

# The Detection of Autism Spectrum Disorder using Machine Learning

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## ABSTRACT

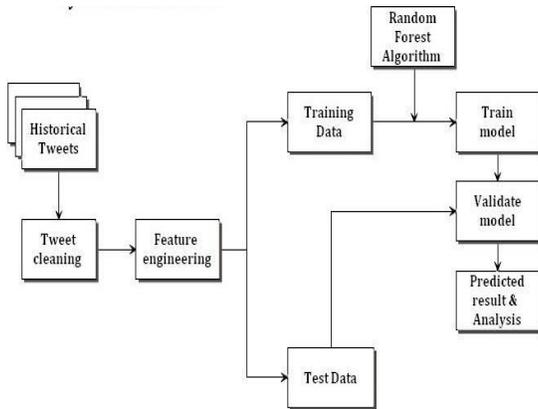
*Autism spectrum disorder (ASD) is a neuro-development disorder that affects a person's interaction, communication and learning skills. These patients face different types of challenges such as difficulties with concentration, learning disabilities, mental health problems such as anxiety, depression, motor difficulties, sensory problems and many others. Autism spectrum disorder diagnosis can be done at any age but its symptoms generally appear in the first two years of life and develops through time. The main objective of this project is to predict the Autism Spectrum Disorder (ASD) at early stage (children between 12 to 36 months) using Machine Learning techniques. Also has capability to predict the ASD for age groups of 4-11 years, 12-17 years and for people of age 18 and more. The in depth analysis of ASD done by using latest techniques & technologies such as interactive framework (Smart Autism) [1] for screening and confirmation of autism, smart device (Autism Barta) based automated autism screening tool [2], Genetic Variant Analysis of Boys with Autism.*

**Keywords** – Autism Spectrum Disorder, Machine Learning, motor difficulties, sensory problems.

## 1. INTRODUCTION

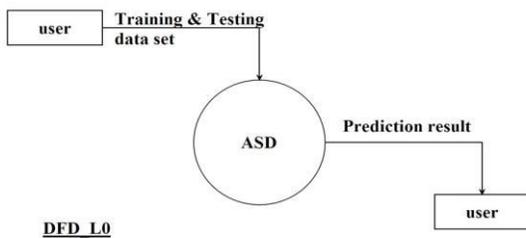
- Autism spectrum disorder is a neuro development disorder that affects a person's interaction, communication and learning skills. Although diagnosis of autism can be done at any age, its symptoms generally appear in the first two years of life and develops through time.
- Autism patients face different types of challenges such as difficulties with concentration, learning disabilities, mental health problems such as anxiety, depression, motor difficulties, sensory problems and many others.
- Current explosion rate of autism around the world is numerous and it is increasing at a very high rate. According to WHO, about 1 out of every 160 children has ASD.
- Some people with this disorder can live independently, while others require life-long care and support.
- The algorithms used in detection of ASD are Random forest algorithm, Support vector machine algorithm, AdaBoost algorithm.
- Using the AQ-10 dataset, the proposed model can predict autism with 92.26%, 93.78%, and 97.10% accuracy in SVM, RF and Ada boost.

## 2. SYSTEM ARCHITECTURE

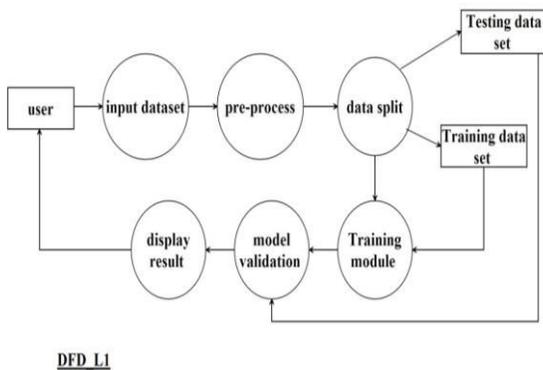


## 3. Data Flow Diagram (DFD)

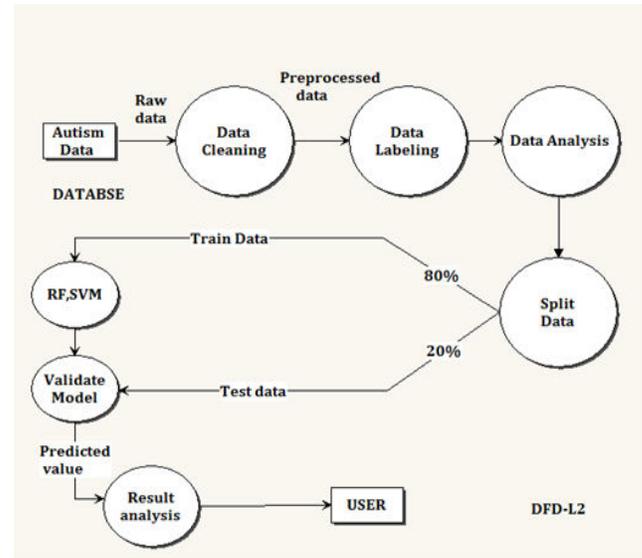
### Level 0:



### Level 1:



### Level 2:



## 3. TECHNIQUES FOR RECOGNISING ASD

3.1 The Effect of Sound Manipulation to Know Response Rate in Autism Children Using FFT.[3] [4]

3.2 Smart Autism - a mobile, interactive and integrated framework for screening and confirmation of autism.

3.3 Autism Barta [2]- A smart device based automated autism screening tool.

3.4 Facial Phenotype to Genotype. [5]

3.5 Family-based association testing,[5]

## 4. TECHNOLOGIES & ALGORITHMMS

### 4.1 Technologies

- Python is an easy to learn, powerful programming language. It has efficient high-level data structures and a simple but effective approach to object-oriented programming.

- Python's elegant syntax and dynamic typing, together with its interpreted nature, make it an ideal language for scripting and rapid application development in many areas on most platforms.
- Libraries from Python :  
Matplotlib & NumPy – generating graphs.  
PyQt & wxPython – interactive graphics.  
scikit-learn (SK) – data analysis and data mining.  
Platform - Linux.

[4] 978-1-5386-8066-7/18 IEEE, 2018 “The Effect of Sound Manipulation to Know Response Rate in Autism Children Using FFT.”

[5] International Conference on Bioinformatics and Biomedicine, IEEE 2017 “Genetic Variant Analysis of Boys with Autism: a Pilot Study on Linking Facial Phenotype to Genotype.”

#### 4.2 Algorithms:

- Support Vector Machine (SVM) algorithm
- Random Forest (RF) algorithm
- Adaptive Booster (AdaBoost) algorithm.

#### 5. APPLICATIONS

- Support technologies that counteract the impact of sensory and cognitive alterations of life related to autism.
- Cognitive rehabilitation / remediation seeking to modify and improve the basic deficit in social cognition.
- Special education programs to counteract the difficulties of children with ASD in the acquisition of social and academic skills
- Support tools and processes for parents, guardians, caregivers and / or professionals.

#### 6. REFERENCES

[1] Khondaker Abdullah Al Mamun , Sharmistha Bardhan “Smart Autism - A mobile, interactive and integrated framework for screening and confirmation of autism.”

[2] 5th International conference for informatics, Electronics and Vision, 2016 “Autism Barta - A smart device based automated autism screening tool for Bangladesh.”

[3] Cheol-Hong Min, IEEE member “Automatic Detection and Labeling of Self-Stimulatory Behavioral Patterns in Children with Autism Spectrum Disorder.”