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Wearable Health Monitoring System for Detecting Physiological Changes in Individual with Autism Spectrum Disorder Along with Anxiety Detection

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Abstract
This project introduces a Comprehensive Autism and Health Assessment System created on the basis of the deep learning and machine learning techniques. The system is created to act as a pre-screening instrument that will combine three significant examinations into one web-based application created with Streamlit. The former module does the autism detection with the help of a YOLOv8 object detector model, which evaluates the uploaded image and shows the outcome of the detection and the confidence level. In case of autism identification, the system passes to the second module, which assesses respiratory health conditions through a Support Vector Machine model upon the input of vital signs and symptoms as typed by the user. The condition is categorized as either normal, mild, severe or chronic in the output. The third module is based on anxiety measurement and predicts Separation Anxiety Disorder and Generalized Anxiety Disorder with the help of machine learning pipelines that rely on the inputs of behavioral and emotional symptoms. The system adheres to a step-by-step working process and introduces a final combined report that would show all the outcomes and fundamental recommendations. The application is not to be used professionally and is only to be used as a learning and research tool. The system illustrates that it is possible to have several artificial intelligence models integrated into one viable healthcare screening platform.

Keywords: *Autism Detection, YOLOv8, Health Assessment, Support Vector Machine, Anxiety Prediction, Separation Anxiety Disorder, Generalized Anxiety Disorder, Machine Learning, Streamlit Application.*

1. Introduction
This project presents a whole new system of web-based Autism and Health Assessment System which is intended to facilitate early screening based on artificial intelligence. Many real-life situations prevent the experts from being readily accessible and able to form a formal evaluation, this is why early Detection is one problem. In order to rectify the gap, the system integrates various assessment processes behind the system in one Streamlit-based system. It is said to provide users with an easily accessible stepwise interface which could provide some of the initial screening information for autism, respiratory complications and anxiety related disorders. The first one is an autism detector which is powered with YOLOv8 deep learning model. Users upload an image and the model analyses indicators associated with autism that can be seen in the visually uploaded photos, and gives a prediction with levels of confidence. If the signs of autism are found, the user moves on to another assessment stage. The second module is dedicated to basic evaluation of health, and especially the imbalance of the respiratory. [1-3]

1.1.Sub section 1
The second module aims to do respiratory-related health classification using a Support Vector Machine. Users enter in symptoms and vital signs, such as temperature, blood pressure, PH level, oxygen saturation and behavioral indicators such as dehydration or cough. Inputs are numerically coded, normalized and extended into a vectorized and

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organized feature vector.

1.2.Sub section 2

The Comprehensive Autism and Health Assessment System combines three independent machine-learning modules, namely, autism detection, health assessment, and anxiety prediction into a single sequential web-based system using Python and Streamlit. Each module is independent of each other with a common workflow managed through session state. [4-7]

2. Method

The proposed system is realized as a web-based application based on the Streamlit framework and is implemented with a sequential assessment workflow. It has three major modules: autism detection, health and anxiety assessment. Users move on to the next module only after having finished the earlier one. All user inputs and model predictions are captured with session state management which allows the creation of a final integrated report at the end of the assessment. This methodology has the sole purpose of preliminary screening, educational purposes and not clinical diagnosi (Figure 1)

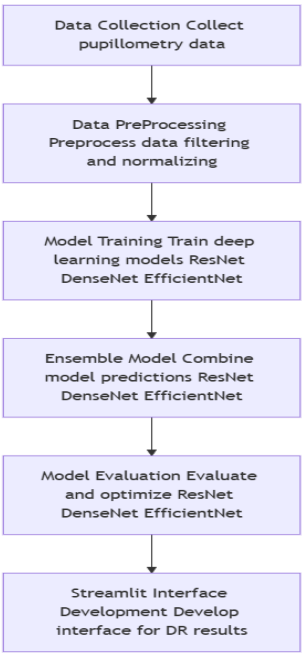

Figure 1 Illustrates The High-Level Block Diagram of the Proposed System, Showing The Interaction Between the User, The Streamlit Interface, And The Three Assessment Modules.

3. Results and Discussion

3.1.Results

Performance evaluation of the URL and email classifiers was conducted using Accuracy, Precision, Recall, and F1-score. [8-10]

3.2.Discussion

The module to detect autism disease provides results after uploading an image. The image goes into the YOLOv8 model, the bounding boxes are drawn in the image, and class labels with confidence scores are given out. When autism is detected, the system shows the annotated image and the correct annotation for it, with a clear message to proceed to the next module. If not detected the system ceases the evaluation and advises the user that no further evaluation is necessary. This module works well as a controlled gate for a complete workflow as well. Real-time inference, visualization with an internal disclaimer message ensure ethical use, proper user understanding and prevention of misinterpretation of results. Figure 2 shows Aurtism Spectrum Disorder Process of Detection Diagram of the Workflow

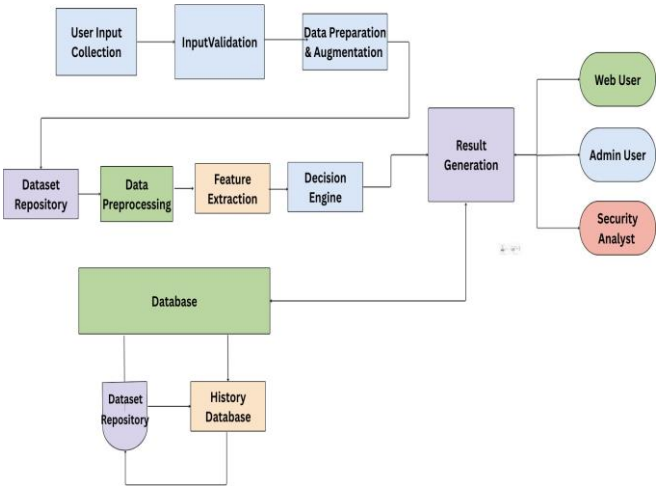

Figure 2 Aurtism Spectrum Disorder Process of Detection Diagram of the Workflow

Conclusion

The Comprehensive Autism and Health Assessment System is a successful demonstration of integrating deep learning models and machine learning models into one user-friendly web-based screening tool. Built in streamlit, the system assimilates 3 major modules - YOLOv8-based autism disease detection,

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SVM based respiratory diseases detection and machine learning pipeline based anxiety diagnosis for SAD and GAD cases is consolidated. The platform allows users to upload images, enter information about health parameters and report the behavioral symptoms in a structured process.

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