# Chapter 12
# Machine Learning Techniques for Healthcare Applications: Early Autism Detection Using Ensemble Approach and Breast Cancer Prediction Using SMO and IBK

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## ABSTRACT

*Autism spectrum disorder (ASD) is one of the common disorders in brain. Early detection of ASD improves the overall mental health, which is very important for the future of the child. ASD affects social coordination, emotions, and motor activity of an individual. This is due to the difficulties in getting self-evaluation results and expressive experiences. In the first case study in this chapter, an efficient method to automatically detect the expressive states of individuals with the help of physiological signals is explored. In the second case study of the chapter, the authors explore breast cancer prediction using SMO and IBK. Breast cancer is the second leading cause of cancer deaths in women worldwide and occurs in nearly one out of eight. In this proposed system, the tumor is the feature that is used to identify the breast cancer presence in women. Tumors are basically of two types (i.e., benign or malignant). In order to provide appropriate treatment to the patients, symptoms must be studied properly, and an automatic prediction system is required that will classify the tumor into benign or malignant using SMO and IBK.*

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## INTRODUCTION

An automated analysis of a complex organ brain would be very useful to neurologists to detect disorders. Autism spectrum disorder (ASD) is one of the common disorders in brain. Early detection of Autism Spectrum Disorder improves the overall mental health, which is very important for the future of child. ASD affects social coordination, emotions and motor activity of an individual. This is due to the difficulties in getting self-evaluation results and expressive experiences. It is an efficient method to automatically detect the expressive states of individuals with the help of physiological signals. The efficiency of ensemble classifiers over the other classifiers is measured and compared. Electroencephalogram a record of electrical activity of brain is used in ASD detection. Autism is an impairment of development in the central nervous system. Children affected by autism will have less social coordination, swinging emotions, impaired motor activity and repeated actions. The major cause behind Autism is still a mystery. The various factor that causes autism is genetic, which is predominant and environmental to which parents are exposed. Autism Spectrum Disorder (ASD) prevails in different forms like very severe to very mild.

## OVERVIEW OF ASD

Autism spectrum disorder is a neuro-develop mental disorder identified by the difficulties in social interactions and repetitive and restricted behaviours and interests. An individual's communal impairments and emotional processing deficits are interconnected (Honkalampi, Hintikka, Tanskanen, Lehtonen & Viinamäki, 2000). An analysis on this subject suggests that individuals with ASD always face obscurity in ascertaining their own mental and expressive states (Baron-Cohen, Tager-Flusberg & Cohen, 1994). The persons affected by ASD are also affected by alexithymia. The probability of occurrence of alexithymia is very less. The underlying factor of alexithymia in ASD patients is apparent disassociation between expressive arousal and conscious awareness of the response. The result of challenges in emotional processing is psychiatric disorders such as depression (Frith, 2004). Early detection and diagnosis is important in preventing unnecessary delays in providing behavioural therapies and rehabilitating speech. There are various types of Autism spectrum disorder. They are High functioning Autism, Asperger's syndrome, Rett Syndrome, pervasive developmental disorderetc (Baron-Cohen, Tager-Flusberg & Lombardo, 2013).

*Table 1. Types OF ASD*

| Autism Types | Description |
|---|---|
| Asperger's syndrome | This is on the milder end of the autism spectrum. |
| Pervasive developmental disorder, not otherwise specified (PDD-NOS) | Diagnosis included most children whose autism was more severe than Asperger's syndrome, but not as severe as autistic disorder. |
| Autistic disorder | It includes the same types of symptoms, but at a more intense level. |
| Childhood disintegrative disorder | This was the rarest and most severe part of the spectrum. |
| High-functioning autism | It is an informal one, people who can speak, read, write, and handle basic life skills like eating and getting dressed. |
| Rett syndrome | A rare, severe neurological disorder that affects mostly girls. |

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