Predicting Depression, Anxiety & Stress based on Personality

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ABSTRACT

Mental health disorders, such as depression, anxiety, and stress, are prevalent and pose significant challenges to individuals and societies worldwide. Early identification of these disorders can lead to timely interventions and improved outcomes. This study aims to develop and evaluate a machine learning model to predict depression, anxiety, and stress based on personality traits. Utilizing a large dataset (N=34000) consisting of self-report questionnaires, including the Ten Item Personality Inventory (TIPI) and the Depression, Anxiety, and Stress Scale (DASS-19), we extracted relevant features and employed various machine learning algorithms, such as decision tree classification, logistic regression, support vector machines, and random forests, to construct predictive models. We evaluated the models based on variance of the training and testing accuracies.

INTRODUCTION

Mental health disorders, including depression, anxiety, and stress, are increasingly recognized as major public health concerns, affecting millions of individuals worldwide. Early detection and intervention can greatly improve the prognosis and quality of life for those afflicted with these conditions. Despite the growing body of research in the field, there remains a need for more effective and efficient methods to predict and identify individuals at risk of developing these disorders. One promising avenue for exploration lies in understanding the relationship between personality traits and mental health outcomes.

The Ten Item Personality Inventory (TIPI), consisting of openness, conscientiousness, extraversion, agreeableness, and neuroticism, have been widely researched and shown to be influential in various aspects of life, including mental health. Several studies have reported significant associations between certain personality traits and depression, anxiety, and stress levels. However, most of this research has been correlational in nature, and there is a need for predictive models that can be used in practical settings.

By employing advanced machine learning techniques, we hope to establish robust and accurate predictive models that can help identify individuals at risk for depression, anxiety, and stress. In doing so, our study may contribute to early identification, targeted interventions, and ultimately, improved mental health outcomes for those in need. Furthermore, our findings may provide valuable insights into the underlying mechanisms linking personality traits to mental health disorders, paving the way for future research in this area.

OBJECTIVE

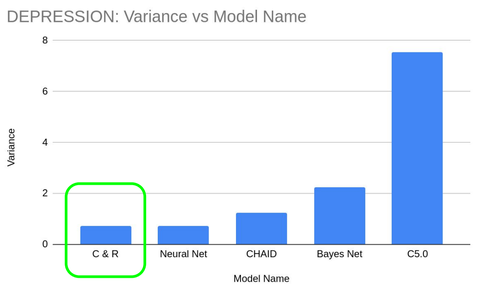
- **Early identification of Depression, Anxiety & Stress**: By identifying the mental status of who are at risk of falling into depression, or poor mental health conditions we can initiate preventive measures and provide appropriate treatment to improve their way of living or proper counseling and guidance.
- **Improved Outcome:** By improving the outcome or the prediction using machine learning algorithm we can accurately send the mental health patients to proper counseling.

PROPOSED METHOD

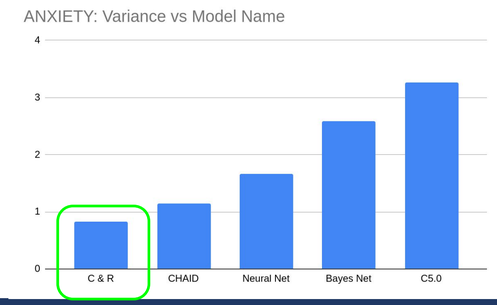
- We have made stream for predicting depression, anxiety & stress based on personality using IBM SPSS Modeler. As per given dataset we have target attributes so we used supervised learning algorithm.
- We implemented C&R - Classification and Regression Tree Model , Neural Net, CHAID, C5.0, and Bayes Net model provided in IBM SPSS Modeler.
- Below are the Screenshot of accuracy achieved from the respective models:

D/A/S	Sr. No.	Model Name	Training Accuracy (%)	Testing Accuracy (%)	Variance
D	**1**	**C & R**	**76.03**	**75.48**	**0.72**
	2	Neural Net	76.81	76.25	0.73
	3	CHAID	76.61	75.67	1.23
	4	Bayes Net	76.86	75.14	2.24
	5	C5.0	81.24	75.12	7.53
A	**1**	**C & R**	**86.87**	**86.15**	**0.83**
	2	CHAID	86.89	85.89	1.15
	3	Neural Net	87.23	85.78	1.66
	4	Bayes Net	86.92	84.68	2.58
	5	C5.0	88.63	85.73	3.27
S	**1**	**C & R**	**67.62**	**66.65**	**1.43**
	2	CHAID	67.32	66.25	1.59
	3	Neural Net	69.17	67.24	2.79
	4	Bayes Net	69.64	65.33	6.19
	5	C5.0	73.47	65.95	10.24

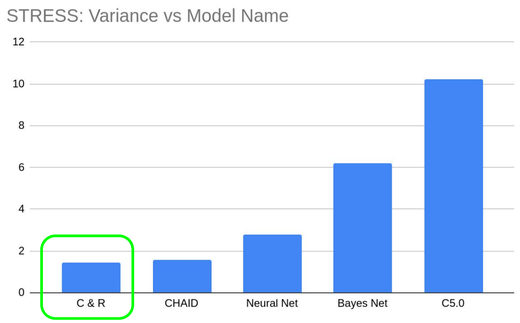
- **FOR DEPRESSION:**



- **FOR ANXIETY:**

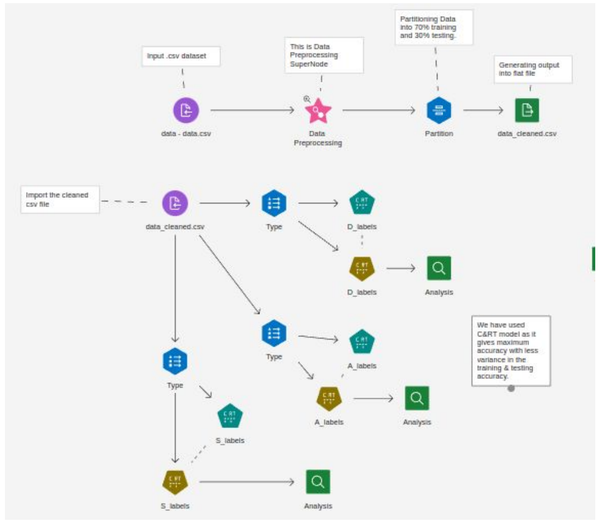


- **FOR STRESS:**



- As we can see that C&R Tree Model gives better accuracy with minimum variance between the training & testing accuracy. So we will select C&R Model or CART Model for predicting the levels of depression, anxiety and stress.

PROJECT FLOW



DATA DESCRIPTION

- Attributes: 172
- Records: 39775
- Input Variables:
  - TIPI1 to TIPI10
  - Age Category
  - Education
  - Urban
  - Religion
  - Race
  - Marital Status
- Output Variables:
  - D_labels
  - A_labels
  - S_labels

RESULTS

- We have used C&R Model Node from IBM SPSS Modeler or DecisionTreeClassifier from sklearn.tree which uses optimized CART algorithm to classify the target value.
- We achieved accuracy as follows:

	Training	Testing
Depression	76.03 %	75.48 %
Anxiety	86.87 %	86.15 %
Stress	67.62 %	66.65 %

CONCLUSION

- In conclusion, the research project aimed at predicting depression, stress, and anxiety based on the Ten-Item Personality Inventory (TIPI) scale using the Classification and Regression Tree (CART) model has yielded valuable insights. The use of decision tree classifiers and regressors allowed for a comprehensible and interpretable analysis of the associations between personality traits and mental health indicators.
- Our findings demonstrated that specific combinations of personality traits, as measured by the TIPI scale, were indeed predictive of depression, stress, and anxiety levels in our sample. This evidence supports the notion that the understanding of one's personality can be a crucial factor in the identification of individuals at risk for mental health issues.
- The outcomes of this study have several implications for both research and practice. Firstly, the results can be used to enhance the early identification of individuals at risk of developing mental health issues, allowing for timely intervention and support. Secondly, the study's findings contribute to the growing body of literature on the role of personality traits in mental health and help refine existing theoretical frameworks.
- In summary, this research project demonstrated the potential of using the TIPI scale and the CART model for predicting depression, stress, and anxiety based on personality traits. The findings contribute to the understanding of the role of personality in mental health, and the development of targeted interventions for individuals at risk, ultimately promoting mental well-being across diverse populations.