



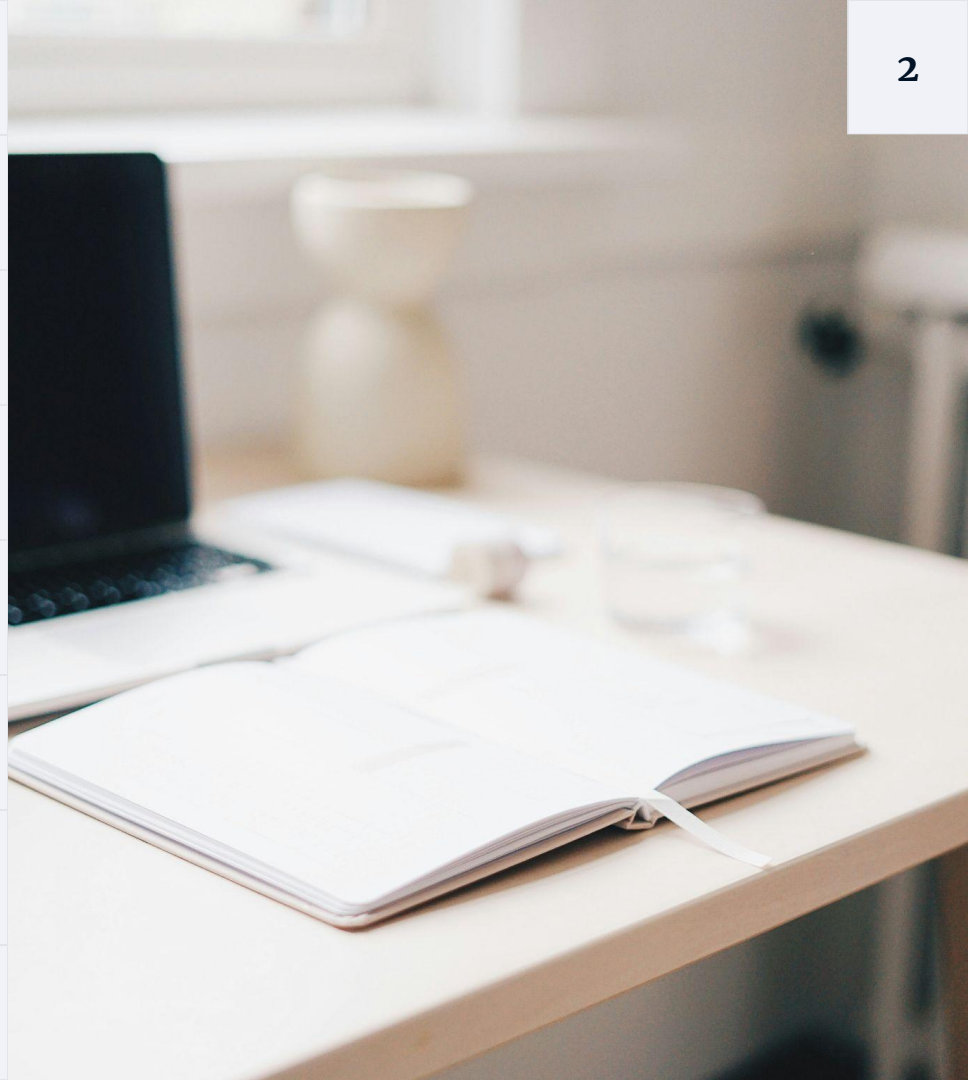
Visual Analytics Exam

Student
performance
visualization

Group 6
January 2025

Agenda

- Goal
- Dataset
 - Understanding the dataset
- Dimensionality reduction
- Visualizations
- Insights
- References
- Demo



Goal

- Identify **key factors** affecting performance in secondary school
- Use **interactive visualizations** to simplify complex data
- Uncover **patterns** and **insights** to determine what drives academic success/failure



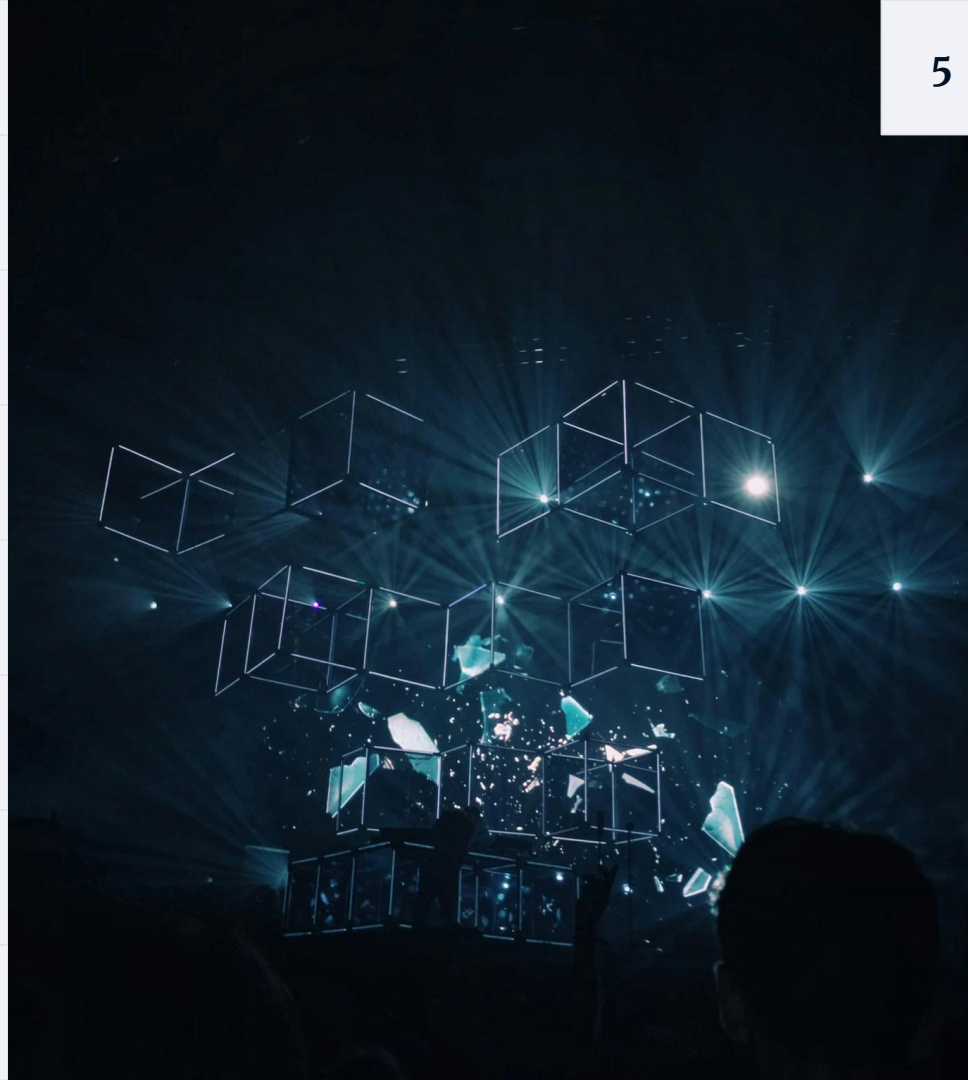
Related work

- (1) Studies related to student performance
- (2) Dimensionality reduction studies
- (3) Visualization studies for high-dimensional data



Dataset

- Kaggle: Student performance dataset [1]
- 33 columns
- 395 students
- AS Index: 13,035



[1] <https://www.kaggle.com/datasets/devansodariya/student-performance-data>

Understanding the Dataset

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Data types

- Numerical attributes (e.g., grades, study time, absences).
- Categorical attributes (e.g., parental jobs, school type).
- Binary attributes (e.g., internet access, romantic relationship status).

Preprocessing

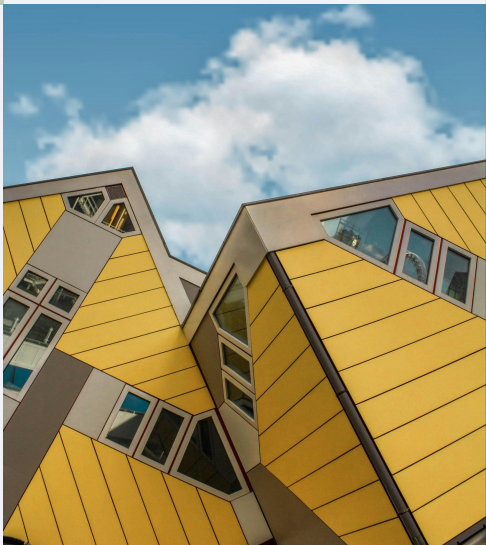
- One-hot encoding (categorical variables)
- Mapping binary attributes to 0s and 1s (e.g., yes \rightarrow 1, no \rightarrow 0).
- Normalization and scaling of numerical data.





Principal
Component Analysis
(PCA)

Reduced to 5 dimensions



t-Distributed
Stochastic Neighbor
Embedding (t-SNE)

Reduced it further to 2
dimensions for
visualization

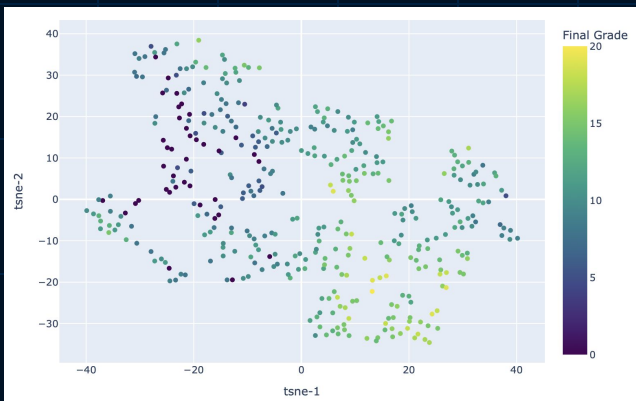
Dimensionality⁷ reduction

Played around with different
dimensions and techniques.

More seperable data points

Visualizations

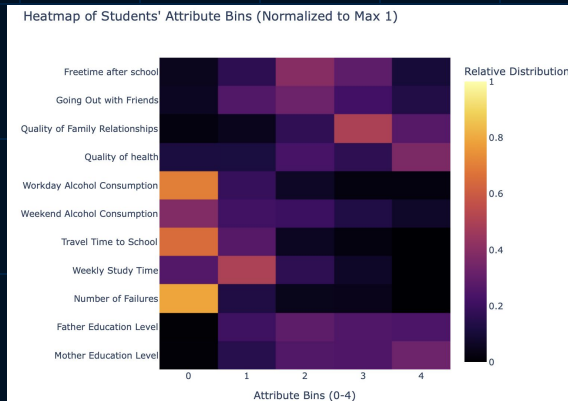
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t-SNE Scatter Plot

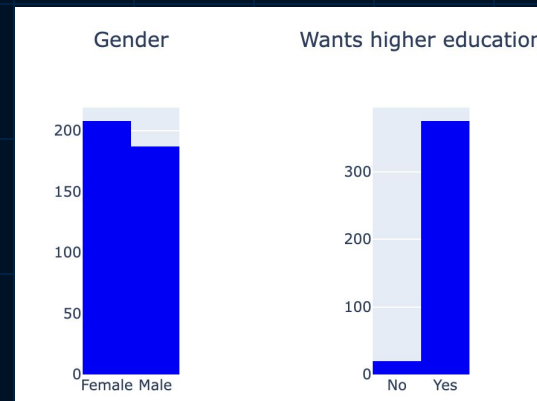
Visualize in a 2D space after dimensionality reduction.

Points are color-coded by the final grade (G3)



Heatmap

Displays normalized distributions of key attributes across selected bins.



Histograms

Used to filter data interactively

Represents binary data

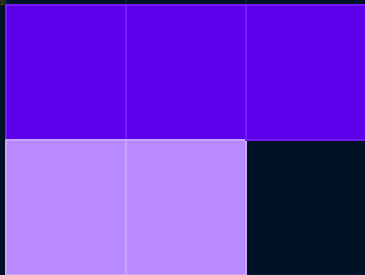


Insights

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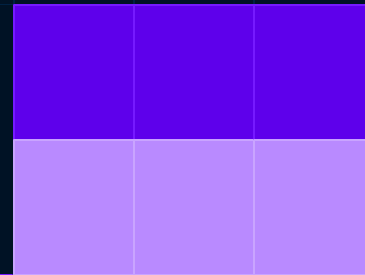
Parental education

Plays a big role.



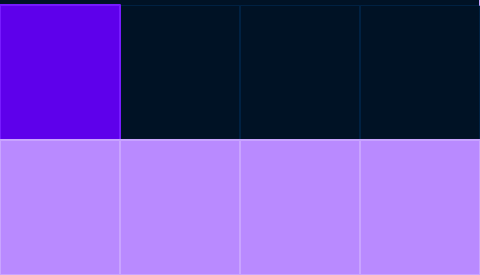
Past failures

If a student fails once, they are more likely to do it again.



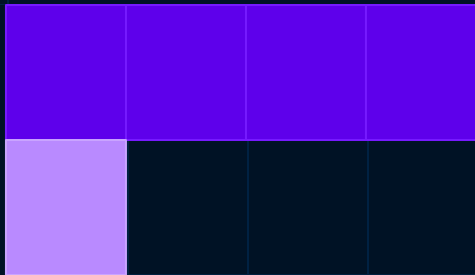
Alcohol consumption

Alcohol consumption, both during the weekend and weekdays negatively correlates with good grades.



Time spent studying

Students that spent more time studying, had higher grades.



References

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Dataset:
<https://www.kaggle.com/datasets/devansodariya/student-performance-data>



Demo

