

AI for Early Detection of Student Burnout

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Abstract

Today, student burnout is something we see very commonly in colleges and schools. Most students are handling continuous assignments, exams, records, projects, presentations, and sometimes even family responsibilities at the same time. Because of this, they rarely get proper rest. When this kind of pressure keeps building up, it slowly turns into stress and mental tiredness. Some students start losing interest in classes, some feel low without knowing the exact reason, and others find it hard to focus even on simple tasks.

Even though many institutions conduct feedback surveys or provide counselling facilities, these methods are not always enough. The main reason is that students have to openly say they are struggling. But in reality, not everyone feels comfortable sharing their problems. Some may think it is normal stress, while others may hesitate to talk about it. So, in many cases, the early warning signs of burnout are simply ignored.

To reduce this issue, this research proposes an AI-based system that can help in detecting burnout earlier. Instead of waiting until a student's marks drop or attendance decreases, the system analyses the written content students already provide, such as feedback forms, online discussion messages, or journal-type entries. Using Natural Language Processing and Machine Learning, it checks the emotional tone and repeated stress-related expressions in their writing. From this, the system calculates a burnout risk score for each student.

The idea is not to replace teachers or counsellors. It is only to support them by giving an early indication. If a student seems to be at risk, the institution can step in at the right time and provide proper guidance or counselling. The system also takes care of student data privacy and keeps improving its accuracy as more data is processed. In simple terms, this approach helps create a more caring academic environment where students' mental health is noticed before the situation becomes serious.

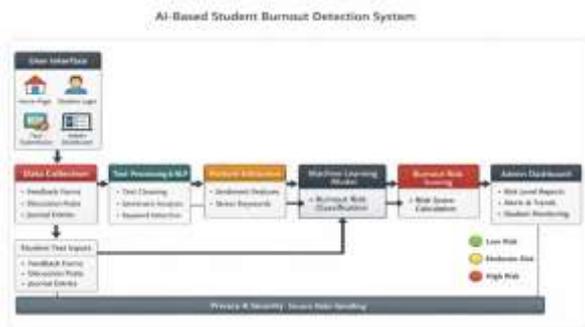
Introduction

Nowadays, student burnout is something we see very commonly. Almost every student is busy all the time. There are assignments, internals, semester exams, projects, record work, presentations — and everything comes together. On top of that, there are expectations from parents and teachers. Slowly, this pressure starts affecting students mentally. At first, it may look like normal stress. But after some time, students may feel tired without reason, lose interest in classes, or find it hard to focus. That stage is what we call burnout.

The main issue is that burnout doesn't show up suddenly. It builds slowly. Colleges do conduct surveys and provide counselling, but honestly, not all students talk openly about their problems. Some feel shy. Some think everyone is stressed, so it's normal. Because of this, early warning signs are usually missed. By the time someone notices, the student might already be struggling badly.

So, in this project, we thought — instead of waiting for students to say they are stressed, why not look at the things they already write? Students give feedback, reply in discussion forums, and sometimes write reflections. In many cases, their emotions can be seen in their words, even if they don't directly say it. So, we use Natural Language Processing and Machine Learning to analyse that text. The system checks tone and stress-related patterns and gives a burnout risk score. The idea is simple: identify early and support early.

Proposed System Architecture



The system is designed in a very simple way so that it is easy to use.

First, there is a basic interface. It has a home page, registration page, and login page. Students can log in and submit their responses. There is also an admin dashboard for counsellors or staff.

Then comes data collection. The system collects written responses like feedback forms, discussion posts, and journal-type entries. These are the main inputs.

After collecting the data, it goes to the processing stage. Here, NLP is used to clean the text and understand the emotional tone. The system checks whether the writing sounds positive, negative, or stressed. It also looks for repeated stress-related words.

Next, the Machine Learning model analyses these patterns. Based on what it has learned from the dataset, it decides whether the student might be at risk. It then gives a burnout risk score.

Finally, everything is shown in the dashboard. The admin can see which students have higher risk levels. The system also makes sure student data is kept safe and

confidential. As more data is used, the model improves gradually.

Methodology

The working process is divided into simple parts.

Data Collection

We used publicly available student mental health and stress-related datasets. These include feedback responses and emotional statements. The data was taken from different open-source sources.

Text Processing

In this step, the text is cleaned. Unnecessary words or symbols are removed. Then sentiment analysis is done to understand the emotional tone. The system also checks for stress patterns and emotional keywords.

Machine Learning Model

After processing, the text is given to the model. The model studies patterns and classifies students into burnout or non-burnout categories. It also calculates a risk score.

Dashboard Monitoring

The results are shown in the admin dashboard. Counsellors can monitor risk levels and provide support if needed. This helps in early intervention.

Experiments and Results

To check performance, we used standard metrics like accuracy, precision, recall, and F1-score.

Accuracy tells how correctly the model identifies burnout cases. Precision and recall help understand how well the system detects at-risk students. F1-score balances both.

The results show that the system can reasonably detect stress-related patterns in text. It is not perfect, but it performs well enough to be useful.

Results and Discussion

From the results, it is clear that student writing often reflects emotional condition. Even if students don't directly say they are stressed, their tone can show it.

Compared to only using surveys, this system provides continuous monitoring. It does not fully depend on students speaking up. At the same time, privacy is maintained.

Overall, this approach helps institutions act earlier instead of reacting later.

Real-World Use Case

In real colleges, this system can:

Identify students who may be struggling silently

Provide timely counselling

Reduce dropout chances

Improve academic performance

Create a more supportive environment

Conclusion

Burnout does not happen overnight. It builds slowly. If institutions can identify early signs, they can prevent serious outcomes.

This project presents a system that uses NLP and Machine Learning to analyse student-written content and estimate burnout risk. The system supports teachers and counsellors by giving early warning signals.

In simple words, this project shows how technology can be used not just for academics, but also to support student mental health in a practical way.

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