DETECTION OF EARLY STAGE OF AUTISM SPECTRUM DISORDER USING MACHINE LEARNING

Minor project report submitted
in partial fulfillment of the requirement for award of the degree of

Bachelor of Technology
in
Computer Science & Engineering

By

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CERTIFICATE

It is certified that the work contained in the project report titled DETECTION OF EARLY STAGE OF AUTISM SPECTRUM DISORDER USING MACHINE LEARNING by SUDA VENKATA RAGHAVENDRA (19UECS0933), CHEVVU VENKATA SUJITH KUMAR REDDY (19UECS1159), AFREEN SHAIK (19UECS0883) has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

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DECLARATION

We declare that this written submission represents my ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any data fact in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

Autism spectrum disorder (ASD) is the neuro development disorder. It effects on how the people communicate and interact with others. In this we particularly concerning three domains social functioning, communication and Stereotyped Behaviors. Diagnosis of autism requires significant amount of time and cost. ASD can be cause due to having an immediate family member who's autistics, certain genetic mutations and some mental and physical health condition. Early detection of autism can come to a great help by prescribing patients with proper medication at an early stage. According to the ASD problem starts with childhood and continues to and keep going on into adolescence and adulthood. Based on some machine learning algorithms like Naive bayes, support vector machine, logistic regression, KNN, CNN (Convolution neural networking) for predicting and analysis of ASD problems in child, adolescents and Adults. So, this will try to shed light on characteristics and features of Autistic children and their common language, speech and communication related problems so that it may help to the diagnosis as soon as possible to take effective measures.

keywords:
Autism, Neuro Development Disorder, Stereotyped, Diagnosis, Genetic Mutation, Adolescence.

LIST OF FIGURES

LIST OF ACRONYMS AND ABBREVIATIONS

ASD	Autism spectrum disorder
ADOS	Autism Diagnostic Observation Schedule
CARS	Childhood Autism Rating Scale
CNN	convolutional neural network
GARS	Gilliam Autism Rating Scale
ML	Machine learning

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Chapter 1

INTRODUCTION

1.1 Introduction

Autism spectrum disorder (ASD) is a complex neurodevelopmental disorder generally it can be cause due to having an immediate family member who's autistics, certain genetic mutations and some mental and physical health condition is characterized by deficits in communication and social interaction and restricted, repetitive patterns of behaviors, interests, and activities. The problem of autism spectrum disorder now a days it is mounting swiftly to all ages of Human population. Autism patients face different types of challenges such as difficulties with concentration, learning disabilities, mental health problems. Current explosion rate of autism around word is numerous and it is increasing at the very high rate. Earlier detection of autism can be great help for patients at an early stage.

The doctors will diagnose a child with ASD specific methods for diagnosis of children with Autism are broken down in to two levels: level-1 Initial screening level and it is carried out by general practitioners of children. Level-2:Get the more detailed evaluation from expects and again early detection ASD around 18 months but diagnosis is usually at or after age of three and assignments are conducted using neurodevelopment frame work the frame work includes involving the child's family and doctors .ASD difficult to diagnose because it has such diverse list of symptoms which include delayed in speech, no proper eye contact , lack of response ,poor social skills, Atypical tone behaviors issues, learning delay and more the main causes of ASD

1.2 Project Domain

Machine learning (ML) is a study of computer algorithms that improve automatically through experience and by the use of data. Machine learning algorithms build a model based on sample data, known as Training data

1.3 Aim of the project

Autism Spectrum Disorder is a neurobiological disorder. There is no cure for this Disorder and no physical treatment or test to find it. So the project's objective is to early detecting the autism in children's and adults by gathering some datasets and building ml model to predict disorder and How this disorder occurred and provides the precautions to the disorder.

1.4 Scope of the Project

The scope of the project is to study focuses mind set of the children's and adults and detecting the (AUTISM SPECTRUM DISORDER)ASD in early stage and provide them some suggestions and precautions.

Chapter 2

LITERATURE REVIEW

F Bonnet-Brilhault et al., [1]The ASD are complex neurobehavioral disorder by by social and communication deficits and repetitive and stereotyped behaviors. It is now believed that environmental factors may modulate phenotypical expression of ASD that are associated with the genetic predisposition. The diagnosis of ASD can be reliably made in the second year of Life and appears to be relatively stable over time. However, diagnosis of very young children can be quite complex due to their clinical heterogeneity and varying patterns of onset that can differ from the typical autism symptoms of an older child.

Ditza Antebi Zachor et al., [2]This study evaluated the effectiveness of the ESDM for preschool-aged children with ASD using a predominantly group-based intervention in a community child care setting.in this they follow some methods there are taken some participants with some 26 children's with ASD with mean age 49.6 months. Children received 15-20 hours of group-based, and one hour of one-to-one, ESDM intervention per week his study suggests community dissemination of the ESDM using predominantly group-based intervention may be an effective intervention.

valsamma Eapen et al ., [3]The Behavioral interventions for children with autism spectrum disorders,the intervention behavioral is only treatment for young children with ASD s. This article describes the core features of behavioral treatments, summarizes the evidence base for effectiveness, and provides recommendations.

Patricia Manning-Courtney,Donna Murray, Kristen Currans et al., [4]Children on the Autism Spectrum and the Use of Virtual Reality for Supporting Social Skills Autism spectrum disorders (ASDs) are characterized by differences in socio-pragmatic communication. These conditions are allocated within a "spectrum" of phenotypic variability with some methods for improving social skills like emotional training and traditional emotional training.

Alessandro Frolli , Giulia Savarese et al.,[5]The Using participant data to extend the evidence base for intensive behavioral intervention for children with autism the gathered individual participants data from 16 group studies with children with autism, most children who are underwent behavioral intervention achieved change in IQ(29.8 percent)compared with 2.6percent and 8.7percent.

Sigmund Eldevik , Richard P Hastings et al., [6]This article summarizes the current literature on social skills training for children and adolescents with autism spectrum disorders. The article describes several different methods of social skills training, along with a summary of research findings on effectiveness. Interventions described include social skills groups, peer mentoring/training, social stories, and video modeling.

Amy J Bohlander,Felice Orlich, Christopher K Varley et al .,[7]The study provides an overview of recent studies on behavioral interventions for children and adolescents with autism spectrum disorder (ASD),Behavioral interventions are effective for improving language, cognitive abilities, adaptive behavior, and social skills, and reducing anxiety and aggression. Medication combined with behavioral intervention appears to be more effective for reducing aggressive behavior than medication alone.

Geraldine Dawson , Karen Burner et al ., [8]The New strategies and findings for behavioral interventions in autism spectrum disorders . Outcomes of these interventions are neither easily assessed nor simple, but are dependent on child characteristics as well as caregiver skills and attitudes.

Catherine Lord , Rebecca M Jones et al .,[9] The Overview of meta-analyses on early intensive behavioral intervention for young children with autism spectrum disorders ,There were many differences between meta-analyses, leading to different estimates of effect and overall conclusions. The weighted mean effect sizes across meta-analyses for IQ and adaptive behavior ranged from g = .38-1.19 and g = .30-1.09, respectively.

Chapter 3

PROJECT DESCRIPTION

3.1 Existing System

Different existing data mining procedures and its application were considered or explored. Utilization of machine learning algorithms was connected in various medical data sets. Machine learning strategies have diverse power in different medical data sets.Previously mentioned conventional machine learning techniques gave less exact outcome and results additionally shifts in light of the procedures has been utilized for the prediction.

3.2 Proposed System

Our proposed strategy focuses on a novel machine learning procedures for Autism spectrum disorder (ASD) classification and prediction, thus overcoming the existing problem.By utilizing Random Forest (RF), Support Vector Machine(SVM). AdaBooster algorithms we will make our model in order to increase the performance and accuracy.

3.3 Feasibility Study

Automatic Identification of High-Risk Autism Spectrum Disorder: A Feasibility Study Using Video and Audio Data Under the Still-Face Para-diagram.

3.3.1 Economic Feasibility

Cost-effectiveness analysis is an integral component of HTA. Given the cost of running fully powered RCTs, it is important to establish their feasibility to evaluate whether or not to conduct the trial and how to best to do so. This part of the second phase of the ASSSIST study evaluated the feasibility of collecting data for economic analysis. More specifically, the economic study aimed to establish whether or not

it was feasible to collect data on generic measures of health and relevant resource use in this population to allow estimation of costs associated with treatment delivery and associated health-care and societal costs (i.e. how various service usage changes given treatment and the costs associated with that change).

3.3.2 Technical Feasibility

A Feasibility Study of Autism Behavioral Markers in Spontaneous Facial, Visual, and Hand Movement Response Data.Feasibility of using a humanoid robot for enhancing attention and social skills in adolescents with autism spectrum disorder

3.3.3 Social Feasibility

Children with ASD have difficulty with social interaction behaviors, including establishing and maintaining relationships, reciprocating social interaction, and communicating with others.

3.4 System Specification

3.4.1 Hardware Specification

These tools include the Childhood Autism Rating Scale (CARS), Gilliam Autism Rating Scale (GARS), Autism Diagnostic Observation Schedule (ADOS) and the Autism Diagnostic Interview- Revised (ADI-R).

3.4.2 Software Specification

ASD Module: a software to support the personal autonomy in the daily life of children with autism spectrum disorder.

3.4.3 Standards and Policies

3.4.3.1 Anaconda Prompt

Anaconda prompt is a type of command line interface which explicitly deals with the ML(MachineLearning) modules.And navigator is available in all the Windows,Linux and MacOS.The anaconda prompt has many number of IDE's which make the coding easier. The UI can also be implemented in python.

3.4.3.2 Jupyter

Standared Used:ISO/IEC27001

It's like an open source web application that allows us to share and create the documents which contains the live code, equations, visualizations and narrative text. It can be used for data cleaning and transformation, numerical simulation, statistical modeling, data visualization, machine learning.

Chapter 4

METHODOLOGY

4.1 General Architecture

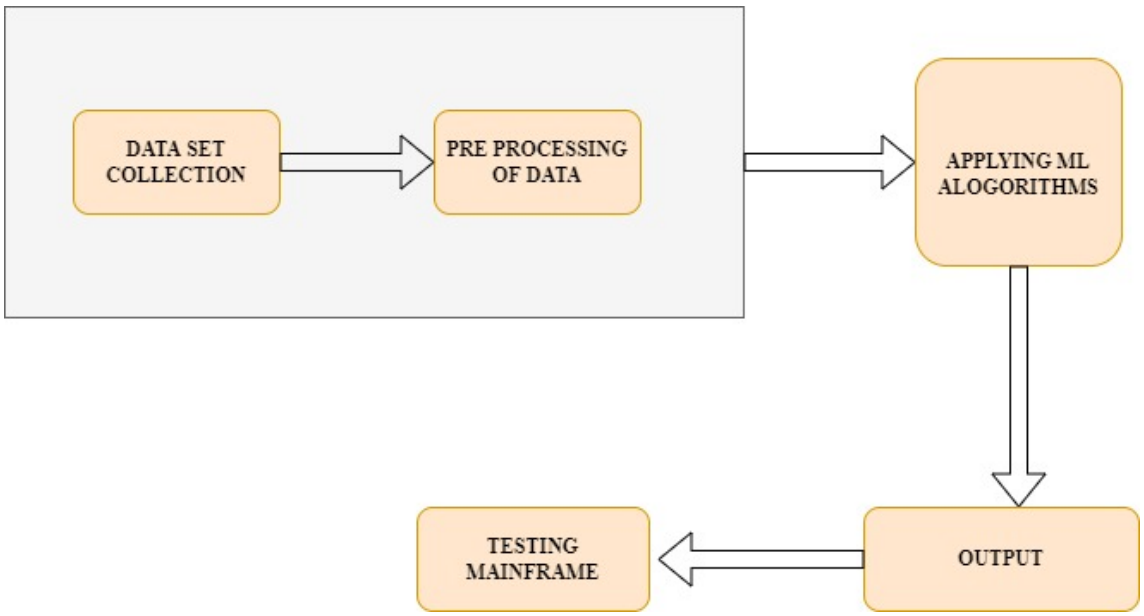

Figure 4.1: **Autism Architecture Diagram**

Figure 4.1 shows The Data set collection in which to develop an effective predictive model we have Q-chat-10 dataset that we used. The dataset contains attributes like age, sex, ethnicity and Autism specific screening questions focus on different domains such as attention to detail, attention switching, Communication imagination and social interactions. Pre-processing of data: In pre-processing the data refers to the transformations applied to a data set before feeding it to the model. It was done to clean raw or noisy data in data set and make it as more suitable for training and analysis and it remove the non-contributing attributes, Label encoding coverts the labels into numeric form to make it machine readable.By applying ML algorithms we can get the output.

4.2 Design Phase

4.2.1 Data Flow Diagram for Autism application

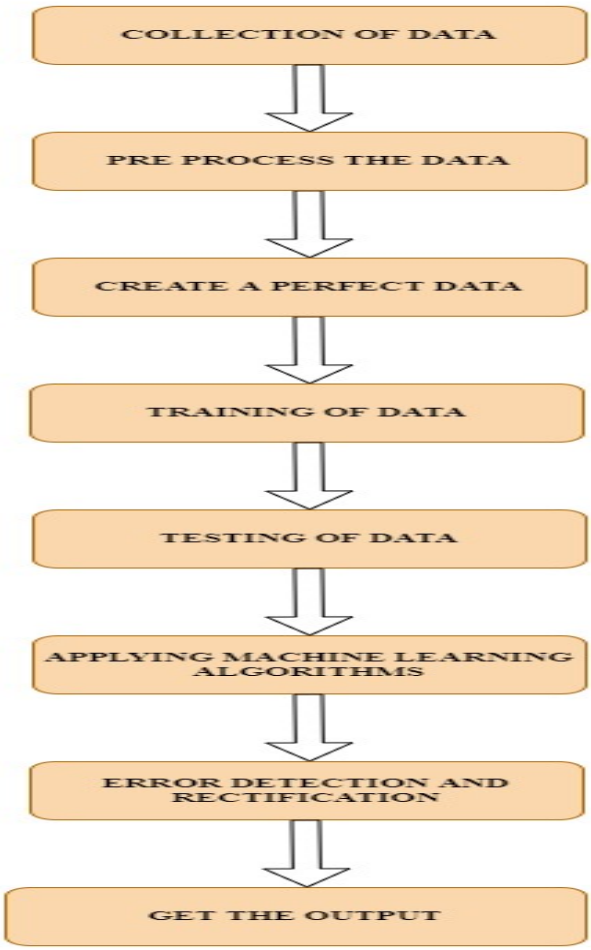

Figure 4.2: **Data flow diagram for ASD application**

Figure 4.2 shows the data flow diagram shows the way information flows through a process or system. It includes data inputs and outputs, data stores, and the various subprocesses the data moves through. DFDs are built using standardized symbols and notation to describe various entities and their relationships.Firstly we need to collect the data by machine learning technique and then pre processing of data will be happen then create the perfect data that data has to been trained and tested And then applying the machine learning alogorthims then get the output.

4.2.2 Use Case Diagram

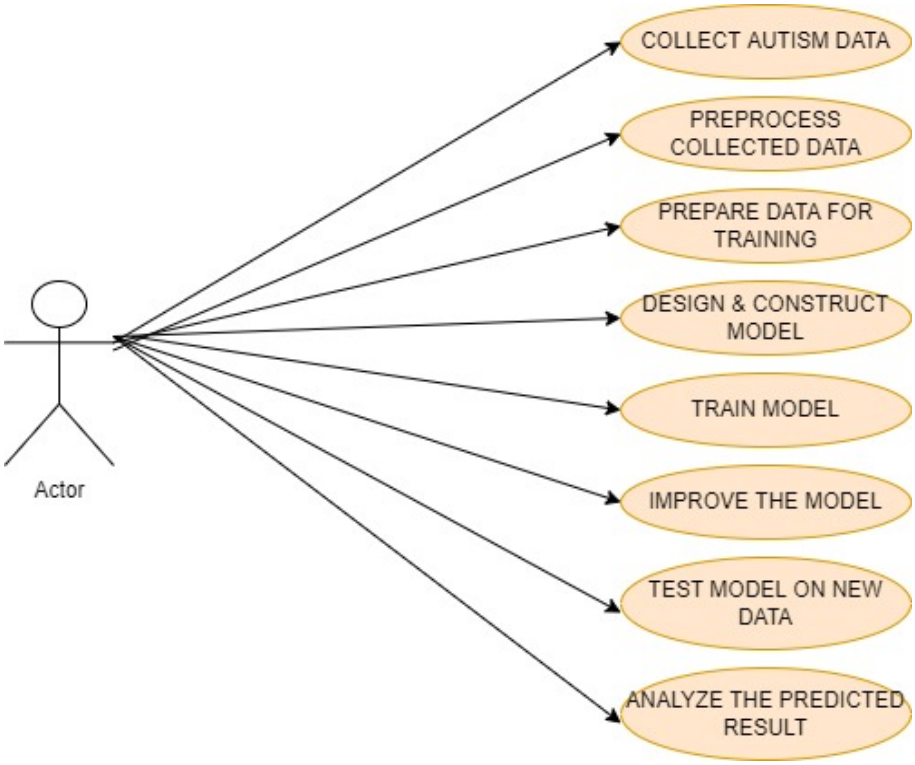

Figure 4.3: **use case diagarm for ASD**

In Figure 4.3 shows the UML,use-case diagrams model the behavior of a system and help to capture the requirements of the system. Use-case diagrams describe the high-level functions and scope of a system.These diagrams also identify the interactions between the system and its actors.The use cases and actors in use-case diagrams describe what the system does and how the actors use it, but not how the system operates internally.Collect the dataset from the internet, which has 1055 records to find the Autism.In this dataset, ten behavioral features (Q-Chat-10) plus other individuals characteristics that have proved to be effective in detecting the ASD cases from controls in behavior science are present.This dataset contained some string value parameter based on that we need to convert string to numeric. Then plot the graph for analyzing the data.

4.2.3 Class Diagram

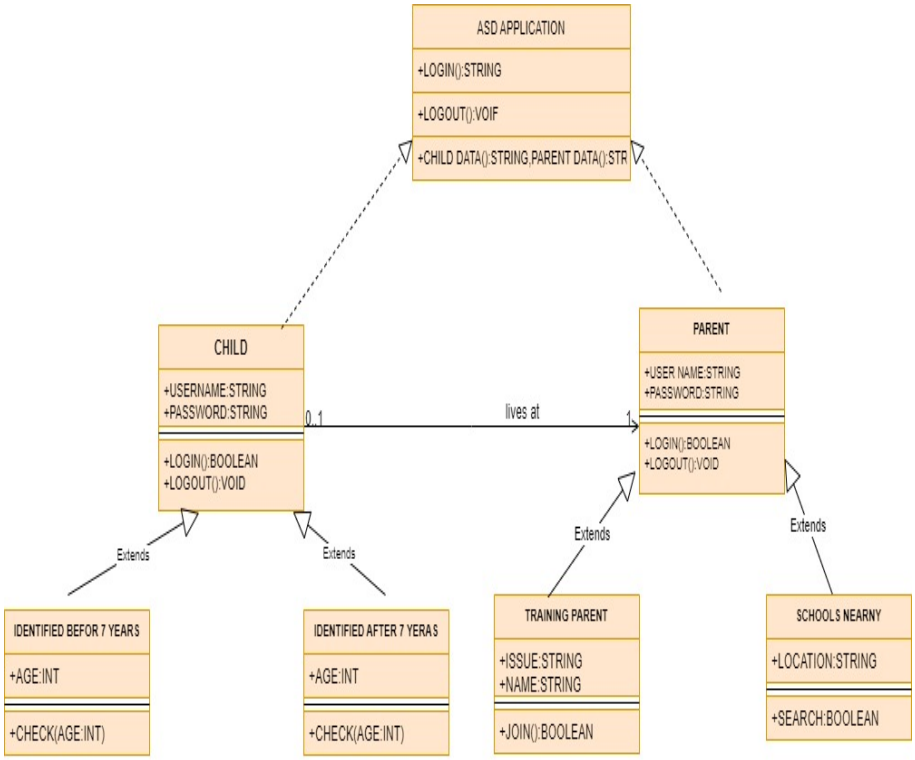

Figure 4.4: **class diagram for ASD**

In the Figure 4.4 shows the Class diagram is a static diagram. It represents the static view of an application.Class diagram is not only used for visualizing, describing, and documenting different aspects of a system but also for constructing executable code of the software application.In this ASD Application is the main class with have the details about the Child and Parent.ASD application can be accessed by the Login ID.From Child parent has the user name password they need to get login and get the output.

4.2.4 Sequence Diagram

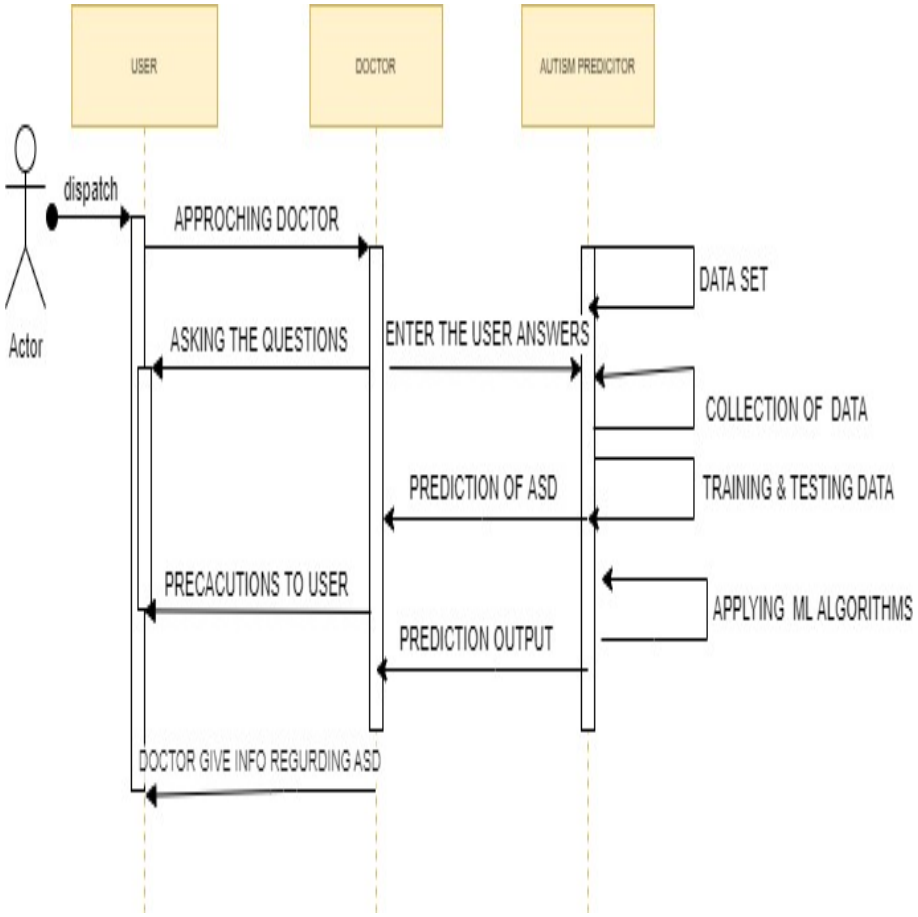

Figure 4.5: **sequence Diagram for ASD**

A sequence diagram simply depicts interaction between objects in a sequential order i.e. the order in which these interactions take place. We can also use the terms event diagrams or event scenarios to refer to a sequence diagram. Sequence diagrams describe how and in what order the objects in a system function.In this user,Doctor and ASD Application are main entity firstly user need to Approch the doctor then doctor will ask the Questions doctor will enter the user answers.In ASD Application Data prepossessing traing and testing of data done predict the output to doctor then doctor will give precautionsDoctor give information regurding the AD.

4.2.5 Collaboration diagram

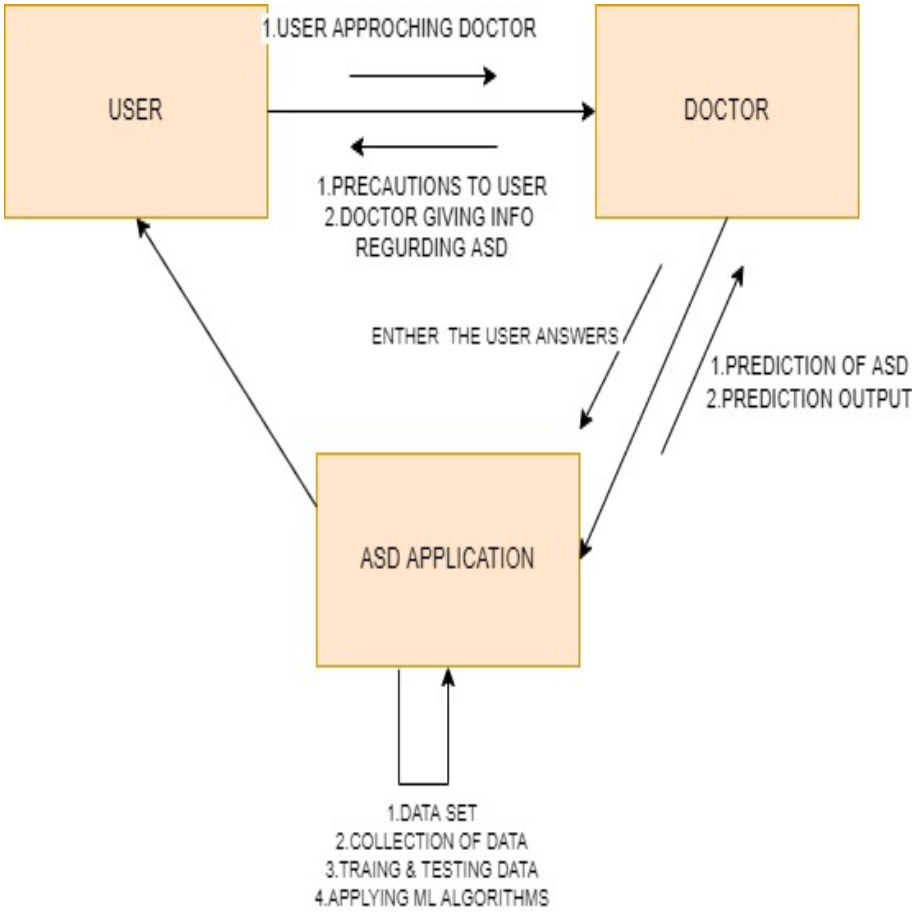

Figure 4.6: **collaboration diagram for ASD**

The collaboration diagram is used to show the relationship between the objects in a system. Both the sequence and the collaboration diagrams represent the same information but differently. Instead of showing the flow of messages, it depicts the architecture of the object residing in the system as it is based on object-oriented programming. An object consists of several features. Multiple objects present in the system are connected to each other. The collaboration diagram, which is also known as a communication diagram, is used to portray the object's architecture in the system.

4.2.6 Activity Diagram

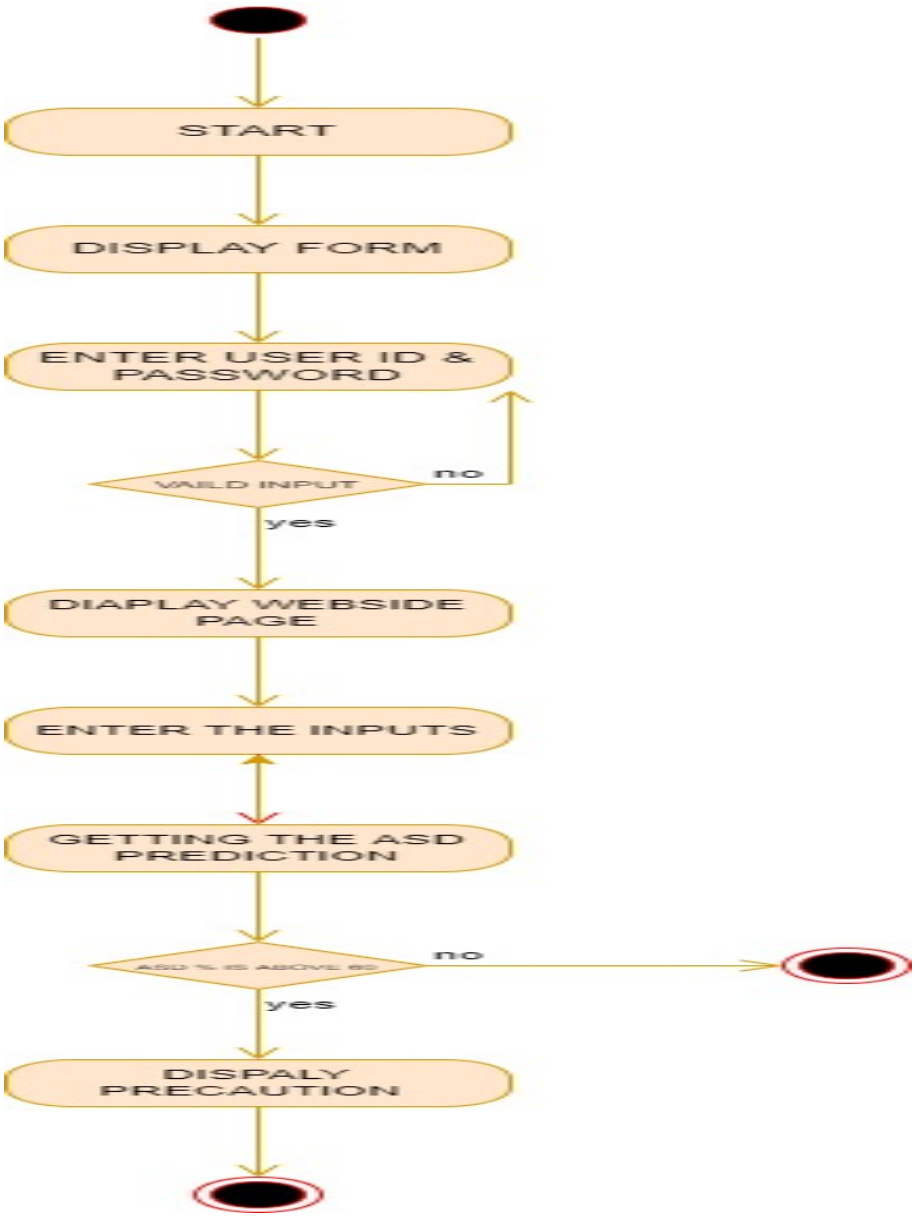

Figure 4.7: **acivity Diagram for ASD**

The basic purposes of activity diagrams is similar to other four diagrams. It captures the dynamic behavior of the system. Other four diagrams are used to show the message flow from one object to another but activity diagram is used to show message flow from one activity to another. we need start the applcation then dispaly the form then user need to login User id password if password is correct it will goto dispaly the website page if password is wrong user need to login Again.The user need to enter the inputs we will predicit the ASD if Autism is more 60 percent display the precaution and then stop.

4.3 Algorithm & Pseudo Code

4.3.1 Algorithm

step 1:start the program
step 2: create a Dataset program to store the data about ASD user
step 3:Then train the Dataset
step 4:Developing the predictive Machine Learning model
step 5:Evaluating the predictive model
step 6:Developing a web-based application using Heroku and GitHub
step 7: Developing a Android application using Android Studio
step 8: End of the program

4.3.2 Pseudo Code

1. E S == R ←
2. r
1 ←
3. Temp ← T
4. Do
5. If [(p(Ai, vi)—ci=I)/—Temp—]¿=minfreq
6. If [(p(Ai, vi)—ci=I)/—(p(Ai, vi)]¿=RS
7. r Ai vi i ← (,)
8. Repeat steps 5-7 until ri accuracy cannot improve
9. E S R r ==← i
10. Temp Temp Locate r Temp ← -( ) i (,)
11. Train T ← -( ) rain Temp
12. Repeat steps 2-11
13. Exit when T has no more instances OR all p(Ai, vi) have been tested
14.
15. Generate E S == R
16. Classify Test (Test, E S == R)

4.4 Module Description

4.4.1 Data Preprocessing

Data Collection and training using Machine Learning.

4.4.2 Data gethering

Real Time data gathering and prognostics GUI design.

4.4.3 Applying the algorithm

Applying machine learning algorithms for the Prediction of ASD

4.5 Steps to execute/run/implement the project

4.5.1 Step1

Open anaconda jupyter and run kernal of the program.

4.5.2 Step2

Go to command prompt and type python app.py.

4.5.3 Step3

It create an address to run the project on server using flask here we can execuite our project.

Chapter 5

IMPLEMENTATION AND TESTING

5.1 Input and Output

5.1.1 Input Design

Data collection and analysis is an important component of educational programming for all students, but particularly for students with ASD. Making data-based decisions is critical for supporting students to make progress in all areas, including academics, behavior, communication, social skills, and other skills. To generate prediction of autism traits, algorithms had been developed and their accuracy were tested. After attaining results from various types of supervised learning like Linear Regression, SVM, Naive Bayes, Random Forest was found to be highly feasible with higher accuracy than the other algorithms. So, Random Forest (CART) was proposed for im- plementing the ASD predictive system.

5.1.2 Collaboration diagram

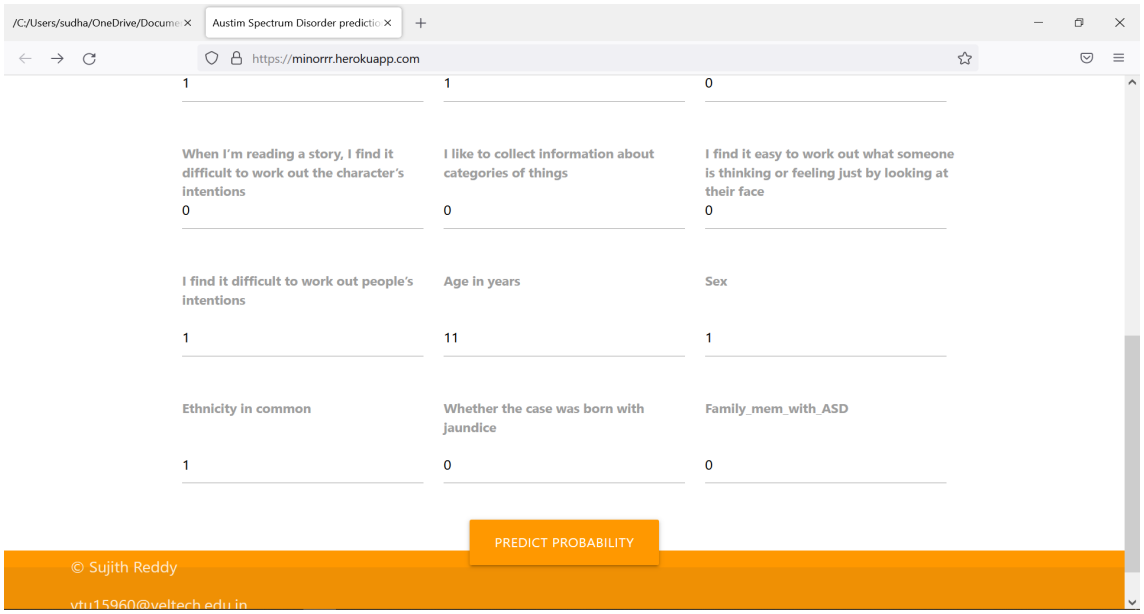

Figure 5.1: **Home page of ASD**

5.1.3 Output Design

The final step for the processes, expected to give the right predictions of the input data and try to predict labels and create the desired classification for each entered data.It will give Autism percent based on user question to the answer.

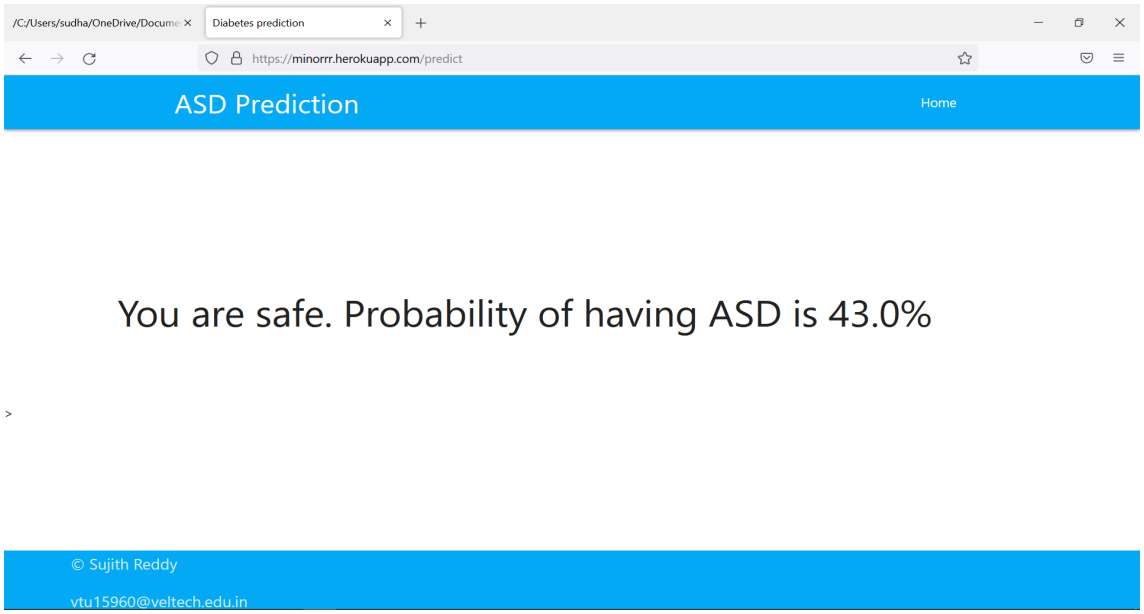

Figure 5.2: **Prediction of ASD**

5.2 Testing

The purpose of testing is to discover errors. Testing is the process of trying to discover every conceivable fault or weakness in a work product. It provides a way to check the functionality of components, sub assemblies, assemblies and/or a finished product It is the process of exercising software with the intent of ensuring that the Software system meets its requirements and user expectations and does not fail in an unacceptable manner. There are various types of test. Each test type addresses a specific testing requirement.

5.3 Types of Testing

5.3.1 Unit testing

unit testing is a type of software testing process where the individual components of a software are being tested. The purpose of this test is to validate that every unit of

the software code works in the way it is intended to be. This test is done during the development (coding phase) of the project by the developers. Unit tests takes out section of code and verify how it works. Unit tests have two fundamental purposes: Decrease the quantity of bugs by ensuring that our class module part is filling in true to working as expected with all possible inputs. Decrease the quantity of relapses by ensuring that our new usefulness, bug fixes or refactoring hasn't broken any current usefulness

Input

```
clf = GridSearchCV(estimator=pipe, param_grid=grid,
                   cv=5, scoring='roc_auc', n_jobs=-1)
clf.fit(X_train, y_train)
y_hat_train = clf.predict(X_train)
y_hat_test = clf.predict(X_test)

best_clf_estimator = clf.best_estimator_
best_clf_estimator.fit(X_train,y_train)

y_hat_train=best_clf_estimator.predict(X_train)
y_hat_test = best_clf_estimator.predict(X_test)
rf_gridsearch_test_acc = round(accuracy_score(y_test,y_hat_test), 2)
print("The accuracy of Random Forest Algoritham after Grid Search View is:",rf_gridsearch_test_ac)
\begin{figure}[H]
 \centering
 \includegraphics[height=8cm,width=15cm]{429.png}
 \caption{\textbf{Unit testing of Home page}}
\end{figure}
```

Figure 5.3: **Unit testing of Home page**

Test result

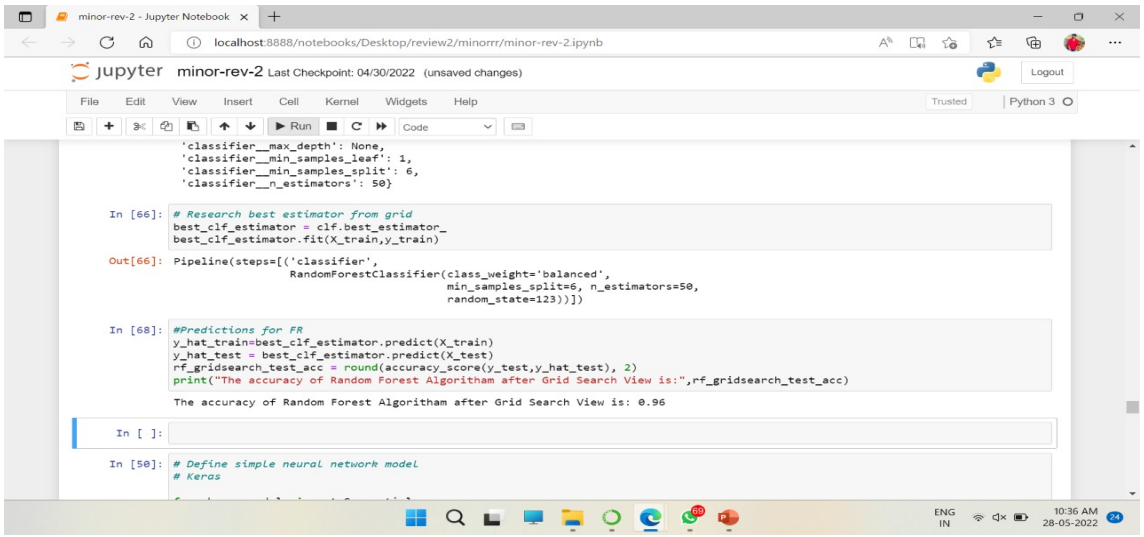

Figure 5.4: **Result page of Unit testing**

5.3.2 Integration testing

Integration testing can be formulated as a type of testing where software modules are integrated in a logical order and tested as a group.A regular software project consists of different software modules, worked on by different programmers. The purpose of this level of testing is to discover any defects in the integration between these software modules.

Input

```
import seaborn as sns
sns.countplot(x = 'Qchat-10-Score', hue = 'Sex', data = df)
```

Figure 5.5: **Integrating testing of Home page**

Test result

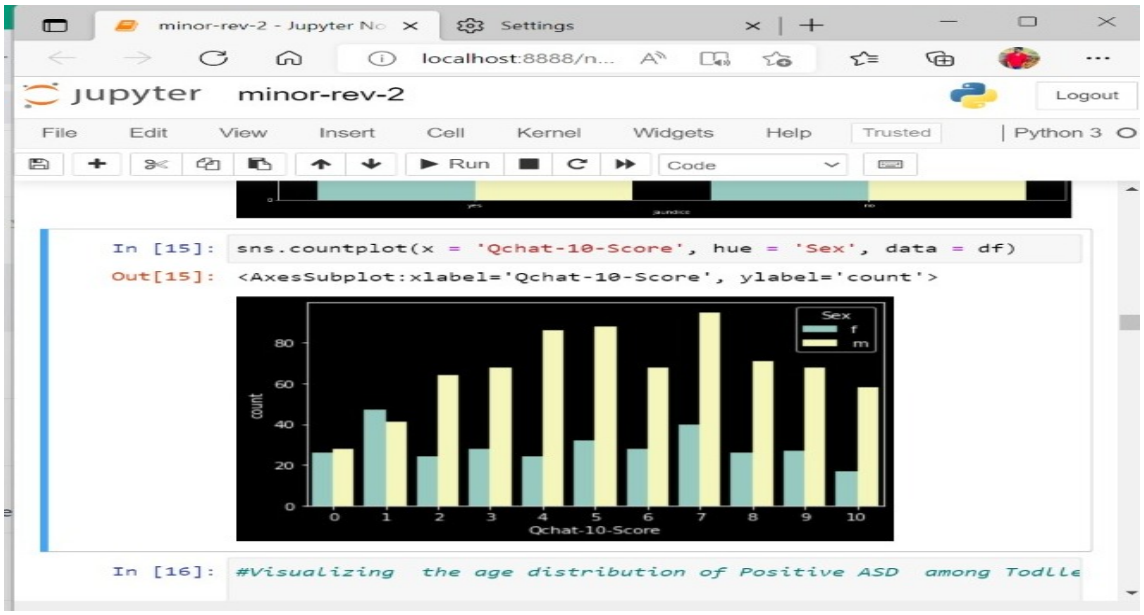

Figure 5.6: **Result page of Integrating testing**

5.3.3 System testing

System Testing is a level of testing that validates the complete and fully integrated software product. The purpose of a system test is to evaluate the end-to-end system specifications. Usually, the software is only one element of a larger computer-based system. Ultimately, the software is interfaced with other software/hardware systems. System Testing is actually a series of different tests whose sole purpose is to exercise the full computer-based system.

Chapter 6

RESULTS AND DISCUSSIONS

6.1 Efficiency of the Proposed System

Autism spectrum disorder is associated with significant healthcare costs, and early diagnosis can substantially reduce these. Unfortunately, waiting times for an autism spectrum disorder diagnosis are lengthy due to the fact that current diagnostic procedures are time-consuming and not cost-effective. Overall, the economic impact of autism and the increase in the number of autism spectrum disorder cases across the world reveal an urgent need for the development of easily implemented and effective screening methods. This article proposes a new web application mobile application to overcome the problem by offering users and the health community a friendly, time-efficient and accessible mobile-based autism spectrum disorder screening tool called ASDTests.The user has to Answer the Questions Efficiently then we can predict the output easy and Early Detection of the problem

6.2 Comparison of Existing and Proposed System

In the existing data mining procedures and its application were considered or explored.Machine learning strategies have diverse power in different medical data sets. Previously mentioned conventional machine learning techniques gave less exact outcome and results.

6.2.1 Existing system:

Different existing data mining procedures and its application were considered or explored. Utilization of machine learning algorithms was connected in various medical data sets. Machine learning strategies have diverse power in different medical data sets.Previously mentioned conventional machine learning techniques gave less exact outcome and results additionally shifts in light of the procedures has been utilized for the prediction.

6.2.2 Proposed System:(Random Forest Algorithm)

Our proposed strategy focuses on a novel machine learning procedures for Autism spectrum disorder (ASD) classification and prediction, thus overcoming the existing problem.By utilizing Random Forest (RF), Support Vector Machine(SVM). AdaBooster algorithms we will make our model in order to increase the performance and accuracy.

6.3 Sample Code

```
from sklearn.ensemble import RandomForestClassifier , GradientBoostingClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.svm import SVC, LinearSVC

# Regression
from sklearn.linear_model import LinearRegression,Ridge,Lasso,RidgeCV, ElasticNet,
    LogisticRegression
from sklearn.ensemble import RandomForestRegressor,BaggingRegressor,GradientBoostingRegressor,
    AdaBoostRegressor
from sklearn.svm import SVR
modelks = []
modelks.append(('RF', RandomForestRegressor()))
modelks.append(('LR', LogisticRegression()))
modelks.append(('SVM', SVC()))
modelks.append(('RF', RandomForestRegressor()))
modelks.append(('XGB', XGBClassifier()))
modelks.append(('KNN', KNeighborsClassifier()))
modelks.append(('CART', DecisionTreeClassifier()))

for name, model in modelks:
    model.fit(X_train, y_train)
    y_hat_test = model.predict(X_test).astype(int)
    y_hat_train = model.predict(X_train).astype(int)
   # print(name, 'Accuracy Score is : ', round(accuracy_score(y_test, y_hat_test)))

for name, modepl in modelks:

    y_hat_test = modepl.predict(X_test).astype(int)
    y_hat_train = modepl.predict(X_train).astype(int)
    print(name, 'Accuracy Score is : ',round( accuracy_score(y_test, y_hat_test),2))
```

Figure 6.1: **Sample code for Proposed System**

Output

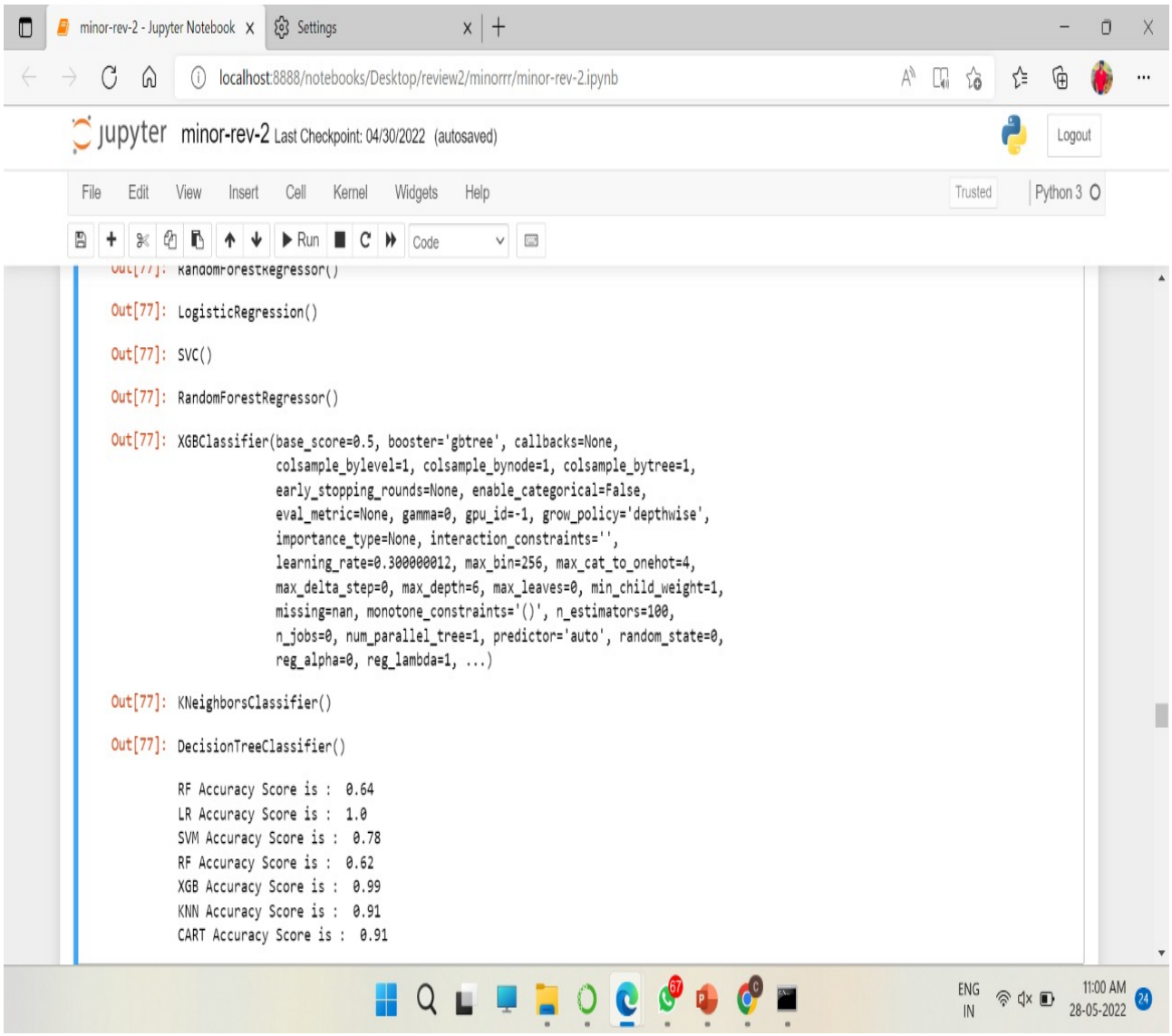

Figure 6.2: **Accuracy Score of proposed score**

Chapter 7

CONCLUSION AND FUTURE ENHANCEMENTS

7.1 Conclusion

In this work, detection of autism spectrum disorder was attempted using various machine learning and deep learning techniques. Various performance evaluation metrics were used to analyze the performance of the models implemented for ASD detection on non-clinical dataset from three sets of age groups viz. Child, Adolescents and the Adult. When comparing the result with another recent study These results strongly suggest that a Random Forest model can be implemented for detection of autism spectrum disorder in addition to enhance the prediction process that decide if the person has autism spectrum disorder or not and also showing the estimated percentage.

7.2 Future Enhancements

Our project can be enhanced further by adding the data base of patients that helps in frequent monitoring of patients and maintaining their health history.We can add feature to contact to doctors to directly if they proved that they having Autism Spectrum Disorder.

Chapter 8

PLAGIARISM REPORT

Curiginal

Document Information

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Figure 8.1: **plagiarism Report**

Chapter 9

SOURCE CODE & POSTER PRESENTATION

9.1 Source Code

```
# Regression
from sklearn.linear_model import LinearRegression,Ridge,Lasso,RidgeCV, ElasticNet,
    LogisticRegression
from sklearn.ensemble import RandomForestRegressor,BaggingRegressor,GradientBoostingRegressor,
    AdaBoostRegressor
from sklearn.svm import SVR
modelks = []
modelks.append(('RF', RandomForestRegressor()))
modelks.append(('LR', LogisticRegression()))
modelks.append(('SVM', SVC()))
modelks.append(('RF', RandomForestRegressor()))
modelks.append(('XGB', XGBClassifier()))
modelks.append(('KNN', KNeighborsClassifier()))
modelks.append(('CART', DecisionTreeClassifier()))

for name, model in modelks:
    model.fit(X_train, y_train)
    y_hat_test = model.predict(X_test).astype(int)
    y_hat_train = model.predict(X_train).astype(int)
   # print(name, 'Accuracy Score is : ', round(accuracy_score(y_test, y_hat_test)))

for name, modepl in modelks:

    y_hat_test = modepl.predict(X_test).astype(int)
    y_hat_train = modepl.predict(X_train).astype(int)
    print(name, 'Accuracy Score is : ',round( accuracy_score(y_test, y_hat_test),2))
```

Figure 9.1: **Source Code**

9.2 Poster Presentation

Figure 9.2: **Poster Presentation**

References

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