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Model for predicting academic stress among students of technical education in India

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ABSTRACT– *The purpose of this paper is to examine the mental stress among the students studying in higher education at the college level, especially those who are taking technical education in India. Also, the paper will identify the factors that affect the mental condition of students who have just taken admission from traditional school education to technical education in college or university. Data from 2500 students studying at graduation level in various technical education colleges and universities in northern India, has been collected using a structured questionnaire through online and offline channels. An ensemble prediction model to know the stress level of technical students has been proposed using the Machine learning technique. The findings of the study revealed that the main factors which influence the mental stress and depression in the students who are new to technical education are heavy workload, lack of support of family and friends, attendance pressure, cooperation with teachers, placement and lack of extra-curricular activities. This study is an effort to analyse the stress level of the students at the early stage so that different types of precautions can be taken by their parents, teachers, friends, college management, etc. to help them in managing their depression, stress, and anxiety. This is the first study as per the literature that explores the stress of students enrolled in technical education in India. The study identifies various factors that are of concern and that affect the stress level in students.*

Keywords--*Mental stress, Technical education, Depression, Anxiety, Machine Learning*

I. INTRODUCTION

Stress is an inevitable part of life. It effects every range of people with no concern to age, gender, social or educational status (Marthoenis et al., 2018). Now a days, students' mental health of any standard has become a serious issue all over the world. Various kinds of studies and researches are being conducted for this regard (Lei et al., 2007; Zhao et al., 2009; China Youth Social Service Centre, 2008).Stress is not always negative as sometimes it is required to be successful or to maintain a proper motivation in life and work. A lot depends on stressor how he or she takes it (Nandamuri et al., 2007). But generally it has been seen that it becomes negative factor if the individual fails to cope up with it. Verma et al., 1990 referred that academic stress leads to the mental stress and which arises generally due to the academic failure. The stress, be it of any type, can create various problems in youngsters, such as – depression, anxiety, health problems-physical as well as mental. In fact, if not managed properly then it may lead to social acts also (Field at al., 2001; Anderman, 2002; Ang et al., 2006; Bjorkman, 2007). Some studies done by researchers of various countries (Ang et al., 2007; Crystal et al., 1994; Deb et al., 2011; Lee and Larson, 2000;

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Lei et al., 2007; Zhao et al., 2009; Mitra et al., 2011) indicate that the students of Asian countries such as Japan, China, India, Korea etc. feel more stress in academics in comparison to western countries. This difference can be influenced by many factors such as demographic conditions, education system of countries, cultural values or socioeconomic variables etc. (Bossy, 2000; Ang et al.,2006; Lin et al., 1995; Lu, 2008). Bataineh, (2013) conducted a study related to academic stressamongst students in King Saud University. The main factors identified for stress among students in the study were, short time to study, overload of assignments, exam load, no interest in the chosen stream, high pressure and expectations from family. Further, the situation of student stress is also not good in India. In a study done by Arun et al, 2009 in Chandigarh, India, found that out of 2,402 students, approximate 46% were suffering with psychological disorders and approximate 6% cases were reported as those who had made suicidal attempts. Similar type of situation was found in students studying for higher education after completion of school education. A study done by Waghachavareet al, 2013 on medical students in India found various factors that affect the stress level among medical students. These factors were life style, change in environment and method of study, academics, environmental and social factor etc. They observed that among all the sampled students, approximate 73% were found stressed.The changes in life style, college atmosphere, study pressure, career pressure, and different pattern of teaching, increase work load, hostel life etc. could be various reasons for the development of mental stress. Generally above factors are the situations which bring prompt changes in the life of a student. Slowly the effect of these factors become critical in their mind and start causing stress (Towbes et al., 1996). Also the increase stress level starts damaging their health and mental peace. There are various cases where students commit suicide or start taking drugs (Ghaderi et al., 2015). Deb et al., 2011 did a study to identify that one of the common cause of stress among students in India is the pressure of expectations of performing well in examson students by their parents. The authors also inferred that sometime theses expectations varied with gender also i.e. different level of expectations from a maleandfemale child.A study was done by Deb et al., 2014 on students of secondary education in Kolkata to examine the academic stress. The authors have taken student data from five schools from Kolkata studying in 10^{th} and 12^{th} standard. Study reveals that 35 to 37% students reported stressed due to exam anxiety and academics. The stress becomeshigher on students when they move up from their traditional education i.e. school and go for the technical education (Waghachavare et al, 2013). Thawabieh et al., 2012 did a study on college students and found that students feels different type of pressures such as educational, social, psychological an environmental in new college and atmosphere. This happens due to the huge difference in the education system and teaching methodology of technical college. One more factor that they identified was relation between teacher and students and even among students themselves (Kitzrow, 2003; Marthoenis et al., 2018).For understanding the important factors creating stress in students of technical education, there is a need of fresh study to analyse these factors. This study is an effort to analyse the stress level of the students at the early stage, so that different type of precautions can be taken by their parents, teachers, friends, college management etc.

II. METHOD AND MATERIALS

Dataset

This study collected data from 2500 student participants studying in different private universities and technical colleges from northern India. Out of 2500, only 2029students filled the questionnaires complete in all respects and

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same were used for further data analysis purpose. Amongst those whose responses for selected for final data analysis, 1349 were males and 680 were females. All the participants' age ranged between 18 to 23 years.All the students were from engineering students studying in first, second, third and fourth year. The data was collected using online as well as offline questionnaire through open and close interviews. Initially a structured questionnaire was prepared with 21 features, such as information aboutdemographicdetails, geographicalconditionsrelated with whether, their health, surroundings etc. Support details and work details information such as lack of support from friends, attendance pressure, placement pressure etc.A pilot testing of questionnaire was done by taking a sample of 50 students. These 50 students were not included in the final sample. Out of 21 variables finally only 17 features were included in the final questionnaire to avoid duplication and ambiguity. There were two sections of the final questionnaire. Section -1 was about capturing Demographic details such as age, gender, family income etc., section -2 was about questions based on seven-point (strongly disagree, disagree, somewhat disagree, neutral, somewhat agree, agree, strongly agree) Likert scale such as "You feel more work load of academics in technical education?", "You have chosen this field by choice of force?", "You have attendance pressure ?" etc. Section-3 contained questions related with extra-curricular activities, placement pressure etc. (Deb et al., 2014).

III. DATA ANALYSIS

Data analysis was performed using mean ratings on all 16 variables that were captured using likert scale. For this, all variables were checked for mean differences across two groups of gender and four groups of study year. The differences were checked for statistical significance using one-way Anovatest.The results of mean differences across gender and year are shown in Table-I.

Table 1: Mean differences across gender and year

Gender		**Heavy workload in classrooms**	**Lack of support from faculty members**	**Lack of support from parents**	**Lack of support from classmates and friends**	**Constant pressure to maintain a fixed attendance**	**My own health issues**	**Homesickness**	**Examination Stress**	**High parental expectations**	**Social Anxiety**	**Financial Burden**	**Placement**	**Taken admission forcefully not by choice**
Female	Mean	5.9912	4.0515	5.5235	4.0471	5.3706	5.1794	4.7000	5.0324	4.1294	5.2750	5.5368	4.7853	4.1618

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	N	680	680	680	680	680	680	680	680	680	680	680	680	680
	SD	.67126	1.94520	1.07975	1.76469	1.32419	1.24715	1.65811	1.68564	1.79699	1.27948	1.28952	1.66779	1.80337
Male	Mean	5.8769	3.8399	3.7153	3.7079	5.4411	3.9852	4.8050	5.2016	5.3884	5.1512	5.3951	4.7161	5.1557
	N	1349	1349	1349	1349	1349	1349	1349	1349	1349	1349	1349	1349	1349
	SD	.67466	1.81557	1.87453	1.83498	1.30582	1.75200	1.53102	1.65252	1.05714	1.29858	1.38731	1.62196	1.34851
Total	Mean	5.9152	3.9108	4.3213	3.8216	5.4174	4.3854	4.7698	5.1449	4.9665	5.1927	5.4426	4.7393	4.8226
	N	2029	2029	2029	2029	2029	2029	2029	2029	2029	2029	2029	2029	2029
	SD	.67552	1.86222	1.85873	1.81836	1.31210	1.69676	1.57513	1.66520	1.47559	1.29322	1.35666	1.63738	1.58676
Current Year		**Heavy workload in classrooms**	**Lack of support from faculty members**	**Lack of support from parents**	**Lack of support from classmates and friends**	**Constant pressure to maintain a fixed attendance**	**My own health issues**	**Homesickness**	**Examination Stress**	**High parental expectations**	**Social Anxiety**	**Financial Burden**	**Placement**	**Taken admission forcefully not by choice**
First year	Mean	5.8898	3.8969	4.2726	3.8249	5.3828	4.3898	5.3630	5.2161	4.9421	5.2218	5.5749	4.2415	4.9619
	N	708	708	708	708	708	708	708	708	708	708	708	708	708
	SD	.67004	1.84532	1.83337	1.79197	1.30458	1.6728	1.07413	1.63239	1.43734	1.28432	1.10613	1.71510	1.50810

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Second Year	Mean	5.9298	3.9752	4.2769	3.8409	5.4070	4.2975	5.4360	5.2149	5.0475	5.1798	5.4504	4.1694	5.0165
	N	484	484	484	484	484	484	484	484	484	484	484	484	484
	SD	.67122	1.86817	1.86551	1.87097	1.34427	1.73214	1.01848	1.61364	1.46024	1.30246	1.20541	1.79492	1.43447
Third Year	Mean	5.9818	3.9015	4.5219	3.7518	5.4672	4.5401	3.8029	5.1095	4.8504	5.2737	5.2591	5.5766	4.5073
	N	274	274	274	274	274	274	274	274	274	274	274	274	274
	SD	.70297	1.90463	1.91425	1.81480	1.36707	1.61047	1.73665	1.68457	1.53454	1.28740	1.62693	1.06714	1.70593
Fourth Year	Mean	5.9023	3.8774	4.3233	3.8348	5.4458	4.3801	3.9218	5.0124	4.9840	5.1279	5.3588	5.4476	4.6341
	N	563	563	563	563	563	563	563	563	563	563	563	563	563
	SD	.67178	1.86108	1.85563	1.81121	1.26765	1.73547	1.77295	1.73457	1.50613	1.29932	1.58817	1.10257	1.70337
Total	Mean	5.9152	3.9108	4.3213	3.8216	5.4174	4.3854	4.7698	5.1449	4.9665	5.1927	5.4426	4.7393	4.8226
	N	2029	2029	2029	2029	2029	2029	2029	2029	2029	2029	2029	2029	2029
	SD	.67552	1.86222	1.85873	1.81836	1.31210	1.69676	1.57513	1.66520	1.47559	1.29322	1.35666	1.63738	1.58676

The first comparison according to gender in table-1 depicts that the main factors which influence the stress in female students are lack of faculty support, lack of parent support and health issues. Whereas male students are more stressed due to parent expectations and forceful admission in the course. Apart from these parameters, the heavy work load, exam stress, social anxiety, financial burden and attendance pressure are the factors which affects both genders. In the second group, the comparison has been done according to year wise students and variables such

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as the home sickness appears to have been affecting more to first and second year students as compared to third & fourth year student. Also, placement is the factor which created more stress in third year and fourth year students as compared to 1st and 2nd year students.

Table –II exhibits the results ofthe Fisher's exact test to check any statistically significant relationship between stress and gender, stress and student's study year and stress and extra-curricular activities. From the Table-II it is very much clear that stress level in male is more in comparison to females. The percentage of male students who are feeling stress is 80.73% while females are 76.47%. In the second comparison the stress level is more in first year (95.20%) and in second year (95.04%) in comparison to third year and fourth year students. In the third comparison the students who participates in extra-curricular activities (74.74%) are less stressed in comparison to who do not participate (90.91%).

Table 2: Stress percentage of students according to gender and study year

			stress exist		
			Not Stressed	**Stressed**	**Total**
Gender	**Female**	Count	160	520	680
		% within Gender	23.53	76.47	100.00
	Male	Count	260	1089	1349
		% within Gender	19.27	80.73	100.00
Total		Count	420	1609	2029
		% within Gender	20.70	79.30	100.00
			stress exist		
			Not Stressed	**Stressed**	**Total**
Current Year	**First year**	Count	34	674	708
		% within Current Year	4.80	95.20	100.00
	Second Year	Count	24	460	484
		% within Current Year	4.96	95.04	100.00
	Third Year	Count	117	157	274
		% within Current Year	42.70	57.30	100.00
	Fourth Year	Count	245	318	563
		% within Current Year	43.52	56.48	100.00
Total		Count	420	1609	2029
		% within Current Year	20.70	79.30	100.00
			stress exist		
			Not	**Stressed**	**Total**

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			Stressed		
Participate in Extracurricular	**No**	Count	52	520	572
		% within Participate in Extracurricular	9.09	90.91	100.00
	Yes	Count	368	1089	1457
		% within Participate in Extracurricular	25.26	74.74	100.00
Total		Count	420	1609	2029
		% within Participate in Extracurricular	20.70	79.30	100.00

IV. PROPOSED MODEL

The study usesensemble machine learning model for processing dataset and create predictions. Ensemble is a technique which is used to combine a different set of individual machine learning models together to make the single and better model on the strength and prediction power (Zhang et al., 2012). It is also used to improvise the results by decreasing the errors that can occur in simple and single machine learning models such as bias error called as under-fit and variance called as over-fit (Dietterich, 2000). The error occurred in the model can be represented as Eq.1

$$Error(x) = Bias2 + Variance + Irreducible\ errors \quad (1)$$

The block diagram of proposed system is shown in Fig. 1. To make the dataset better and handle all missing values, cleaning and refining ondataset has been done. For making dataset dimensions in the form of features some features have been created by merging similar kinds of features in same category. The model created is based on the voting technique and uses five models which includes - Logistic Regression, Support Vector Machine (SVM), K - Nearest Neighbour (KNN), Decision Tree and Random Forest.

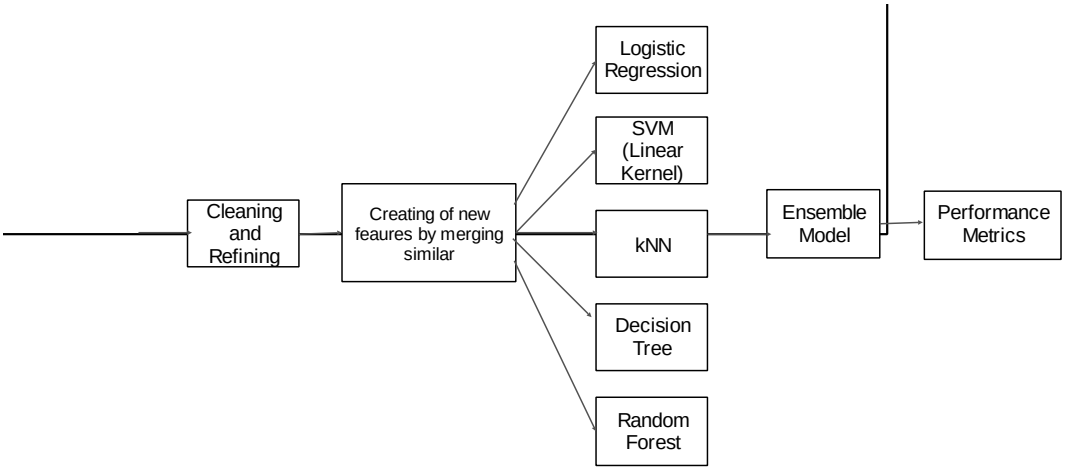

Figure 1: Block Diagram of the proposed ensemble model

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V. RESULTS

Experimental Setup

The Simulation of the model has been done using python on PyCharm 2016.3.6 IDE in a workstation with Intel coreTM i3 3.2 GHz processor with 8GB RAM. The proposed model has beenapplied on the dataset of 2029studentsstored in the form of a csv file. The main purpose ofdeveloping and testing of a proposed model was to predict the stress level of the students coming for the technical education after completion of schooling. For the experiment the dataset has beensplit into two parts - training data and testing data. 80% of data has been used for thetraining of the model and the remaining 20% used for testing of the model. For the prediction one target variable has been created called as output variable. Which contains a value 0 or 1. The value 0 and 1 has been decided on the basis of stress range between 0 to10. Under stress level 5 the target will have 0 else the target value will be 1. Fig. 2 shows the plot of target variable created in the dataset.

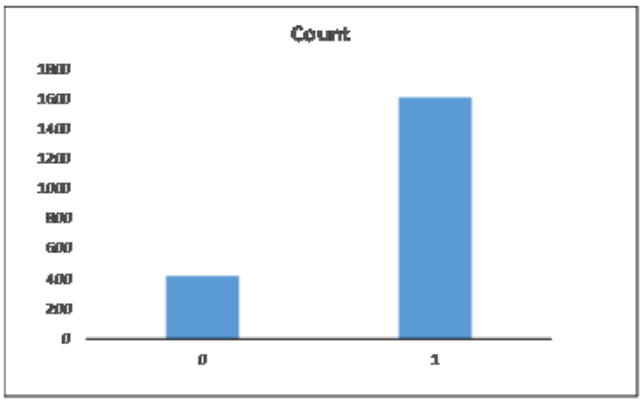

Figure 2 : Plot of target variable for representing stress level.

Performance measures

The two performance measures have been used for the evaluation of the proposed model accuracy and Area under the curve of Receive Operating Characteristics (AUC-ROC) (Verma et al., 2019).

- Accuracy

When the sum of True positive and false negative is divided by total input sample then it is called as accuracy shown in Eq. 2.

$$Accuracy = \frac{True\ Positive + False\ Negative}{Total\ number\ of\ prediction\ made}$$

When the model is predicting case/s to be true and the actual value is also true, then these cases comes under the category of True Positives. While if the model is predicting cases false but actual output is true then these cases comes under the category of False Negative. The Accuracy of the proposed model after the evaluation is shown in

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Table III. From the table-III, it can be depicted that the as an individual model the Random Forest model has given best accuracy as 89.78%. While the proposed ensemble model has improvise accuracy a little bit i.e. 90.10%.

Table 3:Accuracy of individual Models and Proposed Ensemble Model

Sno	Model	Accuracy
1	Logistic Regression	60.1%
2	SVM	87.85%
3	kNN	68.66%
4	Decision Tree	89.12%
5	Random Forest	89.78%
6	Proposed Ensemble Model	90.10%

- AUC-ROC Curve

AUC-ROC curve is the most widely used metrics used for classification problem evaluation. It is a plot between False Positive Rate (FPR) and True Positive Rate (TPR), where FPR and TPR are calculated using Eq.3 and Eq.4.

$$FPR = \frac{False\ Positive}{False\ Positive + True\ Negative}$$

$$TPR = \frac{True\ Positive}{False\ Negative + True\ Positive}$$

Figure-III shows the AUC-ROC curve of the individual models and the ensemble model.

VI. DISCUSSION AND IMPLICATIONS OF STUDY

From this study a large number of students found that they felt stressed because of various factors such as lack of parent support, faculty support, work load etc. According to gender wise comparative study the female stress factors were found to be lack of faculty support, lack of parent support, health issues and male students were found to be more stressed due to parent expectations and forceful admission in the course. Work load stress is common factor for both the genders. The study findings also says that when student comes in first year after completion of school, he or she feels more stress (95.20%), may be due to several type of changes such as academic environment, study pattern, change in friends etc. that happen around him or her. This stress gets reduce slowly as he or she passes the years of engineering. But the study also finds that the stress also increase little bit in fourth year because of placement and other things which can affect their future after completion of degree. Apart from this the study highlighted one more factor i.e. extra-curricular activities as key influencer of stress. The students who participate in extra-curricular activities (74.74%) are less stressed in comparison to those who do not participate (90.91%).This study identifies and adds some more factors to literature of stress related to students of technical education, which were not identified in other academic stress related studies (Lee et al., 2000; Lei et al., 2007; Sun 2011; Zhao et al., 2009, Deb et al., 2014). The studies in literature also reported that parental expectations is one of the reason for academic stress in school level (Deb et al., 2011, Deb et al., 2014, Lei et al., 2007). In India, generally in middle

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class, parents economic and social pressure is more in comparison to upper class or lower class. These parents always have challenge to protect their social position in the society (Ganguly et al., 2009). The present study also found the same thing but more in male students in comparison to females. The main reason behind this may be the gender biasness in India. One of the major factor in female student stress is lack of support of their parents. Female students feel pressure and stress because in India their parents do not support them whole heartedly. Further, the study also reveals that if the students participate in extra-curricular activities such as dance, sports, etc., they feel less stress in comparison to those who do not participate. The percentage varies from approximate 74% to 90%. In the present study the main factors that contributes in the stress of technical education students are lack of support of parents (female), health issues (female), parents expectations (male), home sickness, anxiety, work load (first year and second year students), placement pressure (fourth year students) etc. The study found that extra-curricular activity is one of the contributor to make students de-stressed.

The study has a lot of important findings for those who manage or handle affairs of the technical colleges and universities. The findings clearly lists important factors that students of technical educations face in present scenario. These findings are in line with earlier studies (Sedlak, 1993). Further, this study contributes uniquely by proposing a machine learning ensemble model for predicting stress amongst students enrolled in technical education. So, teachers and management utilize this model to identify students who are stressed, which otherwise would be not visible, and take proper measures to improvise the condition of the student. They can talk to parents, they can recruit psychiatrist as student counsellor (Bhatnagar, 1997). They can inform to the faculty about the problems of the students. Apart from this college authorities can organize stress reliving workshops.

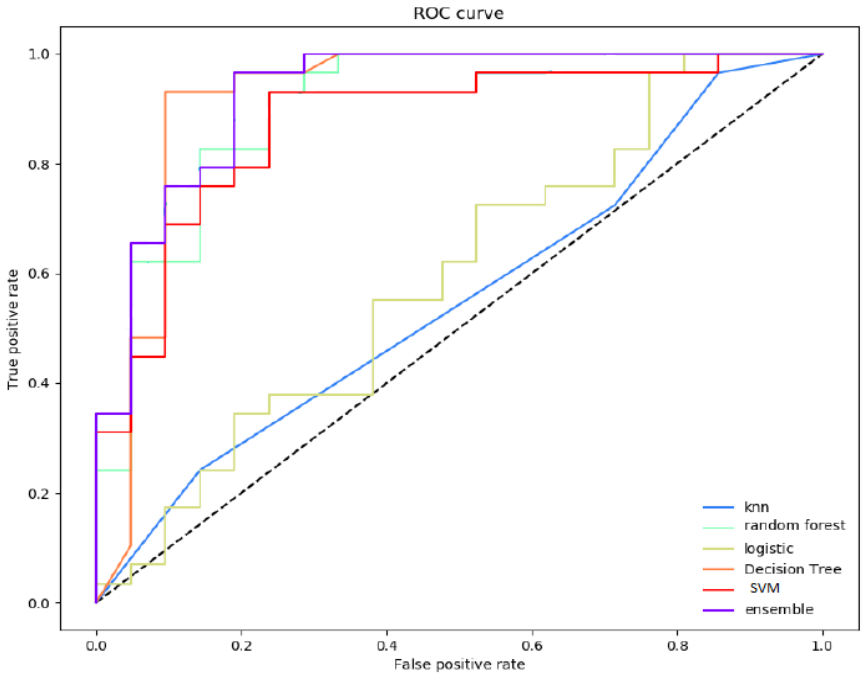

Figure 3: Plot of AUC-ROC Curve.

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VII. CONCLUSION AND FUTURE SCOPE

As per this study, more than 74% of the students experienced stress. The stress factors are of different type with different levels of student. Such as, female students stress factors are different from that of male. Lack of support of parents & health issues cause more stress in female students than male students whereas parental expectations and forced admission to a program are more prominent stress factors amongst male students. However, there are some factors that are general or common to both i.e. males and females, such as attendance pressure, heavy work load etc. The study also proposed an ensemble machine learning model to predict if a student is facing stress level or not. The model is based on the voting method and consists with five primary models -logistic regression, kNN, SVM, decision tree and random forest. The prediction accuracy of the model is approximate 90.10%.

Given the large number of technical college and university in India, the study has taken only private colleges and universities. Therefore, caution is required to be used when it is required to generalize the findings. May be if the Government colleges and Universities will be included, some more and different factors may emerge related to stress. Further, to validate the findings of the current study a psychological study is required to be included. Which can identify the stress and level of stress medically. On factor can be included in the questionnaire which can identify the educational standard of parents, place from where student belong (rural or urban) etc. More work can be done to improve the accuracy of the proposed prediction model by including some more feature leading to stress in future.

REFERENCES

1. Anderman, E.M. (2002), “School effects on psychological outcomes during adolescence”, Journalof Educational Psychology, Vol. 94 No. 4, pp. 795-809.
2. Ang, R.P. and Huan, V.S. (2006), “Academic expectations stress inventory: development, factoranalysis, reliability, and validity”, Educational and Psychological Measurement, Vol. 66No. 3, pp. 522-539.
3. Ang, R.P., Huan, V.S. and Braman, O.R. (2007), “Factorial structure and invariance of theAcademic expectations stress inventory across Hispanic and Chinese adolescent samples”,Child Psychiatry & Human Development, Vol. 38 No. 1, pp. 73-87.
4. Arun, P. and Chavan, B.S. (2009), “Stress and suicidal ideas in adolescent students inChandigarh”, Indian J Med Sci, Vol. 63 No. 7, pp. 281-287.
5. Bataineh, Z. M. (2013). Academic Stress Among Undergraduate Students: The Case of EducationFaculty at King Saud University. International Interdisciplinary Journal of Education, 2(1), 82-88.
6. Bhatnagar, A. (1997), “Guidance and counselling”, in Buch, M.B. (Ed.), Fifth Survey of Educational Research 1988-1992 (Vol. 1), National Council of Educational Research and Training, New Delhi, pp. 216-234.
7. Bjorkman, S.M. (2007), “Relationships among academic stress, social support, and internalizingand externalizing behavior in adolescence”, PhD dissertation, Northern Illinois University,Dekalb, IL.

DOI: 10.37200/IJPR/V24I4/PR201378
Received: 22Sep 2019 | Revised: 13 Oct 2019 | Accepted: 15 Jan 2020

8. Bossy, S. (2000), “Academic pressure and impact on Japanese students”, McGill Journal ofEducation, Vol. 35 No. 1, pp. 71-90.
9. China Youth Social Service Center (2008), “2007 China national juvenile internet use surveyreport”, available at: www.edu-china.net/full_T_index.jsp?ID¼841 (accessed 1 June 2009).
10. Crystal, D.S., Chen, C., Fuligni, A.J., Stevenson, H.W., Hsu, C.-C., Ko, H.-J., Kitamura, S. and Kimura,S. (1994), “Psychologicalmaladjustment and academic achievement: a cross-cultural study ofJapanese, Chinese, and American High School students”, Child Development, Vol. 65 No. 3,pp. 738-753.
11. Deb, S., Majumdar, B. and Sun, J. (2011), “Academic stress, parental pressure, anxietyand mental health among Indian school students”, paper presented at theInternational Conference on Students’ Mental Health: Issues and Challenges,Puducherry, July 25-26.
12. Deb, S., Strodl, E., & Sun, J. (2014). Academic-related stress among private secondary school students in India. Asian Education and Development Studies, 3(2), 118-134.
13. Dietterich, T. G. (2000, June). Ensemble methods in machine learning. In International workshop on multiple classifier systems (pp. 1-15). Springer, Berlin, Heidelberg.
14. Field, T., Diego, M. and Sanders, C. (2001), “Adolescent depression and risk factors”, Adolescence,Vol. 36 No. 143, pp. 491-498.
15. Ganguly-Scrase, R. and Scrase, T.J. (2009), Globalisation and the Middle Classes in India:The Social and Cultural Impact of Neoliberal Reforms, Routledge, New York, NY.
16. Ghaderi, A., Frounchi, J., &Farnam, A. (2015, November). Machine learning-based signal processing using physiological signals for stress detection. In 2015 22nd Iranian Conference on Biomedical Engineering (ICBME) (pp. 93-98). IEEE.
17. Kitzrow, M. A. (2003). The Mental Health Needs of Today's College Students: Challenges and Recommendations. NASPA Journal, 41(1), 167-181. doi: 10.2202/1949-6605.1310
18. Lee, M. and Larson, R. (2000), “The Korean ‘examination hell’: long hours of studying, stress, anddepression”, Journal of Youth and Adolescence, Vol. 29 No. 2, pp. 249-271.
19. Lei, L., Sun, H., Li, D., Guo, F. and Zhang, G. (2007), “Comparison study on life consciousnessbetween Chinese, Japanese, Korean, and American high school students”, China YouthStudy, Vol. 7 pp. 1-7.
20. Lin, J. and Chen, Q. (1995), “Academic pressure and impact on students’ development in China”,McGill Journal of Education, Vol. 30 No. 2, pp. 149-168.
21. Lu, H.D. (2008), “Focus on learning stress of Chinese children: the puzzledom and theway out”, Journal of Northeast Normal University (Philosophy and Social Sciences),Vol. 6 pp. 24-28.
22. Marthoenis, M., Meutia, I., Fathiariani, L., &Sofyan, H. (2018). Prevalence of depression and anxiety among college students living in a disaster-prone region. Alexandria journal of medicine, 54(4), 337-340.
23. doi: https://doi.org/10.1016/j.ajme.2018.07.002
24. Mitra, C. and Deb, S. (2011), “Mental and physical stress among students before boardexaminations and before admission to the next level: analyses of case studies”, paperpresentation at the International conference on Students’ Mental Health: Issues andChallenges, Puducherry, July 25-26.

DOI: 10.37200/IJPR/V24I4/PR201378
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25. Nandamuri, P. P., & Ch, G. (2007). Sources Of Academic Stress – A Study On ManagementStudents. Journal of Higher Education,, 61(1), 31-42.
26. Sedlak, A.J. (1993), Estimating the National Prevalence of Child Abuse from Sentinel Data, American Statistical Association, Alexandria, VA.
27. Sun, J. (2011), "Educational stress among Chinese adolescents: measurement, risk factors and associations with mental health", unpublished doctoral dissertation, submitted to the School of Public Health, Queensland University of Technology, Brisbane.
28. Thawabieh, A. M., &Qaisy, L. M. (2012). Assessing Stress among University Students. American International Journal of Contemporary Research, 2(2), 110-116.
29. Towbes, L. C., & Cohen, L. H. (1996). Chronic stress in the lives of college students: Scale development and prospective prediction of distress. Journal of youth and adolescence, 25(2), 199-217.
30. Verma, H., & Verma, G. (2019). Prediction Model for Bollywood Movie Success: A Comparative Analysis of Performance of Supervised Machine Learning Algorithms. The Review of Socionetwork Strategies, 1-17.
31. Waghachavare, V. B., Dhumale, G. B., Kadam, Y. R., & Gore, A. D. (2013). A Study of Stress among Students of Professional Colleges from an Urban area in India. Sultan Qaboos University Medical Journal, 13(3), 429.
32. Zhang, C., & Ma, Y. (Eds.). (2012). Ensemble machine learning: methods and applications. Springer Science & Business Media.
33. Zhao, X., Zhu, S. and Ma, G. (2009), "Comparison study on basic rights between Chinese, Japanese, Korean, and American high school students", China Youth Study, Vol. 6, pp. 1-7.
34. Perfilova, O.V., Magomedov, G.O., Magomedov, M.G., Babushkin, V.A.Quality of jelly marmalade from fruit and vegetable semi-finished products(2018) International Journal of Pharmaceutical Research, 10 (4),pp.721724.
35. Kiruthika,S.,&Vadivel,S. (2015). A Systematic Study of Various Radio Propagation Models for a Hybrid Mac Protocol in Sensor Networks. International Journal of Communication and Computer Technologies, 3(1), 31-36.
36. Logarasu,R., &Andulgafoor,A. (2015). Bayesian Saliency Using the Spectral form of Relaxation Aid Cuts. International Journal of Communication and Computer Technologies, 3(1), 37-51.
37. Astiti, N.M.A.G.R. Impact of Bali Cattle Calf marketing to the farmers income (2019) Journal of Research on the Lepidoptera, 50 (4), pp. 89-96.
38. Duaaal-Musawip, Al-Juborip, S.S. Correlation between Chaperone-Usher of Pap, SFA, AFA Operons with Type 1 Fimbriae (2019) Journal of Research on the Lepidoptera, 50 (2), pp. 131-146.

DOI: 10.37200/IJPR/V24I4/PR201378
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