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Analysis of Student Dropouts in School

K. Vignesh [1], Dr. D. Swamydoss [2]

[1] Dept of Computer Applications,

[2] HOD, Dept of Computer Applications.

[1,2] Adhiyamaan College of Engineering college (Autonomous) Hosur Tamilnadu, India

ABSTRACT:

Student drop-out is a chronic problem within most education systems globally, affecting not only the futures of individual students but also the development of society as a whole. The current research provides an in-depth review of school drop-outs with emphasis on establishing major determinants of student attrition, trends in drop-outs among different demographics, and predictive methods for early intervention. Through the application of a mix of statistical analysis and machine learning algorithms, the study examines datasets gathered from secondary schools spanning five years. The study concludes that socioeconomic status, education level of parents, academic achievement, and attendance are strong predictors of dropout. The paper concludes by offering strategic advice to policymakers and educators to address dropout rates and ensure student retention.

1. Introduction

Education is essential in developing people and societies. Student dropout, however, is a key issue, particularly in low- and middle-income countries. Dropping out not only restricts students' future prospects but also fuels wider socioeconomic inequalities. Identifying the reasons and trends for student dropouts is important in planning effective interventions.

This study seeks to examine dropout patterns among secondary schools and offer evidence-based insights on how to mitigate this issue. The goals are:

- Determining critical factors behind student dropout.

- Examining trends in dropout according to gender, location, and socio-economic status.

- Using machine learning to predict students at risk.

2. Literature Review

Various studies have sought to explain the reasons behind student dropout. Past studies list poverty, poor academic performance, lack of parental engagement, and school culture as the top factors. Rumberger (2011) states that dropout is a multifaceted issue with interlinked factors. More recent studies have used predictive analytics via logistic regression and decision trees to determine early warning indicators for at-risk students.

Yet, an in-depth, data-driven study integrating statistical analysis and machine learning approaches is still scarce, especially in the developing world. This paper tries to bridge this gap.

3. Methodology

3.1 Data Collection

Data was gathered from 50 secondary schools between 2018 and 2023. The dataset contains:

- Student demographics (age, gender, socioeconomic status)

- Academic records (grades, attendance)

- Family background (parental education, occupation)

- School infrastructure and location

3.2 Data Preprocessing

Data cleaning included the removal of missing and inconsistent values. Categorical variables were encoded, and numerical data was normalized.

3.3 Analytical Methods

- Descriptive Statistics: To comprehend dropout distribution.

- Correlation Analysis: To determine relationships between factors.

- Predictive Modeling: Logistic Regression, Random Forest, and XGBoost were applied to predict dropouts.

4. Results and Discussion

4.1 Descriptive Insights

Out of 15,000 students, 1,230 dropped out throughout the study duration. Dropout rate was higher for rural areas (12%) as compared to urban areas (5%).

4.2 Factor Analysis

Critical factors determining dropout:

- **Socioeconomic Status:** Students belonging to low-income backgrounds had a dropout rate of 14%.

- **Parental Education:** Dropout rates were negatively correlated with parents' education level.

- **Academic Performance:** Students with consistent failure in exams had a 20% higher probability of dropping out.

- **Attendance:** Persistent absenteeism was a robust predictor.

4.3 Predictive Modeling

The Random Forest model had the highest performance:

- Accuracy: 87%

- Precision: 85%

- Recall: 82%

These outcomes indicate that predictive models are able to effectively distinguish students at risk of early dropout.

5. Recommendations

To effectively tackle the problem of student dropouts, there is a need for a proactive and multisectoral approach. Schools ought to use early warning systems that employ data analytics and predictive modeling to determine students at risk of dropping out. The systems are able to track critical indicators like academic performance, attendance, and changes in behavior, allowing interventions in time before the students totally disconnect from the education system.

Also, financial aid mechanisms have to be enhanced to support students from economically disadvantaged backgrounds. Faced with financial stress, numerous students drop out of school, and offering scholarships, subsidies, or free school items and meals can effectively alleviate such pressure. Such measures can be supplemented by focused counseling programs offering emotional and academic guidance, especially for those who are confronted with personal or family issues.

Parental support is also of essential importance for students' retention. Schools can achieve more in establishing better school-home relationships by having workshops, holding frequent parent-teacher conferences, and information campaigns highlighting the significance of learning. Parents with positive involvement in education are most likely to encourage habitual attendance and scholastic endeavour.

In addition, schools need to develop attendance tracking mechanisms and intervention systems to deal with chronic absenteeism early on. This may encompass outreach, home visits, and individualized support plans that remediate the cause of absenteeism. Schools should also make their learning environment vibrant and inclusive through interactive teaching pedagogies, extracurricular activities, and mentorship programs that engage students to be committed to schooling.

By incorporating these strategies into policy and practice within schools, stakeholders can develop a more supportive and responsive school climate that minimizes dropout and contributes to long-term student success.

Based on the findings, the following interventions are proposed:

- Early warning systems in schools using predictive models.

- Financial assistance and counseling for low-income families.

- Parental engagement programs to encourage support at home.

- Attendance monitoring and academic support systems.

6. Conclusion

The research puts the complexity of student dropout at the forefront and shows the possibility of data analysis in solving it. Knowing the early indicators and root causes may enable schools to take proactive steps. Future studies may increase the dataset and introduce qualitative analysis based on surveys and interviews.

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