

# Pattern Recognition in Human Brain

Ayesha Akter

Brac University,CSE Dept

ayesha.akter2@g.bracu.ac.bd

SHIHAB SHARAR

Brac University,CSE Dept

shihab.sharar@g.bracu.ac.bd

Annajiat Alim Rasel

Brac University,Sr. Lecturer,CSE Dept

annajiat@bracu.ac.bd

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## Abstract

Human brain pattern recognition is a crucial element of how we learn and make decisions. There are some present implementations of a correlative technique based on pattern recognition. This project includes investigation of the neural correlates of higher cognitive functions, diagnostic screening, differential diagnosis, and prognostic assessment of neurologic disorders, classification of the stages of normal and disturbed sleep, and classification of the neuroelectric patterns associated with various types of psychotropic drugs. This paper uses pattern classification algorithms, statistical techniques, structural techniques, template matching, neural network approach, fuzzy model, and hybrid models. Dataset is analyzed using pattern classification algorithms such as decision functions, trainable classification networks, distance functions, syntactic methods, and their hybrids[9]. Most studies have used stepwise linear discriminant analysis because it is widely available. This paper utilizes neuroimaging data from Allen Brain Atlas datasets provided by The Allen Institute for Brain Science which include Magnetic Resonance Imaging (MRI), Diffusion Tensor (DT), and Computed Tomography (CT) scan data..

Keywords— Cognitive functions, neurologic disorders patterns, classification algorithms, stepwise linear discriminant.

## 1 Introduction

This is accomplished in machines via machine learning and pattern recognition specific algorithms. Pattern Recognition gives the solution to problems like Investigation of the neural correlates of higher cognitive functions, diagnostic screening,

differential diagnosis, and prognostic assessment of neurologic disorders, classification of the stages of normal and disturbed sleep, and classification of the neuroelectric patterns associated with various types of psychotropic drugs.

## 2 PATTERN CLASSIFICATION

There are numerous categorization algorithms available today, and it is impossible to determine one is superior to the others. It is dependent on the application and the nature of the data collection supplied. Classification of techniques that describe.

## 3 TECHNIQUES, EXPERIMENT AND RESULT

Statistical Techniques: The pattern is referred to in this model as features. These features have been chosen in such a way that different patterns take up the same amount of area without overlapping[5][1]. It is capable of foreseeing and recognizing the probabilistic nature of events. It works so well that the selected attributes assist in cluster formation. It examines the patterns' probability distributions, decision boundaries, and so on.



Figure 1: Statistical Techniques.

The machine is always learning and adapting. These patterns are then projected to be used in further processing and training. Then we apply pattern recognition testing patterns. This leads to the development of new classification algorithms[7]. Baye's Decision Rule, PCA, and other schemes are among the schemes utilized in Investigation of the neural correlates of higher cognitive functions.

Structural Techniques: In sophisticated pattern recognition, such as multi-dimensional entities, a structural model is used like diagnostic screening, differential diagnosis. Patterns are hierarchical in structure and are further classified into subclasses. Following a pattern recognition method that is ruled by sub-patterns that are related to one another in the structural approach[8]. Structure and its shapes in patterns are added to the model.

Template Matching: The pattern that was matched is saved in templates, and the templates are provided scalar and rotational freedom. This model's competence is based on the database's already stored templates classification of the stages of normal and disturbed sleep[6]. In this scenario, we consider the correlation function to be the recognition function, which is then optimized based on the availability of the training set.

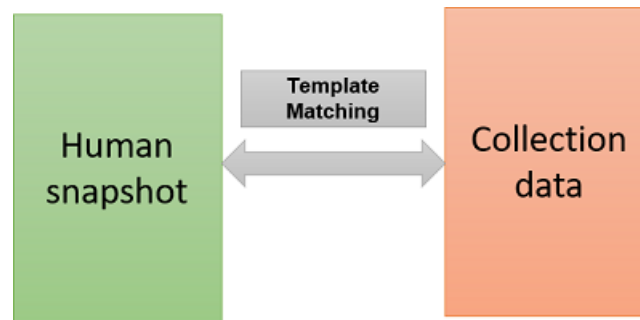


Figure 2: Template Matching.

Neural Network Approach: The ability to change the weights on iteration patterns frequently, known as learning skills, gives this model a competitive advantage over competing models[4]. classification of the neuroelectric patterns associated with various types of psychotropic drugs one of the oldest neuron models is the perceptron.

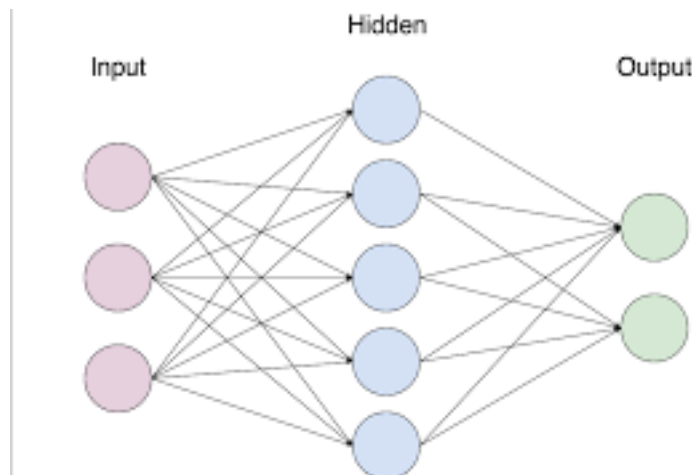


Figure 3: Neural Network Approach.

Fuzzy Model: For patterns linked to formal languages, employ a syntactic approach. When fuzzy divisions of data sets are required, semantic approaches can be considered to be applied. The similarity index is then calculated based on the weights of the distance between fuzzy and reference sets[3]. In contrast to classical or digital logic, which functions on discrete values of 1 or 0, this mathematical system analyzes analog input values in terms of logical variables that take on continuous values between 0 and 1.

Hybrid Models: For the final conclusion, we can employ a collection of classifiers and combiners to improve the system's performance. The use of many classifiers improves the system's performance[8]. Each classifier is trained in a

different set of feature spaces. The classifiers and their accuracy are determined by a decision function. The optimization is used to determine whether or not a set of classifiers should be formed. It is our challenging face in this paper

## 4 CONCLUSION

We have to clear about the expectation problems then apply techniques in pattern classification algorithms and testing, training. We've compiled a list of several pattern recognition algorithms and compared them. It's a good idea to use these methods in accordance with the problem statements' requirements. Dataset training are important for getting the better results and experiment which I want to apply[2]. The fuzzy approach is used to recognize unknown shapes. In a hybrid approach, this boosts the strength of pattern recognition algorithms and adds variation.

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