

Motivation (Shivraj) (1 minute):

I find Anushikha upset on stage and ask what's wrong.

She says that she can't understand how to know where she's making errors in the end of chapter questions. There are so many questions!

It'd be great to help Anushika by creating a list of keywords in the questions she's struggling with so that she can keep track of her progress in the course.

Wait, hang on. Hang on a minute. Does student engagement always mean better grades? Our project DOES create a tailored list of keywords for students and it can check whether engagement affects her performance.

Methods (Mudit) (30 seconds):

- We utilize the `page_views` and `responses` datasets to see if engagement and performance in review exams are related.
- We implement text preprocessing and count vectorizer to build an n-gram model on the review questions and answers students didn't answer correctly to understand what statistics terminology was tested.
- We calculate the frequency of each uni/bi-gram showing up in these questions by student and chapter which we compare with engagement from `page_views.csv` using K-means clustering, a widely used method for cluster analysis to partition a set of objects into 2 clusters in such a way that the sum of the squared distances between the objects and their assigned cluster mean is minimised.

Word cloud (Anushikha) (15 seconds):

The word cloud shown above displays the most frequently observed keywords in review questions. We see that histogram, residuals, standard deviation, distributions, and supernova tables are mostly observed in these questions.

Heatmap (Khushil) (1 minute):

- Every student comes from different backgrounds: we all come with different prerequisite knowledge
- Means every student struggles a little bit differently
- Instead of just focusing on the key areas of failed questions for each word, we want to understand what chapters students are failing and understand how deeply they engaged with the material.
- So we created this heat map: Comparing percentage of questions failed across chapters
- But we did not stop there, we want to investigate the discrepancy between how much one studies vs how much they score, encoded in blue hues
- 2 different groups arise

- Students: Who failed many questions and high engagement
- Students who failed few questions and had high engagement. For these students, traditional learning methods work
- These are the students who need a personalised learning approach

K-means clustering (Mudit) (1 minute):

In the two graphs shown, we compare the cluster means for the top 25 words by frequency. We find that using 2 clusters we can sufficiently separate students based on how much they engaged with the textbook and the topics that they struggled the most with. We find that even though cluster 0 had higher means for each feature than cluster 1, this doesn't translate into more engagement for either cluster. This could suggest that there is a difference between students who are able to answer questions correctly more than other students but spend similar amounts of time on the textbook.

Solutions (Anushikha) (1:15 minutes):

- Using the key words identified from our ML model, we performed textual analysis
- Based on the outcomes of this analysis, our goal is to create a study guide that targets the students' weak spots, thereby improving their understanding of the subject matter.
- By strategically targeting a student's weak areas, we can support their learning process, leading to improved grades and a deeper understanding of the material.
- An extension of our work can be used by applying our n-gram model to tell students after the review exam what topics they struggled with the most.