SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY, MARLUR

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SYNOPSIS ON

"Detection of Autism Spectrum Disorder(ASD) using ML Techniques"

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Abstract

Autism spectrum disorder (ASD) is a neuro-developmental disorder associated with brain development that subsequently affects the physical appearance of the face. This type of mental illness/disorder begins in early childhood and lasts throughout a person's life. Autistic children have different patterns of facial features, which set them distinctively apart from typically developed (TD) children. So specialists believe that these distinct facial features can be used to help diagnose their ASD and even correlate with ASD severity. Autism can be diagnosed at any stage in once life and is said to be a "behavioral disease" because in the first two years of life symptoms usually appear. Thus this correlation can be used to train a model to detect ASD using those unique facial features.

This is important because approximately 25 percent of children with autism are undiagnosed. Diagnosing ASD is a complicated and expensive process that not every family can go through. Getting the right kids to the right specialists is crucial to reducing the number of undiagnosed children and the burden on families.

The goal is to provide a free preliminary diagnostic tool that can aid parents in their decision to pursue further ASD testing. Propelled with the rise in use of Machine Learning techniques in the reseaarch dimensions of medical diagnosis. Here is an attempt to explore the possibility to use **Naive Bayes, Support Vector Machine, Logistic Regression, KNN, Neural Network and Convolutional Neural Network** for predicting of ASD problems in children. It's important for models that have significant real-world impacts to represent their results responsibly and used Bayesian statistics to explain their meaning.

Problem Statement

The problem of autism spectrum disorder (ASD) have been mounting swiftly nowadays among all ages of the human population.
Early detection of this neurological disease can greatly assist in the maintenance of the subject's mental and physical health. With the rise of application of machine learning-based models in the predictions of various human diseases, their early detection based on various health and physiological parameter now seems possible. This factor motivated us to increase interest in the detection and analysis of ASD diseases to improve better treatment methodology. Detection of ASD becomes **a challenge as there are several other mental disorders whose few symptoms are very similar to those with ASD symptoms**, thereby makes this task a difficult one.

A person who has suffered from the Autism Spectrum Disorder is **generally not able to do social interaction and communication** with other persons. It is interesting to know that **both environmental and genetic factors may turn out to be the causing factors for this disease**. People with ASD also have **difficulty with constrained interests and consistently repetition of behaviors**.

ASD Symptoms usually recognized by observation. In Older and adolescents who go to school, ASD symptoms are usually identified by their parents and teachers. In **adults identifying ASD symptoms is very difficult than older children and adolescents** because some symptoms of ASD may be overlap with other mental health disorders.

Thus early detection and treatment are most important steps to be taken to decrease the symptoms of autism spectrum disorder problem and to improve the quality of life of ASD suffering people. It is not possible to completely treat the patient suffering from this disease, however its effects can be reduced for some time if the symptoms are early detected. By assuming that human genes are responsible for it, the exact causes of ASD have not been recognized by the scientist yet. The human genes affect the development by influencing the environment.

Proposed Methodology

To illustrate this application, Figure 0.1 shows the steps in the proposed workflow which involves the pre-processing of data, training, and testing with specified models, evaluation of results and prediction of ASD. This work is implemented in Python 3.

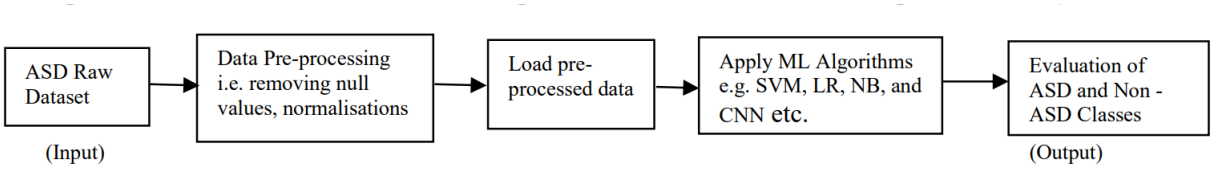

Figure 0.1: Steps in the proposed ASD detection solution

The model will be based on **VGG Face, Oxford's deep facial recognition model**. To extract the facial features needed to detect autism, the new model will use the same architecture and weights as VGG Face. This is an example of feature-representation **transfer learning**, Figure 0.2. This type of transfer learning is used when the source and the target domains look for similar features but make different inferences based on those features.

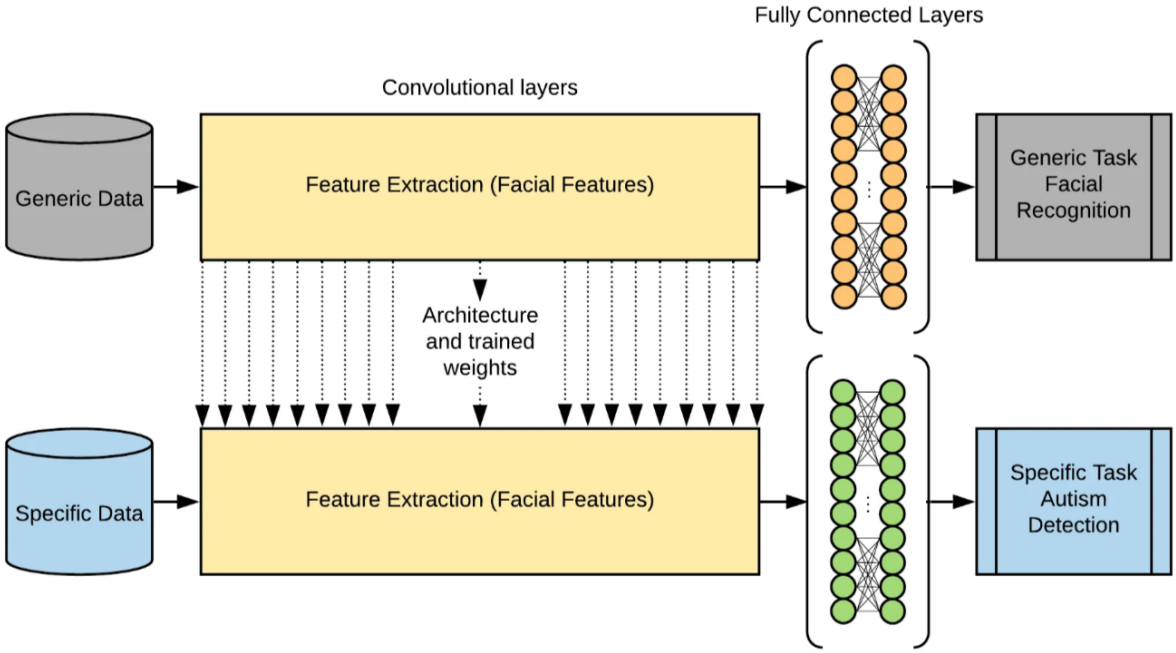

Figure 0.2: Feature-representation transfer learning

Proposed Conclusion

Interest in child autism has risen due to the advances in global health know-how and capacities. Moreover, the number of autistic children has increased in recent years, due to which researchers and academics have intensified their efforts to uncover the causes of autism and to detect it early in order to give autistic people behavioral development treatment programs that should help them integrate into society and leave the isolation of the autistic world.

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.Although accuracy was used to measure model performance during training, sensitivity and specificity are more important to consider for Bayesian predictions.

It is important to remember that models are fallible. A positive result from a model does not mean a positive result in the real world. Instead, this new information, like a predicted positive, should be used to update our prior knowledge about that event.

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