

DETECTION OF DEPRESSION AND ANXIETY IN CHILDREN USING MACHINE LEARNING

Vaishnavi.R¹, Prof. Shankar.B S²

PG Scholar, Dept. of MCA, Vidya Vikas Institute of Engineering and Technology, Mysuru, Karnataka, India¹

Assistant professor, Dept. of MCA, Vidya Vikas Institute of Engineering and Technology, Mysuru, Karnataka, India²

Abstract- Childhood mental disorders such as anxiety, depression and attention deficit disorder are commonly found amongst children. It is crucial to diagnose these problems at an early stage to ensure proper treatment and to prevent further complications. Machine learning techniques can be applied to analyze a patient's history, aiding in the diagnosis of the problem. In this research, three machine learning techniques have been identified and compared based on their performance in accurately diagnosing five common mental health disorders. The objective is to determine the most accurate technique. The dataset contains sixty attributes, but only twenty-five attributes were found to be important in diagnosing the disorders. By ignoring irrelevant attributes, the techniques were evaluated based on their performance on selected attributes.

I. INTRODUCTION

Depression is an emotional disorder that can have a negative impact on a child's mood and development. If left untreated, depression can cause significant problems in a child's normal activities, such as learning. In Australia, about 112,000 children and teenagers are clinically depressed, with a prevalence rate of 1.1% among boys and 1.2% among girls aged 4-11 years, and 4.3% among boys and 5.8% among girls aged 12-17 years. In 2015, 10.7% of teenage girls and 4.5% of teenage boys attempted suicide. It is important to study the underlying causes of depression as they can have serious implications for children's psychological health and development.

There have been few studies that have investigated the use of machine learning algorithms to identify mental illnesses such as depression in diverse populations like school-aged children, college students, working people, and social media users. These studies have used data from both longitudinal research and one-off investigations to draw conclusions. Trouble sleeping has been linked to many mental disorders, and scientists have used a machine learning approach to classify sleep and extract its stages as a series of intricate networks. They built a weighted visibility graph and categorized it using a kNN classifier.

Problem Statement

The aim of this project is to develop an accurate and reliable machine learning system for the early detection of depression and anxiety in children. Depression and anxiety are prevalent mental health disorders that can significantly impact a child's well-being, academic performance, and long-term development. Early identification and intervention are crucial for effective treatment and support.

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II. RELATED WORKS

1. Literature Survey on Machine Learning Approaches for Child Mental Health Assessment

Abstract: This literature survey provides an in-depth analysis of machine learning techniques employed for the early detection of depression and anxiety in children. It reviews various data sources, including clinical assessments, surveys, and physiological measurements, used to build predictive models. The survey also discusses the challenges of feature selection, model validation, and ethical considerations in this sensitive domain. By synthesizing research findings, this survey offers insights into the state-of-the-art methods and their potential for improving child mental health assessment.

2. A Comprehensive Review of Pediatric Depression and Anxiety Assessment Tools

Abstract: This literature survey focuses on the evaluation of existing assessment tools and scales for pediatric depression and anxiety. It provides a comprehensive overview of commonly used instruments, their psychometric properties, and their applicability in machine learning models. The survey also highlights the limitations of traditional assessment methods and explores how machine learning can enhance their accuracy and efficiency. By analyzing the literature, this survey aids in identifying the most suitable tools for integrating into a machine learning-based detection system.

3. Ethical Considerations in Developing Machine Learning Models for Child Mental Health

Abstract: This literature survey addresses the ethical concerns and considerations inherent in the development of machine learning models for child mental health detection. It reviews existing literature on data privacy, informed consent, and the potential for algorithmic bias in this context. The survey also discusses the ethical responsibilities of researchers, healthcare providers, and caregivers when dealing with sensitive data related to children's mental health. This survey offers critical insights into the responsible development and deployment of such models.

4. Machine Learning Applications in Early Intervention for Child Mental Health

Abstract: This literature survey explores the role of machine learning in facilitating early intervention strategies for children at risk of depression and anxiety. It reviews research on personalized intervention recommendations, monitoring systems, and treatment optimization based on machine learning insights. The survey also discusses the integration of machine learning models with existing healthcare practices and the potential for scalable interventions. By synthesizing relevant studies, this survey highlights the promise of machine learning in improving child mental health outcomes.

5. Cross-Cultural Perspectives on Machine Learning-Based Child Mental Health Detection

Abstract: This literature survey examines the cross-cultural aspects of applying machine learning to detect depression and anxiety in children. It reviews studies that investigate cultural differences in symptom expression, help-seeking behaviors, and stigma associated with mental health. The survey also discusses the challenges and opportunities of adapting machine learning models to different cultural contexts. By analyzing cross-cultural research, this survey provides insights into the need for culturally sensitive approaches in child mental health assessment using machine learning.

III. BACKGROUND STUDY

Symptoms of anxiety in youths include paying no attention due to carelessness, a lack of direct listening, inability to sustain attention, difficulties with reading and mathematics, and other behavioral problems. These frequently lead to issues with education such as the inability to study, read, or take tests with confidence.

Anxiety disorders and abnormalities in children can persist into adolescence and adulthood, characterized by long-term anxiety accompanied by restlessness, exhaustion, difficulty focusing, irritation, tension in muscles, and sleep disturbance. Symptoms may include hyperactivity, inability to regulate one's behavior, and difficulty focusing and paying attention. These conditions are known as persistent developmental disorder (PDD), and are distinguished by delays in the maturation of fundamental capacities such as language and imaginative capacity.

IV. PROPOSED METHOD

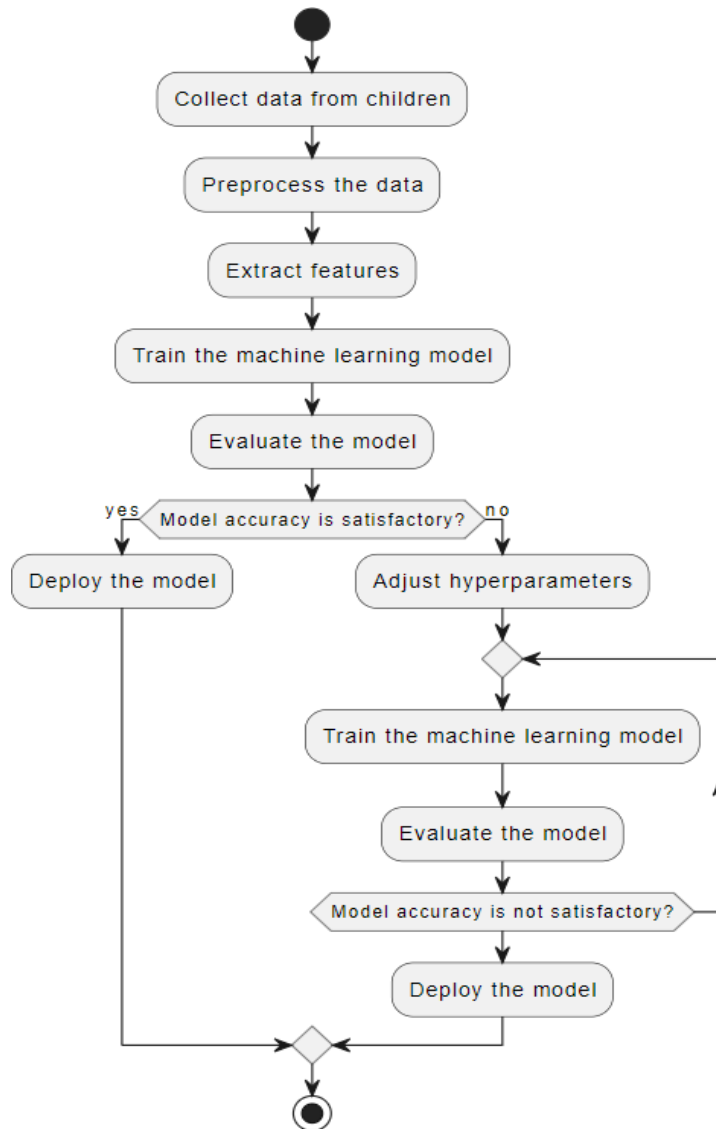
The investigation tackled the challenge of identifying underlying mental health issues and interviewed a qualified psychologist to uncover child-specific mental health problems. Professional diagnosis was conducted thereafter. A machine learning algorithm was used to diagnose five common mental health conditions. However, computers are only able to identify sadness in children through specific characteristics.

The first step in building a strong machine learning model for treating children's depression and anxiety involves collecting data through various means including surveys, questionnaires, clinical exams, and social media postings. This data is then pre-processed to clean, normalize, and format it for analysis, including handling missing data, noise removal, and analyzing features to extract useful information.

Feature selection and extraction are then performed to identify the most important characteristics from the pre-processed data. This helps determine the major predictors of child sadness and anxiety and converts the data into a space of fewer dimensions, reducing complexity while maintaining vital information. The chosen features and extraction help increase model performance, overfitting, and generalization.

The core of the project involves designing an AI model that accurately predicts child sadness and anxiety using the chosen or extracted characteristics. This can be achieved through the use of various algorithms such as SVM, Random Forest, Logical Regression, and Neural Networks. A subset of data is used to train and evaluate the model, with classification measures including precision, accuracy, recall, F1-score, and AUC-ROC. The model can be refined through tuning to improve outcomes.

While the project may also involve model distribution, user interface creation, and ethical considerations, the three modules above constitute the heart of a learning-based approach to treating children's depression and anxiety.



V. CONCLUSION

Detecting depression among children and adolescents is crucial for their academic, social, and personal growth. Our study employed Random Forest (RF) as a classifier to accurately detect depression in YMM, a high-dimensional dataset of mental health records of Australian children and adolescents.

Our findings indicate that the TPOT classifier is a capable tool, as demonstrated through the confusion matrix parameters, K-fold cross-validation results, and AUC and ROC scores of all four methods (XGB, RF, DT, and GaussianNB) utilized in our approach.

**FUTURE ENHANCEMENT**

Implementing a longitudinal analysis approach to track changes in a child's mental health over time. Developing a real-time monitoring system with alerts for timely intervention.

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