

The plot between AUDIT and BDI score in figure 5 shares the information of positive correlation among the individuals with instance of alcohol consumption tend to have depressive moods. On the similar note, the plot as shown below in Figure 6 also shows positive relation among the consumption and anxiety disorder.

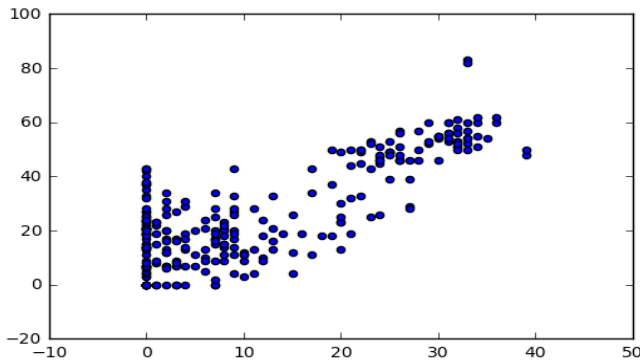


Figure 5. Correlation between AUDIT total and BDI score.

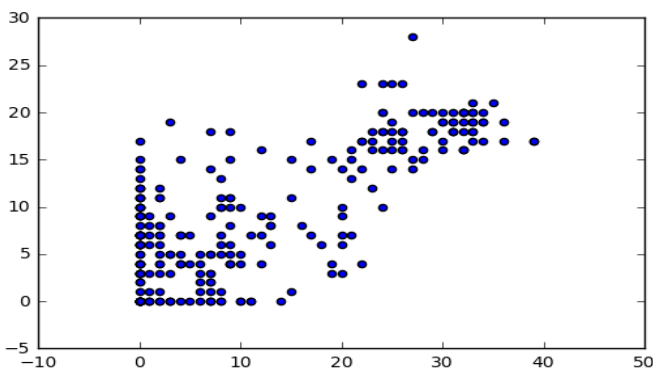


Figure 6. Correlation between AUDIT total and GAD-7 Score.

As far as the illicit and licit drug consumption are concerned, the plot shows a linear graph towards right side with high value of x axis to y axis. It depicts a strong relation on the consumption leading to mental

illness(Depression) as shown in figure 7.

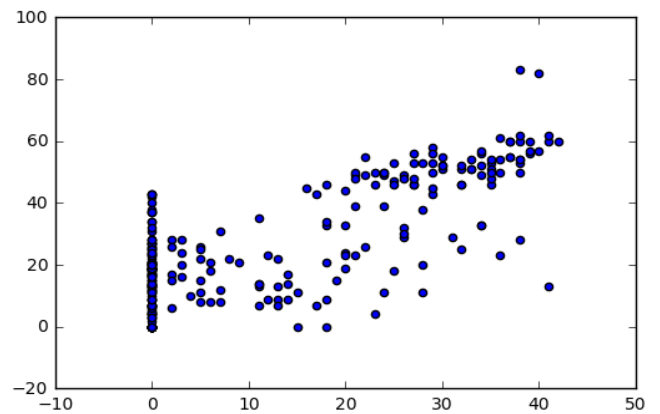


Figure 7. Correlation between NIDA and BDI score.

This findings suffice the findings of various researcher[27-33] that during mental disorder one cannot rule out the possibilities of patient consuming the substance of any nature in any stage of their life. On the similar note, this findings also support the discussion[66] that anxiety also causes due to substance intake as depicted in the Figure 8.

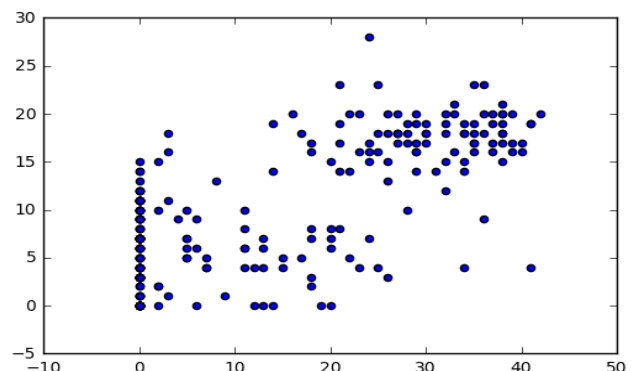


Figure 8. Correlation between NIDA and GAD-7 Score

Though the depression index of the entire study as in Figure 9 displays the concentration towards minimal and mild classification, but there exist various parameters and features like interest, peer group motivation, first timer etc. in case of consumption of alcohol as well as illicit drugs leading to illness also proven by many hospital based studies presented in the literature under this work.

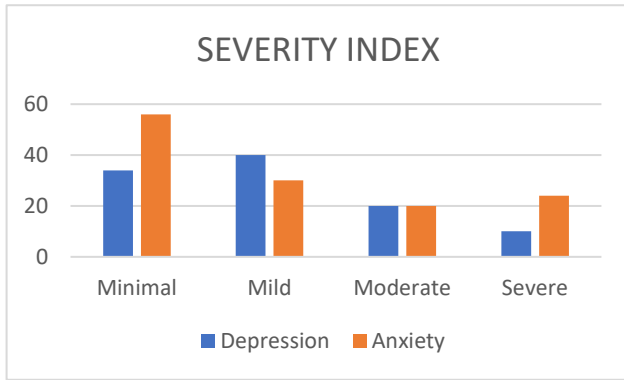


Figure 9. Comparative of BDI and GAD Score

4.2 Discussion on Efficacy of ML

The outcome of this research study validated the potential of the ML approach to explain the convoluted relationships of features connected with disorder (depression and general anxiety) and substance intake habits. Questions relating to substance intake is a known factor for depression [67], high consumption of alcohol and drugs were the features of paramount rank to establish the relationship with mental illness. Crying and libido has been confined to very minimal impact on the core symptom of depression and anxiety. However, daily drinker in combination with few smokes of cannabis are the decidable factors that leads to mental illness. There are not much difference in patterns of male and female subjected to illness due to substance intake. In comparable, adequate sleep and not being restless are incidental to a ablated measure of symptoms due to substance abuse. It is still unclear about the neuro-biological effects[68] of consumption and its prolonged intake. Previous research has predominantly considered creating depression clusters through various socio economic, demography and life style variables, however in this study, the main findings have a higher proportion of alcohol(51%) and cannabis (29%) to create depressive mood and anxiety . However, findings sought for more in depth probe and analysis.

Table 1. Performance of Classifiers

	Accuracy	Precision	Recall	F1 Score
SVM	0.80	0.79	0.63	0.70
DT	0.70	0.51	0.60	0.55
K NN	0.75	0.54	0.65	0.59

The ML approach has revealed Alcohol/Drug-specific multi-variables that classified survey samples to class of

illness. Out of various parameters that convene to result in mental illness, drug intake and alcohol seems to have equal and common impact on illness. Important break up emerged between parameters classifying age and addiction, which often showed alternate form among individuals with mental illness and vice versa.

5. Limitations and Constraints

Firstly, the paper is limited to the sample survey executed in the state of Sikkim in which findings would deemed not conclusive unless similar work is done throughout the population, however finding is relevant as it is inline with the prevalence study report published by national survey of India. During the initial survey on sample subjects they were not willing to respond to the questionnaire also that many of students were absent and there is likelihood that they refrain from giving their substance use details. Another challenge is the characterization of parameters according DSM standards on manifestation of mental illness like depression and anxiety episodes for example, cause of depression due to alcohol or vice versa. Non availability of dataset is also constraint to this study. The self reported questionnaire administered on the sample population could suffer from the prejudice from the point of participants answer, data manipulation and further validation.

6. Recommendations

In this section, there are brief list of recommendations acquired during the design and development of this research work:

- a) **Preliminary Screening environment:**-Which includes the qualitative analysis to understand better the relevant psychological parameters associated with the substance use behavior and associated mental illness. We also found it useful to identify the common co-morbidity associated with mental illness, in order to properly discriminate them and reduce the amount of false positives classification events.
- b) **Training of the model with more data:** It is encouraging to collect more data set samples from the real life environment in order to build more robust model.
- c) **Security and Privacy of the information collected:** Storage and publication of private data would seek some security and privacy to be maintained.
- d) **Personalizing treatment and prognosis:** Given that every one differs in their personality traits and behaviour, a personality pattern analysis could be

done to enable identification, treatment and monitoring of relapse.

7. Conclusion and Future Scope

This paper has presented a prevalence study of substance abuse in the designated demography with positive outcomes. It uses general behavioral assessment through standard questionnaire to detect early stages of anxiety and depression in person with history of substance abuse. We identified the existence of substance intake manifestation leading to mental illness like depression and anxiety episodes. The design used of ML models for a classification with accuracy of 80% . While classifying the multi variable class of parameters into different classes of representation and manifestations associated to mental illness episodes, many other features such as neurocognitive approaches, assertion of individuals addicted to a particular drug can be taken for an effective feature selection to keep them in abstinence. This work has put some light on dealing mental health issues in relation with substance addiction (Abuse) and assist future work in this field. Future endeavour inline with the current work has to focus on many of the other mental illness and co-morbidity. The ML models applied in this work needs optimization on accuracy of validation score.

In future, refined repository in terms of electronic records of patients with disorders due to substance abuse could be created based on the various models for testing personality traits, severity test models that will also gain some insights to predict any of the major health hazard of patient or normal being to react immediately for any medical requirements.

Acknowledgement. The authors would like to acknowledge the reviewers for their valuable comments and suggestion without which this research would not have been fruitful and native. Also heartfelt gratitude to team BOLDS Innovation Pvt Ltd (Sikkim) for their extraordinary support on data collection.

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