



Machine Learning & Educational Choice In J&K

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ABSTRACT

This Paper attempts to review 25 studies using Machine learning with Jammu and Kashmir data from India in the educational and training sector. After reviewing these studies Analyses a survey of opinion from over 219 principals of different schools in the state. Though the survey analyses the use of technology in the schools and the impact of enrolment, the focus is on the determinants of the enrollment or schooling choice using machine learning models. Study uses the machine learning model without code using JASP (an opensource software). While the decision tree results were strategic in nature the regression results were more specific for operations of the schools.

Keywords—Machine learning, prediction, schooling choice, Principal Perception

I. INTRODUCTION

This paper is the survey of 25 studies and 219 principals of different schools in Jammu and Kashmir in India. First the paper analyses the studies on the challenges reported by different school principals. Furthermore it analyses the data collected from 219 principals about the challenges they faced in their schools. The questions were mostly related to the enrolment and the student preferences. This paper uses the above and below average enrolment as the target variable to understand the classification in the machine learning model utilised here. The results were interesting. Regression analysis was also conducted and the results compared.

II. REVIEW OF LITREATURE

A. Literature

Brahma & Mukherjee, (2018) analyse the effectiveness of funding and food grain supply in impacting India's Mid-Day Meal program coverage using state-level data. While regression models suggest food grains have a statistically significant influence, disbursed funds appear less impactful. However, LASSO machine learning with controls for state-specific factors reveals both policy variables as strong out-of-sample predictors of program coverage. This highlights the importance of out-of-sample prediction evaluation, a largely unexplored area in development economics, especially considering that some program funds cover fixed costs and might not show a statistically significant marginal effect on coverage.

Acharya (2020) builds on the established link between quality schools and long-term income (Chetty et al., 2014) by investigating a potential spatial inequality. He explores whether resource-rich neighbourhoods disadvantage nearby poorer ones in accessing quality schools, hindering their human capital development. Leveraging data from Indian and Hungarian universities,

Verma et al. (2020) present a novel application of machine learning in Jammu and Kashmir – predicting student origin based on their technological awareness. Their approach goes beyond existing research on features like access or educational benefits by incorporating sentiment identification through an optimized Multi-Layer Perceptron (MLP) model. This MLP, when fine-tuned with an Adam optimizer and ReLu activation function and combined with dimensionality reduction via Principal Component Analysis (PCA), achieved a significant 94% accuracy in identifying student origin, comparable to a Support Vector Machine (SVM) model. The optimized models also yielded reduced prediction error and time, making them suitable for real-time educational

applications. These findings suggest promising applications for "optimistic native identification models" in analyzing student attitudes and technological awareness based on their geographical background.

In Jammu and Kashmir, Gujjars and Bakkarwals, two nomadic pastoral communities constituting over 8% of the state's population, face significant challenges in accessing education. Despite efforts like the government's Mobile Primary Schools (MPS), literacy rates remain low. Suri (2014) investigates the effectiveness of MPS programs and the reasons behind this educational disparity. The study explores constraints limiting educational access for these communities and proposes strategies to improve educational opportunities for Gujjars and Bakkarwals, empowering them through knowledge and potentially improving their livelihoods.

Wani et al. (2022) address the challenge of achieving Sustainable Development Goal 4 (inclusive and equitable education) within regions facing socio-political conflict. Their study focuses on Kashmir, India, a region grappling with such conflict for over three decades. Employing a qualitative approach, the researchers conducted multiple field visits and 21 semi-structured interviews with parents, teachers, students, and members of an NGO operating Community Learning Centres (CLCs) in Kashmir. Their findings explore the educational barriers caused by the conflict and the role of CLCs in mitigating these challenges within this specific context. Furthermore, the study emphasizes the importance of engaging researchers and policymakers to leverage existing human resources, design for uncertainty, build trust in educational infrastructure, and ensure content usability. By advocating for these considerations, Wani et al. aim to develop solutions that enhance educational accessibility in conflict-affected regions. This research contributes valuable insights to a previously under-explored area within the broader field of Human-Computer Interaction (HCI) and Education.

Jin et al. (2023) emphasize the importance of accurate dementia prevalence estimates for informing effective public health and social care policies. Their study leverages a large, nationally representative sample from the Longitudinal Aging Study in India (LASI) to estimate dementia prevalence in the country. The researchers employed a semi-supervised machine learning approach. This involved using a subsample with confirmed dementia diagnoses to train a model for predicting dementia status in participants without diagnoses. After incorporating sampling weights and age-standardization, the analysis yielded a national dementia prevalence estimate of 8.44% (aged 60+) with an age-standardized prevalence of 8.94%. The study also found that dementia prevalence increased with age, was higher among females, those with no education, and residents of rural areas. These findings suggest potentially higher dementia prevalence in India compared to previous local studies. Jin et al. highlight the value of their approach for informing policy decisions and its potential applicability to other large-scale population aging studies with similar data structures.

Malik et al. (2023) investigate the threat of climate stress on Jammu and Kashmir's agriculture sector, vital for the region's economy and livelihoods. To quantify this risk to food security and sustainability, they propose a novel framework. This framework assesses the impact through three objectives: 1) regional vulnerability (exposure, sensitivity, and adaptive capacity), 2) climate variability analysis, and 3) agricultural performance under climate stress. The study evaluates the vulnerability of 22 sub-regions using indicators to gauge collective susceptibility to climate change. An index-based approach ranks districts based on vulnerability. Next, they assess the impact of socio-economic and climatic factors on agricultural performance using the Ricardian approach. Finally, Long Short-Term Memory (LSTM) networks are employed to forecast climate trends. The findings reveal negative impacts of low minimum temperature and shrinking land holdings on agricultural GDP, while factors like cropping intensity, literacy, and credit facilities have positive effects. The study also identifies vulnerability variations across districts. Budgam, Ganderbal, and Bandipora exhibit higher vulnerability due to lower literacy, higher population density, and reliance on rice cultivation. Conversely, Kargil, Rajouri, and Poonch show lower vulnerability due to lower population density and limited institutional development. The analysis also projects an increasing trend in minimum temperature. The proposed LSTM model outperforms benchmarks in predicting five key climate variables, offering valuable insights for policymakers to formulate strategies that mitigate climate stress and enhance agricultural resilience.

Reashma et al. (2017) address a critical challenge in Indian agriculture: optimizing land use in the face of a growing population and shrinking agricultural land availability. Their study explores the potential of machine learning to improve crop selection and cropping patterns. The paper focuses on various machine learning methods for predicting key soil characteristics – soil type, moisture content, and nutrient levels – which are crucial factors in determining optimal crop choices.

Paul, D. S. et al. (2023) underscore the increasing importance of computational methods in healthcare research. The accessibility of healthcare data has significantly motivated scholars to develop implementations aiding in the prognosis of cancer drug responses. Specifically, machine learning (ML) and deep learning (DL) methodologies are heralded as the most reliable and efficacious strategies to manage the severe repercussions of cancer and the administered treatments. This systematic literature review examines studies that explore drug discovery and the prognosis of anticancer drug responses utilizing ML and DL algorithms. Adhering to PRISMA guidelines, 105 relevant research papers were selected from Google Scholar, PubMed, and ScienceDirect. The review evaluates the accuracy of existing ML and DL methods in predicting anticancer drug responses, revealing inherent challenges in each approach. Addressing these limitations could enable future researchers to develop

robust prediction models, significantly aiding medical professionals in administering non-invasive treatments to patients.

Wani (2023) discusses the ongoing COVID-19 pandemic, characterized by significant morbidity and mortality. Current epidemiological research emphasizes the necessity of sophisticated methods to evaluate the evolution of COVID-19. This study analyzed 228 days of daily COVID-19 incidence data (from May 1 to December 15, 2020) at the district level in the Jammu and Kashmir region, located in the northern Himalayan belt of India. Utilizing a deep learning-based incremental learning technique, the study modeled the current trends in COVID-19 transmission and projected future trends with a 60-day forecast. The results indicated not only high morbidity and mortality rates but also predicted a substantial increase in COVID-19 incidence across various districts. A geographic information system (GIS) was employed to store, analyze, and present the spread of COVID-19, offering crucial insights for understanding, planning, and implementing measures to mitigate the current and potential future spread of the pandemic. The study also highlighted the disparities in healthcare facilities at the district level, correlating these discrepancies with disease spread. Consequently, the findings underscore the urgent need to enhance healthcare infrastructure in the region to manage current and future pandemics effectively. These insights could aid administrators and the scientific community in formulating efficient short-term and long-term strategies against such diseases.

Ansari (2023) examines the seismic activity in Jammu and Kashmir, a region in the northwestern Himalayas frequently affected by moderate to large magnitude earthquakes due to its active tectonic regime. This study proposes a Seismic Tunnel Damage Prediction (STDP) model, formulated mathematically and utilizing a deep learning (DL) approach. The DL model's efficacy is validated with tunnel damage data from historical earthquakes, including the 1999 Chi-Chi, 2004 Mid-Niigata, and 2008 Wenchuan earthquakes. Inputs such as peak ground acceleration (PGA), source to site distance (SSD), overburden depth (OD), lining thickness (t), tunnel diameter (Φ), and geological strength index (GSI) were used to train a Feedforward Neural Network (FNN) for predicting damage states.

The performance evaluation of the model indicates its potential for broader application in various risk assessment domains. Compared to traditional models, the STDP model demonstrates consistent results, underscoring the robustness of the employed methodology. All models showed strong validation performance based on fitness metrics. The introduction of "STD multiple graphs" offers detailed insights into damage indexing, damage patterns, and crack predictive specifications, serving as a practical toolbox for post-seismic vulnerability assessment. Furthermore, the study proposes seismic design guidelines for tunneling projects, addressing damage patterns and suggesting mitigation measures. The STDP model, along with the STD multiple graphs and seismic design guidelines, holds global applicability for earthquake-prone tunneling projects.

Sahil (2016) highlights the expanding applications of Artificial Intelligence (AI) and related fields beyond traditional computer science into various domains. Recently, Machine Learning (ML), a sub-discipline of AI, has been extensively utilized to assist medical professionals in the prediction, diagnosis, and prognosis of various diseases and medical disorders. In this study, the authors applied several ML algorithms to a medical diagnosis problem and evaluated their efficiency in predicting outcomes. The focus of the study was on diagnosing Chronic Kidney Disease (CKD). The dataset comprised 400 instances and 24 attributes. Twelve classification techniques were assessed by applying them to the CKD data. The efficiency of these techniques was measured by comparing the prediction results with actual medical outcomes, using metrics such as predictive accuracy, precision, sensitivity, and specificity. The results indicated that the decision tree algorithm performed best, achieving an accuracy of 98.6%, a sensitivity of 0.9720, a precision of 1, and a specificity of 1.

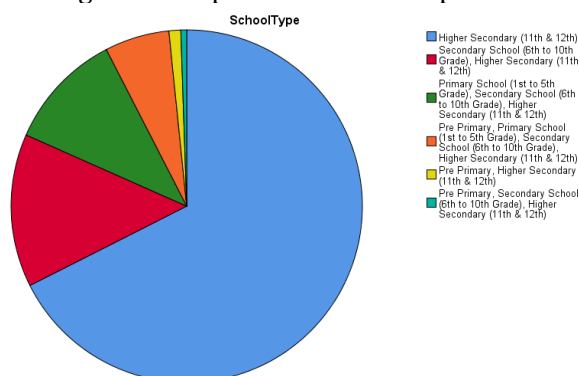
H., Crimmins, E., Langa, K. M., Dey, A. B., & Lee, J. (2023) emphasize the crucial need for accurate dementia prevalence estimates to formulate effective public and social care policies supporting affected individuals and their families. This study aims to estimate dementia prevalence in India using a semi-supervised machine learning approach, drawing from a large, nationally representative sample. The sample comprises adults aged 60 years or older from wave 1 (2017–2019) of the Longitudinal Aging Study in India (LASI). A subsample within LASI underwent extensive cognitive assessments and clinical consensus ratings, resulting in dementia diagnoses. A semi-supervised machine learning model was developed to predict dementia status among LASI participants without diagnoses. Following the predictions, sampling weights and age standardization to the World Health Organization (WHO) standard population were applied to estimate dementia prevalence in India.

The findings reveal that the prevalence of dementia among those aged 60 years and older in India is 8.44% (95% CI: 7.89%–9.01%), with an age-standardized prevalence of 8.94% (95% CI: 8.36%–9.55%). Higher prevalence rates were observed among older adults, females, individuals with no education, and those living in rural areas. These estimates suggest that dementia prevalence in India may be higher than previously reported in local studies. The provided estimates are crucial for long-term public and social care policy planning. Additionally, the semi-supervised machine learning approach used in this study may benefit other large-scale population aging studies with similar data structures.

III. Analysis

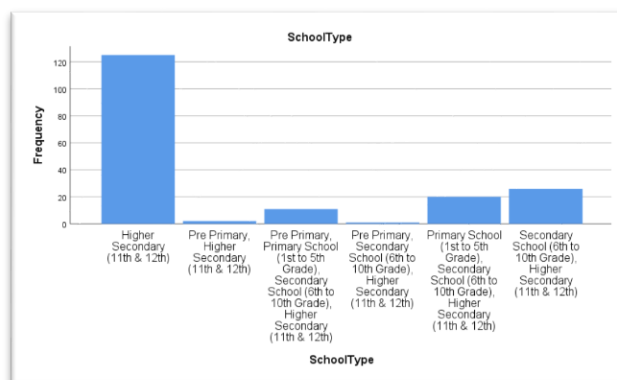
In the analysis an attempt is made to analyse understand the perspectives of the school leadership on the barriers to efficient education in Jammu and Kashmir

Figure 1 Composition of the Sample



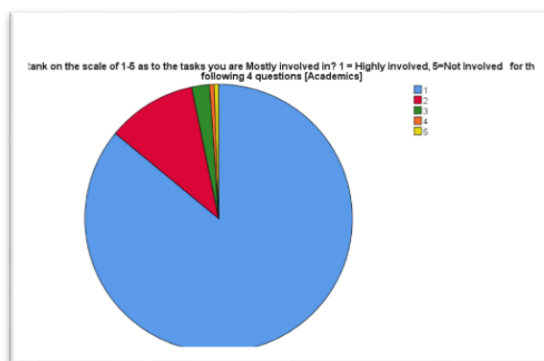
It is evident that most of the principals (56%) were from higher secondary schools. Secondary school principals consisted of about 26% and the primary school principals represented about 18% of the sample. This is because many of the higher secondary schools among the sample had integrated Primary, secondary and higher secondary student enrolments. In order to get an accurate perspective, the direct method of inference from SPSS was used to classify the text school type was used to classify and get the composition of the sample size.

Figure 2 Sample composition by School type



In order to understand the distribution of the sample population that is the principals of different types of the schools, a histogram was created from the text labelled nominal data. The results indicate the exclusive higher secondary schools or the junior colleges were the largest in number and the distribution of the other types of the schools were not highly concentrated as the higher secondary schools.

Figure 3 The level of involvement of the Principal in academics



Most of the principals about 70% of them felt that they were Highly involved in academics only a small proportion of the principals were of the view that they were not highly involved in the academic activities of the intuitions

Hassan, M. M., & Mirza, T. (2021) The present age is the age of information. The globalization has affected every sphere of the life including education. In spite of availability of ICT infrastructure in schools, their potential is underutilized because of digital incompetence of the teachers. New digital technologies are acting as a catalyst towards improvement of learning outcome and enhancing quality of education, but only introduction of such technologies in schools for producing change and innovation is not enough, it requires digitally competent teachers to facilitate the use of ICT in education. These teachers will act as facilitators and mentors to students to lead them towards problem solving and innovation to meet the new challenges of globalization. Teachers must be able to create learning environments which are student centric and foster creativity, Meta cognition, meta-literacy, collaboration and communication in learners. Mere superficial use of ICT in teaching will not yield the required learning outcome, but the integration of ICT in pedagogy is important to enhance teaching, learning process. This can be done only when teachers are competent enough to use ICT tools and facilitate ICT integrated education. In this paper, we tried to assess the teacher's perspective about the ICT and investigate the factors responsible for resistance of teachers in using ICT in schools and suggestive measures for successful integration of ICT in the teaching process by the teachers of Rajouri district (J&K, India). The ICT skills are very important for teachers to support alternative modes of teaching, learning, i.e. e-learning, mobile learning in the present outbreak of pandemic disease caused by Coronavirus-COVID19.

Gupta, A. (2021). Mentoring and coaching are established best practices across the corporate world. These are designed to support leadership development, career progression and engaging select employees with a view to enhancing performance and achievement at the individual, group and organization level. However, such practices have not found wide adoption across the higher education sector, especially in developing countries such as India where it is still an alien concept. We present early results from a year-long mentoring program for 12 faculty members at a higher education institution in Jammu, India. Mentoring was found to have the best outcomes for early and mid-career faculty especially women and resulted in attainment of significant individual and institutional outcomes. This paper makes a strong case for the wide-adoption of faculty mentoring across higher education institutions in India subject to some caveats.

Rainchwar, P., Wattamwar, S., Mate, R., Sahasrabudhe, C., & Naik, V. (2021, With the rise in the adaptability of emotions and technology in humans; we as humans have seen a lot of transformation in our individual thought process, social media has played a vital role in creating a fractured personality of ours where we unknowingly imbibe some or more psychological disorders. Machine learning as a field has revolutionized the way we see and interpret knowledge from Raw data. With the help of machine learning algorithms, we aim at understanding how a certain user responds to questions asked him from different categories which can help us understand his/her behavior. Behavior is a crucial entity when it comes to understanding a person and the way to interpret the sentiments behind the user's preference on a particular situation. Start-ups treat the behavioral psychology of the customers they target as an essential block to test our service upon. Since the data obtained is of structured type, various classification algorithms are implemented to determine the mindset and point-of-view of an individual. Hence, the ideology behind this research is crystal clear in determining the psychological state of the audience from varied age groups categorized as youths, adults, and millennials.

Wani, A. A., Manhas, K. K., & Kumar, M. A (2024) Education is the backbone for the economic growth, social justice and equality, scientific advancement, national integration and cultural preservation of any country. There-fore a well-defined education policy is important at school and higher live. Different countries Uses different education system with due regard to culture and traditions and take different stages during their life cycle at school and college education level to make it work. The New Education Policy 2020 in India in this regard has therefore been transformed into the frame work of these reforms which could help to build a new education system in the country in addition to strength Ing those economic and social indicators. This article reflects the analysis of NEP 2020 with challenges and a way forward.

Nadaf, Z. A., & Ahanger, J. A. (2023). Like the other regions of India, higher education institutions in the state of Jammu and Kashmir (J & K) now divided into two Union Territories (UTs) were in disarray during the lockdown. The inadequate number of higher education institutions (universities and colleges), the unsatisfactory quality of teaching and learning, and the absence of adoption of scientific-technological discoveries aggravated by political prolonged conflict in the region have severely impacted the state of education. Students were unable to attend courses or take exams because of the existing violent state of affairs and the pandemic breakout. Yet, the Education Department in the state pulled out all the stops to provide continuity in education at all levels. The study examines the merits, flaws, possibilities, and risks of virtual classrooms. This chapter analyzes the pre- and post-Covid-19 shutdown and its impact on educational institutions in Kashmir.

Archana Sharma et.al (2019) Classroom teaching assessments are intended to give valuable advice on the teaching-learning process as it happens. The finest schoolroom assessments furthermore assist as substantial

foundations of information for teachers, serving them to recognize what they imparted fittingly and how they can

improve their lecture content to keep the students attentive. In this paper, we have surveyed some of the recent paper works done on facial emotion recognition of students in a classroom arrangement and have proposed our deep learning approach to analyze emotions with improved emotion classification results and offers optimized feedback to the instructor. A deep learning-based convolution neural network algorithm will be used in this paper to train FER2013 facial emotion images database and use transfer learning technique to pre-train the VGG16 architecture-based model with Cohn-Kanade (CK+) facial image database, with its own weights and basis. A trained model will capture the live streaming of students by using a high-resolution digital video camera that faces towards the students, capturing their live emotions through facial expressions, and classifying the emotions as sad, happy, neutral, angry, disgust, surprise, and fear, that can offer us an insight into the class group emotion that is reflective of the mood among the students in the classroom. This experimental approach can be used for video conferences, online classes etc. This proposition can improve the accuracy of emotion recognition and facilitate faster learning. We have presented the research methodologies and the achieved results on student emotions in a classroom atmosphere and have proposed an improved CNN model based on transfer learning that can suggestively improve the emotions classification accuracy.

Sharma V et.al (2023) To quantify the long-term impacts of integrated pest management farmer field school (IPM-FFS) program on rice and vegetables in the subtropics of Jammu and Kashmir, we conducted a field study using latitudinal comparison (with vs. without FFS) and cross-sectional longitudinal comparisons. Our results show contrasting use of pesticides by both rice and vegetable farmers in the subtropical region of Jammu. Rice cultivation in the study area was found to be free of insecticides and fungicides. In vegetable crops, IPM-FFS farmers reduced the number of pesticide applications by 7% but used 27.8% higher amounts of pesticide active ingredients resulting in 59% higher field use environmental impact quotient of pesticide use, mainly driven by the higher fungicide use. Over time, the impact of IPM-FFS fleet as the farmers trained 4–8 years before the survey reported significantly higher number of pesticide applications in vegetable crops (by 49%) compared to those trained 1–3 years. We suggest that IPM dissemination should be reoriented for rationalizing pesticide use, as long-term outcomes of reduced pesticide use do not present a positive impact.

Tewari, K., Vandita, S., & Jain, S. (2020). Our in-depth qualitative interviews with journalism graduate students and professors, from Kashmir, India, show that unlike the rest of India, the region experienced extremely low internet connectivity, and this combined with a lack of access to technology nearly brought classes to a standstill. But students and teachers, used to social disruptions, used the COVID-19 pandemic to learn and practice journalism

that was deeply bound to the community and they created “circles of trust” that helped them overcome internet and other technical issues. Ramifications for journalism education in situations of low connectivity and poor technology resources are discussed.

Maheshwari (2021) Although shadow education in India has been in practice for a long time, the scale has grown dramatically in recent years, with the size of the industry ranging between \$40 and \$70 billion. Drawing from the five rounds of National Sample Survey data sets on education, the study examines the trends and socioeconomic determinants of shadow education participation in India. It also addresses the time burden of shadow education and students’ learning outcomes by using the Indian Human Development Survey database. The findings state that households’ socioeconomic status, educational level of households’ head, urban residence, current schooling levels and type of educational institutions by management are highly significant determinants of participation in shadow education. The analysis further indicates that shadow education is positively associated with learning outcomes at the elementary level and that its contribution is larger in mathematics. However, shadow education costs a couple of hours per day of recreational time of the children (time cost), 40–50% share of household’s total educational expenditure, and around 20% share of household’s per capita annual consumption expenditure (economic cost).

Sharma (2019) Classroom environment is a competent platform for the students to learn and improve their understanding of the subject. An instructor’s primary responsibility lies in managing the students in a way they feel interested and focused during the class. With the aid of automated systems based on artificial intelligence, an instructor can get feedback on the students’ attention span in the class by monitoring their emotions using learning algorithms that can prove to be effective to improve the teaching style of the instructor that can in turn have positive

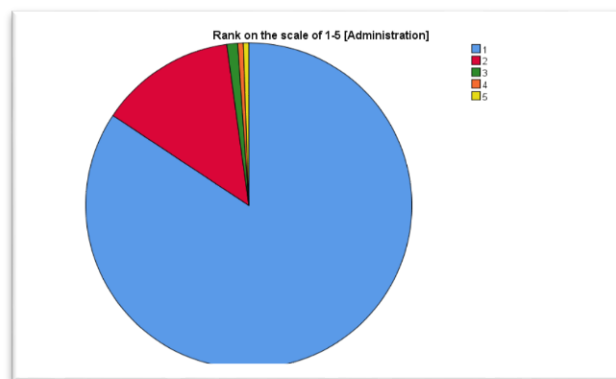
effects on the class. In this paper, we propose an LSTM recurrent neural network trained on an emotional corpus database to extract the speech features and convolutional neural networks trained on the FER2013 facial emotion recognition database were used to predict the speech and facial emotions of the students respectively, in real-time. The live video and audio sequence of the students captured is fed to the learned model to classify the emotions individually. Once the emotions such as anger, sadness, happiness, surprise, fear, disgust and neutral were identified, a decision-making mechanism was used to analyze the predicted emotions and choose the overall group emotion by virtue of the highest peak value achieved. This research approach has the potential

to be deployed in video conferences, online classes etc. This implementation proposal should effectively improve the classification accuracy and the reliability of the detected student emotions and facilitate in the design of sophisticated automated learning systems that can be a valuable tool in evaluating both the students and the instructors. The adapted research methodologies and their results are discussed and found to perform suggestively better than the other research works used in the comparison.

Kumar (2023) In the online education field, Massive open online courses (MOOCs) have become popular in recent years. Educational institutions and Universities provide a variety of specialized online courses that helps the students to adapt with various needs and learning preferences. Because of this, institutional repositories create and preserve a lot of data about students' demographics, behavioral trends, and academic achievement every day. Moreover, a significant problem impeding their future advancement is the high dropout rate. For solving this problem, the dropout rate is predicted by proposing an Ensemble Deep Learning Network (EDLN) model depending on the behavior data characteristics of learners. The local features are extracted by using ResNet-50 and then a kernel strategy is used for building feature relations. After feature extraction, the high-dimensional vector features are sent to a Faster RCNN for obtaining the vector representation that incorporates time series data. Then an attention weight is obtained for each dimension by applying a static attention mechanism to the vector. Extensive experiments on a public data set have shown that the proposed model can achieve comparable results with other dropout prediction methods in terms of precision, recall, F1 score, and accuracy.

The analysis of the concentration of the responses relating to the principals involvement in the academic activities, most of the principals 89% only about 13# felt that they were not adequately involved in academics. It is yet to be known the reason for about 12.5 % why they felt way from academic management.

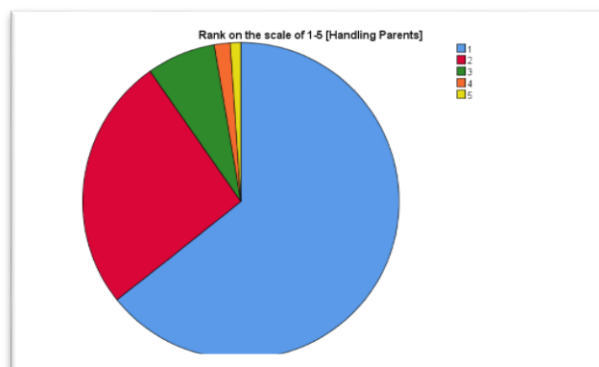
Figure 4 Involvement of the Principals in Administration



Majority of the principals felt that they were involved in administration of the school however a third of the principals were feeling left out of the administration process.

The frequency distribution of the responses indicate about 84% of the principals felt that they were involved in administration and 16% felt they were not involved as much on administration

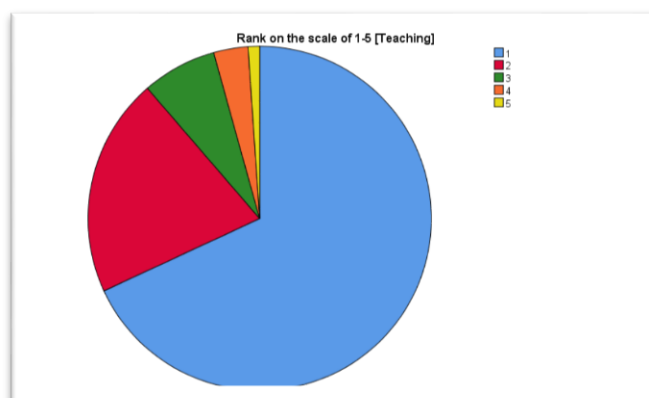
Figure 5 Time spent on handling parents



More than the third of the principals felt that they are not handling the parents as much as handling other challenges.

About 35% of the time the principals are unable to handle parents.

Table 1 Time spent by principals on teaching



Principals felt that they are unable to teach only 30% of the time.

Further an investigation was carried out on the impact of the internet connection in the school on the average student per grade.

Table 2 Analysis of variance on the Impact of Internet availability at schools on the Average number of enrolments per grade

Cases	Sum of Squares	df	Mean Square	F	p
Availability of Internet at School	$1.087 \times 10^{+8}$	7	$1.553 \times 10^{+7}$	13.472	< .001
Residuals	$2.421 \times 10^{+8}$	210	$1.153 \times 10^{+6}$		

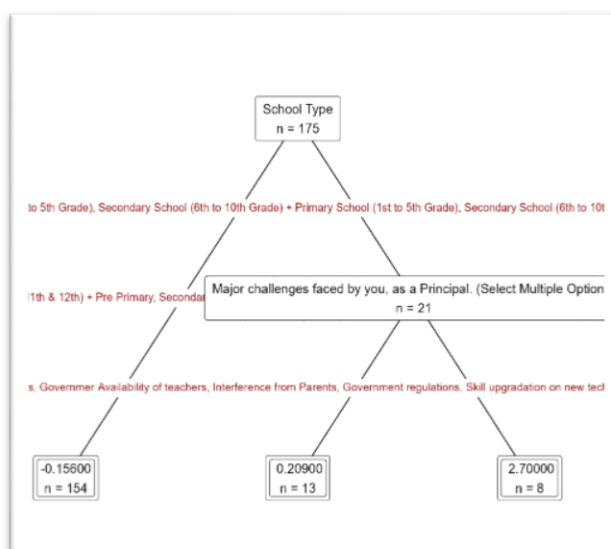
Note. Type III Sum of Squares

The results indicate the F value of the ANOVA and the P value are very significant hence the hypothesis that the student enrolment in schools with the internet connection was available is much higher than the rest.

Decision Tree Plot

Using the school type as the target variable the average enrolment per grade was used as the explanatory variables. Decision tree was plotted and the results indicate that the following were the major challenges faced by the heads of institutions.:

1. Availability of teachers
2. Interference from Parents
3. Government Regulations
4. Skill upgradation of new technology



The decision tree analysis focused on the challenges faced by school principals in Jammu and Kashmir, India. Key Challenges:

- **Teacher Availability:** The tree prioritizes this as the most significant challenge, indicating a substantial teacher shortage across schools.
- **Skill Upgradation on New Technologies:** This is the second most frequent challenge, highlighting a need for training educators to leverage new technologies in education.

Other Challenges:

- **Government Regulations:** This factor appears throughout the tree, suggesting that some regulations may be posing hurdles for principals.
- **Parental Interference:** This is a less frequent concern compared to others, but it's still a factor for some principals.

Potential Links:

- The prominence of both "Teacher Availability" and "Skill Upgradation on New Technologies" suggests a possible connection. A lack of teachers might hinder efforts to integrate new technologies, or the absence of proper training might make it difficult to attract or retain teachers.

Further Considerations:

- It would be helpful to understand the specific nature of the "Government Regulations" causing problems for principals.
- Investigating the reasons behind "Parental Interference" could be beneficial to determine if interventions are necessary.

Overall, this analysis suggests that addressing teacher shortages, equipping educators with new skills, and potentially streamlining some government regulations are crucial steps to improve the functioning of schools in Jammu and Kashmir.

Limitations to Consider:

- This data likely represents a sample of principals, and the situation may differ for the entire population.
- The context behind each challenge is not provided in the image.

For a more comprehensive understanding, further analysis could involve:

- Categorizing the mentions of "Government Regulations" to identify specific problematic regulations.
- Investigating the reasons behind "Parental Interference."
- Comparing these challenges across different school types (primary, secondary, etc.).

Regression analysis was also carried out and the results indicate that the following factors have an impact on the average enrolment per grade:

- Near BSNL Exchange, Kandoli Nagrota Pin Code- 181221
- Gujjar Mandi Rajouri 185121
- School Type (Primary School (1st to 5th Grade), Secondary School (6th to 10th Grade))
- NEAR BSNL EXCHANGE, KANDOLI NAGROTA PIN CODE- 181221
- Near Head Post Office Udampur 182101
- Area and Pincode) (R.S.Pura ; 181102
- Area and Pincode Roulka, Bani, Kathua 184206

While the decision tree results were strategic in nature the regression results were more specific for operations of the schools.

REFERENCES

- [1] Brahma, D., & Mukherjee, D. (2018). India's mid-day Meal program and schooling: an evaluation based on machine learning. *Applied Econometrics and International Development*, 18(1), 141-152..
- [2] Acharya, A. Beggar-thy-neighbourhood: Spatial Externalities in Access to Private Schools-Evidence from India.K. Elissa, "Title of paper if known," unpublished.
- [3] Verma, C., Stofková, V., Illés, Z., Tanwar, S., & Kumar, N. (2020). Machine learning-based student's native place identification for real-time. *IEEE Access*, 8, 130840-130854..
- [4] Suri, K. (2014). Education, conflict and development: A case study of mobile schools for pastoralists in Jammu and Kashmir. *IOSR Journal of Research and methods in Education*, 4(1), 12-9.M. Young, *The Technical Writer's Handbook*. Mill Valley, CA: University Science, 1989.
- [5] Wani, A. S., Singh, D. K., & Singh, P. (2022, April). "Hartal (Strike) Happens Here Everyday": Understanding Impact of Disruption on Education in Kashmir. In *proceedings of the 2022 CHI Conference on Human Factors in Computing Systems* (pp. 1-17).
- [6] Jin, H., Crimmins, E., Langa, K. M., Dey, A. B., & Lee, J. (2023). Estimating the Prevalence of Dementia in India Using a Semi-Supervised Machine Learning Approach. *Neuroepidemiology*, 57(1), 43-50.
- [7] Malik, I., Ahmed, M., Gulzar, Y., Baba, S. H., Mir, M. S., Soomro, A. B., ... & Elwasila, O. (2023). Estimation of the extent of the vulnerability of agriculture to climate change using analytical and deep-learning methods: A case study in Jammu, Kashmir, and Ladakh. *Sustainability*, 15(14), 11465.
- [8] Reashma, S. J., & Pillai, A. S. (2017, December). Edaphic factors and crop growth using machine learning—A review. In *2017 International Conference on Intelligent Sustainable Systems (ICISS)* (pp. 270-274). IEEE.

- [9] Wani, M. A., Farooq, J., & Wani, D. M. (2022). Risk assessment of COVID-19 pandemic using deep learning model for J&K in India: a district level analysis. *Environmental Science and Pollution Research*, 29(12), 18271-18281.
- [10] Ansari, A., Rao, K. S., Jain, A. K., & Ansari, A. (2023). Deep learning model for predicting tunnel damages and track serviceability under seismic environment. *Modeling Earth Systems and Environment*, 9(1), 1349-1368.
- [11] Sahoo, J. P., Tripathy, A. K., Mohanty, M., Li, K. C., & Nayak, A. K. (2022). *Advances in Distributed Computing and Machine Learning*. Springer Singapore.
- [12] Sharma, S., Sharma, V., & Sharma, A. (2016). Performance based evaluation of various machine learning classification techniques for chronic kidney disease diagnosis. *arXiv preprint arXiv:1606.09581*.
- [13] Jin, H., Crimmins, E., Langa, K. M., Dey, A. B., & Lee, J. (2023). Estimating the Prevalence of Dementia in India Using a Semi-Supervised Machine Learning Approach. *Neuroepidemiology*, 57(1), 43-50.
- [14] Hassan, M. M., & Mirza, T. (2021). The digital literacy in teachers of the schools of Rajouri (J&K)-India: Teachers perspective. *International Journal of Education and Management Engineering*, 11(1), 28-40.
- [15] Gupta, A. (2021). Faculty mentoring in higher education: Results from a pilot program at Jammu, India. *Mentoring & Tutoring: Partnership in Learning*, 29(3), 261-283.
- [16] Rainchwar, P., Wattamwar, S., Mate, R., Sahasrabudhe, C., & Naik, V. (2021, December). Machine learning-based psychology: A study to understand cognitive decision-making. In *International Advanced Computing Conference* (pp. 179-192). Cham: Springer International Publishing.
- [17] Wani, A. A., Manhas, K. K., & Kumar, M. A theoretical analysis of national education policy 2020: Challenges and A way forward.
- [18] Nadaf, Z. A., & Ahanger, J. A. (2023). Impacts of Covid-19 on institutions of higher education in Jammu and Kashmir. In *COVID-19 and the Future of Higher Education in India* (pp. 197-219). Cham: Springer International Publishing.
- [19] Peshin, R., Hansra, B. S., Nanda, R., Singh, K., Sharma, R., Bajiya, M. R., & Kumar, R. (2022). Impact of integrated pest management farmer field school programs in the subtropics of Jammu and Kashmir, India. *International Journal of Pest Management*, 1-16.
- [20] Sharma, V., Jain, S., Jain, P. K., & Shukla, K. K. (2023, July). Atherosclerotic Plaque Segmentation in Carotid Ultrasound Image using Hybrid-A-UNet Deep Learning Model. In *2023 Intelligent Methods, Systems, and Applications (IMSA)* (pp. 575-578). IEEE.
- [21] Pain, P., Ahmed, A., & Zahra Khalid, M. (2022). Learning in times of COVID: Journalism education in Kashmir, India. *Journalism & mass communication educator*, 77(1), 111-122.
- [22] Tewari, K., Vandita, S., & Jain, S. (2020). Predictive analysis of absenteeism in MNCs using machine learning algorithm. In *Proceedings of ICRIC 2019: Recent Innovations in Computing* (pp. 3-14). Springer International Publishing.
- [23] Maheshwari, E., Roy, C., Pandey, M., & Rautray, S. S. (2020). Prediction of factors associated with the dropout rates of primary to high school students in India using data mining tools. In *Frontiers in Intelligent Computing: Theory and Applications: Proceedings of the 7th International Conference on FICTA (2018)*, Volume 1 (pp. 242-251). Springer Singapore.
- [24] Sharma, A., & Mansotra, V. (2019). Classroom student emotions classification from facial expressions and speech signals using deep learning. *International Journal of Recent Technology and Engineering (IJRTE)*, 8(3), 6675-6683.
- [25] Kumar, G., Singh, A., & Sharma, A. (2023). Ensemble deep learning network model for dropout prediction in MOOCs. *International journal of electrical and computer engineering systems*, 14(2), 187-196.