

PSYCHIATRIC DISEASES DIAGNOSIS: ANXIETY AND DEPRESSION IN YOUNG CHILDREN USING MACHINE LEARNING AND WEARABLE SENSORS

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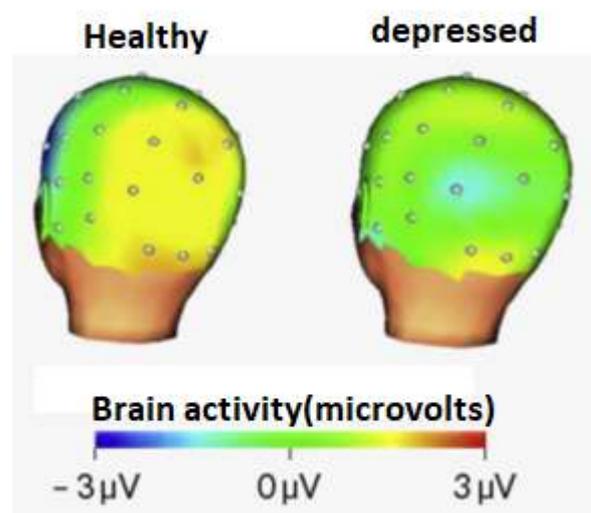
Abstract— In this study, we examine the affiliation of anxiety, depression and brain structure in children. The internalizing symptoms and impulsivity during youth are not well understood. In this paper we use a 90sec fear induction task to observe the child motion at a particular time this task is done by using the wearable sensors task is done to bring out the fear from the children. The data that is extracted from the 90sec task and by using the machine learning technique are used to predict the diagnosis in children.

Key Words: DEPRESSION, KNN CLASSIFIER, IMU BELT WORN.

1. INTRODUCTION

The preschooler concept with melancholy/anxiety was not taken serious by the old age people. Many parents think that childhood is just a time of happiness joy and freedom. And others endore that child do not have the emotional or intellectual capacity to handle such excessive/immoderate feeling. No of articles have been published describing the internalizing disorders. Based on depression /anxiety two approaches were made.

The symptoms were grouped in two categories, internalizing and externalizing (Eg: child behavior).The taxonomy is defined of symptoms and childhood disorders (ex: diagnostic and intellectual troubles) Childhood depression can be diagnosed and effectively treated with medications or psychotherapy. The depression disorders have increased not only among adults but also among children. The depression among children occurs below 13years.The depression in children is an important public health issue. Nearly 20% of children experience the anxiety and depression during childhood. Anxiety and depression can begin during the preschool years known as internalizing disorders. The melancholy among children can be identified by using some task to know the child is in stress/normal.



2. RELATED WORK

A.Angold [1] the research is made on the behavior of the children that is the childhood depression disorder or enthusiastic psychiatric disorder. The childhood psychiatric disorder are anxiety disorder and depression disorder. The dataset is taken from the infant activities with the qualified dataset and by applying the machine learning technique we know that child is in stress or normal.

The studies demonstrate that the childhood depression [2] begins during the preschool. There is no precise test for the depressed child. The psychological health professionals experts by posturing the inquiries for both parents and child it is easy to precise the diagnosis of the depressed child. By performing some task that is for instance snake task publicized in this paper from that task the behavior of the child actions data has been taken and the trained data is used for the healing of depressed child.

S. J. Buffered [3] The anxiety and depression be able to instigate during the preschool years known as internalizing disorders. It is difficult to detect this disorder in infantile children. We cannot examine the mind of the depressed child who has less well developed, so the mental health professionals queries to parents to know the behavior of depressed child.

Depression and Anxiety in Preschoolers [4] An analysis of the Past 7 Years depression and anxiety begins during the preschool periods. An anxiety disorder is a mental illness and distresses the people with an anxiety disorder as conditions of panic disorder, specific phobias, and generalized anxiety disorder. Both the anxiety and depression known as the internalizing disorder.

D.J.Whalen [5] This article review current experimental journalism on the occurrence, correlates, estimation, and healing of preschool-onset internalizing disorders. This effort has been significantly enhanced by the detection of inherent, neural, and physiological indicators, which advance validates this constellation of symptom in young children.

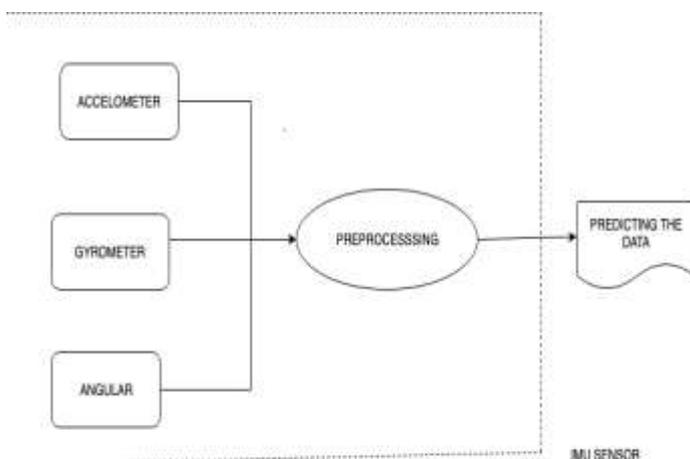
3. IMPLEMENTATION

1. Data sampling:

Collecting the data from the depressed child: the child and the parent brought into research center which is an university based. The diagnostic interviewer queries to both the child and the parent, the queries completed by the parent, but the child faces some obscurity to answer. So, the diagnosis treatments the child with some behavioral task (snake task) in the room with the IMU belt tied to the waist. The motion of the child was tracked by the IMU sensor. The behavioral task was designed to reduce fear from the child. This task was approved by the university.

2. Preprocessing data:

A regulate wisdom approach is then used to create k Nearest Neighbor (KNN) parallel classification models that narrate these features of the IMU-derived signals to internalizing diagnosis We establish performance of the classifiers using leave-one-subject-out validation, where we train a KNN classifier on 59 subjects, and use it to classify the 1 remaining subject as either having an internalizing diagnosis or not, and iterate until each subject has been classified.



3. KNN

Pseudo code:

Known trained data (P_1, R_1), (P_N, R_N)
 Define a distance between no of neighbors and KNN features. $D(P_1, P_j)$.
 Trained method: Save the trained data.
 Predicting the data: Find the K trained data (P_1, R_1), (P_N, R_N) that are nearer to given data P known the distance $D(P_1, P_j)$.
 Calculate the most frequent data among those R_i 's.

4. Results and Analysis

ANG feature is the best performing feature set so, either adding the ACC or GYR to ANG improve the accuracy to 75%. Adding both ACC and GYR to ANG there is no improvement in accuracy. From the graph, we consider the KNN models through 1 to 7 neighbors; KNN attribute set includes accelerometer (ACC), gyro feature, and angle feature.

The accuracy of the sorting is computed using the standard formula:

$$\text{Accuracy} = (\text{Positives} + \text{Negatives}) / \text{Number of Observations.}$$

Table1: KNN classifier features by using accelerometer, Gyro meter, angular

Features	KNN efficiency
ACC	70%
GYR	67%
ANG	75%
ACC+ANG	75%

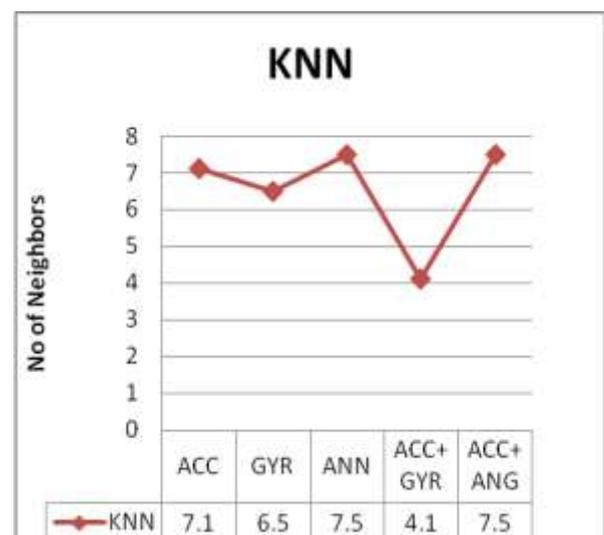


Fig 2: Comparison table of KNN features and no of neighbors considered.

5. CONCLUSION

In this paper, depression is one of the main issues in young children. No remedial test is escort for depress kid so there is just way that is to direct an activity of fear induction task this treatment is approved by the university and this is used for further courses, consequently by utilizing the machine learning procedure and the KNN classifier utilized it is realize the kid having disguising issue or no with some accuracy utilized.

REFERENCES:

- [1] H. L. Egger and A. Angold, "Common emotional and behavioral disorders in preschool children: presentation, nosology, and epidemiology," *J Child Psychol Psychiatry*, vol. 47, no. 3-4, pp. 313-337, Apr. 2006.
- [2] S. J. Bufferd, L. R. Dougherty, G. A. Carlson, and D. N. Klein, "Parent-Reported Mental Health in Preschoolers: Findings Using a Diagnostic Interview," *Compr Psychiatry*, vol. 52, no. 4, pp. 359-369, 2011.
- [3] M. Tandon, E. Cardeli, and J. Luby, "Internalizing Disorders in Early Childhood: A Review of Depressive and Anxiety Disorders," *Child and Adolescent Psychiatric Clinics of North America*, vol. 18, no. 3, pp. 593-610, Jul. 2009.
- [4] J. L. Luby, A. C. Belden, J. Pautsch, X. Si, and E. Spitznagel, "The clinical significance of preschool depression: Impairment in functioning and clinical markers of the disorder," *Journal of Affective Disorders*, vol. 112, no. 1-3, pp. 111-119, Jan. 2009.
- [5] D. J. Whalen, C. M. Sylvester, and J. L. Luby, "Depression and Anxiety in Preschoolers: A Review of the Past 7 Years," *Child and Adolescent Psychiatric Clinics of North America*, vol. 26, no. 3, pp. 503-522, Jul. 2017.
- [6] H.-U. Wittchen and H. Sonntag, "Nicotine consumption in mental disorders: a clinical epidemiological perspective," *European Neuro psychopharmacology*, vol. 10, p. 119, Sep. 2000.
- [7] A. Bittner, H. L. Egger, A. Erkanli, E. Jane Costello, D. L. Foley, and A. Angold, "What do childhood anxiety disorders predict?," *J Child Psychol Psychiatry*, vol. 48, no. 12, pp. 1174-1183, Dec. 2007.
- [8] M. S. GOULD et al., "Psychopathology Associated With Suicidal Ideation and Attempts among Children and Adolescents," *Journal of the American*
- [9] M. G. Craske and M. B. Stein, "Anxiety," *The Lancet*, vol. 388, no. 10063, pp. 3048-3059, Dec. 2016.
- [10] A. Konnopka, F. Leichsenring, E. Leibling, and H.-H. König, "Cost-of-illness studies and cost-effectiveness analyses in anxiety disorders: A systematic review," *Journal of Affective Disorders*, vol. 114, no. 1, pp. 14-31, Apr. 2009.
- [11] J. L. Luby, "Preschool Depression: The Importance of Identification of Depression Early in Development," *Current Directions in Psychological Science*, vol. 19, no. 2, pp. 91-95, May 2010.
- [12] J. L. Luby et al., "The clinical picture of depression in preschool children," *Journal of the American Academy of Child & Adolescent Psychiatry*, vol. 42, no. 3, pp. 340-348, Mar. 2003.
- [13] J. Garber and K. M. Kaminski, "Laboratory and performance-based measures of depression in children and adolescents," *Journal of clinical child psychology*, vol. 29, no. 4, pp. 509-525, 2000.
- [14] T. E. Chansky and P. C. Kendall, "Social expectancies and selfperceptions in anxiety-disordered children," *J Anxiety Disord*, vol. 11, no. 4, pp. 347-363, Aug. 1997.
- [15] D. J. Kolko and A. E. Kazdin, "Emotional/behavioral problems in clinic and nonclinic children: Correspondence among child, parent and teacher reports," *Journal of Child Psychology and Psychiatry*, vol. 34, no. 6, pp. 991-1006, 1993.