may not always have easy access to these resources.

Additionally, research has looked into using behavioral and demographic characteristics to predict autism risk using machine learning techniques. In tasks involving the classification of autism, algorithms like Logistic Regression, Random Forest, Support Vector Machines, and Neural Networks have shown encouraging results.

Digital platforms that offer educational materials, caregiver support systems, and remote behavioral monitoring have been suggested as ways to improve accessibility.

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Nevertheless, a lot of current solutions only concentrate on screening or therapy resources on their own. Screening, behavioral tracking, resource access, and caregiver collaboration are rarely combined into a single platform.

AutiCare combines an integrated digital health platform with AI-based screening to close this research gap.

III. METHODOLOGY

AutiCare was developed using the System Development Life Cycle (SDLC) methodology, which includes the following stages:

1. Analysis of Requirements:
   In this stage, the needs of caregivers and medical professionals were examined in order to determine the system requirements. Important features like report generation, behavioral tracking, screening, and user registration were established.

2. Design of the System:
   Database schema, backend processing logic, and frontend interface design were all part of the system's overall architecture. To guarantee accessibility for non-technical users, user-friendly interfaces were given top priority.

3. Model Creation:
   Autism screening datasets were used to create a machine learning model. The model that performed the best was chosen for integration after a number of algorithms were assessed.

4. Development of Applications:
   Python and Streamlit were used in the development of the application's front-end interface. To handle user input and interact with the machine learning model, backend functionalities were put into place.

5. Assessment and Testing:
   To verify accuracy, dependability, and usability, the system underwent unit, integration, and user acceptance testing.

A structured behavioral questionnaire with several parameters pertaining to behavior, social interaction, and communication serves as the foundation for the screening procedure in the suggested system.

To categorize autism risk levels, the method combines behavioral questionnaire data with a machine learning model that has been developed.

Fig. 1. Screening Workflow of the AutiCare System

The following steps are part of the system's workflow:

- The user enters the system.
- A child profile is made.
- The screening questionnaire has been finished.
- The ML model processes the responses.
- The degree of risk is anticipated
- The database stores and displays the results.

Data storage, machine learning prediction, and user interaction are all seamlessly integrated thanks to the methodology.

When a caregiver establishes a child profile and logs onto the application, the screening process starts. After then, the caregiver responds to a series of behavioral screening questions.

The trained machine learning model analyzes the replies and forecasts the degree of autism risk. The outcomes are saved in the database for further use and presented with suggested next actions.

IV. SYSTEM ARCHITECTURE

The three-tier architecture of the suggested system is made up of:

1. Frontend Presentation Layer:
   Streamlit, which offers an interactive and user-friendly interface, is used to develop the

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system's frontend. This layer manages user interactions, such as:

- Logging in and registering users
- The creation of a child profile
- Input from the screening questionnaire
- Prediction results are displayed.
- Behavioral data visualization

Function calls and API-like interactions are how the frontend and backend communicate.

2. Backend (Application Layer):
Python is used to implement the backend, which is in charge of handling user input and carrying out the system's main logic.

The backend's primary duties include:

- Getting and verifying user input
- Creating feature vectors from questionnaire responses
- The trained machine learning model is loaded.
- Making predictions with the model
- Notifying the frontend of the results
- Overseeing database operations

The machine learning model and the user interface are connected by the backend.

3. The Data Layer (Database):
In our system, SQLite is utilized as a database for storing users' information and results of the screening process. The database contains the following tables:

- Users
- Child Profiles
- Screening Records
- Behavioral Logs

All of the data is safely stored and can be accessed at a later time for analysis and tracking purposes.

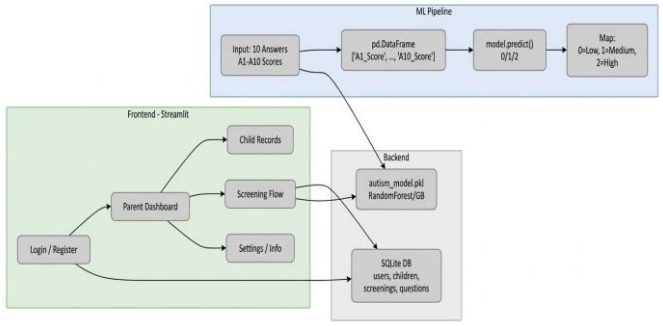

Fig. 2. System Architecture of the AutiCare System

Streamlit, which offers an interactive user interface that can be accessed through web browsers, is used to construct the frontend.

The machine learning prediction model is communicated with and user inputs are processed by the backend.

User accounts, child profiles, screening outcomes, and behavioral records are all kept in the SQLite database.

V. MACHINE LEARNING MODEL

Based on behavioral questionnaire responses, the machine learning component is in charge of categorizing autism risk levels.

Dataset:-

An autism screening dataset comprising behavioral signs and demographic characteristics was used to train the model.

Important characteristics consist of:

- Results from the A1–A10 behavioral questionnaire
- The age of children
- Gender
- Indicators of screening history

Algorithms Evaluated:-

A number of machine learning algorithms were assessed, such as:

- The Logistic Regression
- The Random Forest
- XGBoost
- MLP stands for Multi-Layer Perceptron.

Random Forest outperformed the others in terms of resilience and classification accuracy.

Model Integration:-

The program incorporates the trained model when it has been exported as a serialized file (autism_model.pkl). Questionnaire answers are transformed into feature vectors during screening and sent to the model for prediction.

Three risk categories are overlaid onto the output:
Low Risk

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Medium Risk
High Risk

VI. SYSTEM IMPLEMENTATION

The following technologies are used in the implementation of the AutiCare application

TABLE I
SYSTEM TECHNOLOGY STACK

Components	Technology
Frontend	Streamlit
Backend	Python
Machine Learning	Scikit-learn
Database	SQLite
Visualization	Matplotlib

The system includes several functional modules:

- User Authentication
- Child Profile Management
- Screening Questionnaire
- Machine Learning Prediction
- Behaviour Tracking Dashboard
- Resource Library
- Administrative Dashboard

Each module interacts with the backend services and database to provide a seamless user experience.

VII. TESTING AND VALIDATION

Multiple testing strategies were used to evaluate system functionality and performance.

Unit Testing:-

Individual modules such as login, questionnaire submission, and database operations were tested independently.

Integration Testing:-

Integration testing ensured that the frontend, backend, machine learning model, and database communicated correctly.

User Acceptance Testing:-

The prototype was tested by:

- 10 caregivers
- 3 special education professionals

Feedback indicated:

- 85% improved awareness of ASD symptoms
- 90% user-friendly interface rating
- 80% usefulness in therapy preparation

Performance Testing:-

The system demonstrated stable performance with up to **100 concurrent users** and an average response time below **2 seconds**.

VIII. RESULTS AND DISCUSSION

The application and effectiveness of the AutiCare system, which utilizes a combination of machine learning and a web-based application for early autism screening, can be highlighted. The application and effectiveness of the proposed system can be assessed on various parameters.

1. System Performance Analysis:-

   The application and effectiveness of the proposed system were assessed by analyzing its performance under various usage scenarios.

   The average response time for generating predictions using the proposed application was found to be less than 2 seconds.

2. Machine Learning Model Performance:-

   The proposed machine learning model was trained using behavioral and demographic data. The performance of various algorithms, such as Logistic Regression, Random Forest, XGBoost, and Multi-Layer Perceptron (MLP), was assessed.

   The proposed Random Forest classifier showed excellent performance and accuracy in classifying user responses into three categories: Low, Medium, and High.

TABLE II

MODEL PERFORMANCE COMPARISON

Model	Accuracy
Logistic Regression	88%
Random Forest	94%
XGBoost	92%
NLP	89%

The machine learning model successfully classified screening responses into risk categories, providing caregivers with preliminary insights.

3. Discussion:-

   The results show that there is a potential for improving accessibility to early screening tools by integrating machine learning and digital health platforms. The system provides a cost-effective solution for caregivers, especially in areas where access to healthcare is a challenge.

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In comparison to other traditional screening systems, the proposed system provides faster results and monitoring, as well as improved user engagement.

However, the system is designed as a **support tool rather than a diagnostic system**, and clinical evaluation remains essential.

IX. CONCLUSION

This research presented the design and development of **AutiCare**, an AI-powered web platform for autism screening and caregiver support.

The system integrates machine learning-based behavioural screening with a user-friendly web interface and secure database infrastructure. By providing accessible screening tools, behaviour monitoring, and educational resources, AutiCare aims to support early awareness and intervention for children with autism.

The evaluation results indicate that the system improves caregiver awareness and facilitates structured behavioural tracking.

Future development will focus on integrating advanced artificial intelligence models, cloud-based data synchronization, multilingual support, and telehealth integration.

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