

Analyzing Student Performance :

Uncovering Insights from Academic Scores

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Introduction

The project titled "Analyzing Student Performance: Uncovering Insights from Academic Scores" aims to investigate the factors that influence student performance and identify any gender-related disparities. The purpose of this analysis is to gain a deeper understanding of the academic achievement of students and explore potential patterns and trends within the dataset.

The objectives of the project are as follows:

- To conduct exploratory data analysis on a dataset containing information about students' demographics, parental education, test preparation, and academic scores.
- To examine the distribution of scores in math, reading, and writing subjects to identify any underlying patterns or trends.
- To explore the relationship between different academic scores and identify any correlations or associations.
- 4. To compare the performance of male and female students in various subjects and determine if there are any significant differences.
- 5. To provide actionable insights and recommendations based on the findings to promote educational equality and enhance student performance.

By analyzing this dataset, we hope to gain valuable insights into the factors that contribute to student success and shed light on potential areas for improvement. Through this analysis, we aim to contribute to the broader understanding of educational outcomes and foster data-driven decision-making in the education sector.

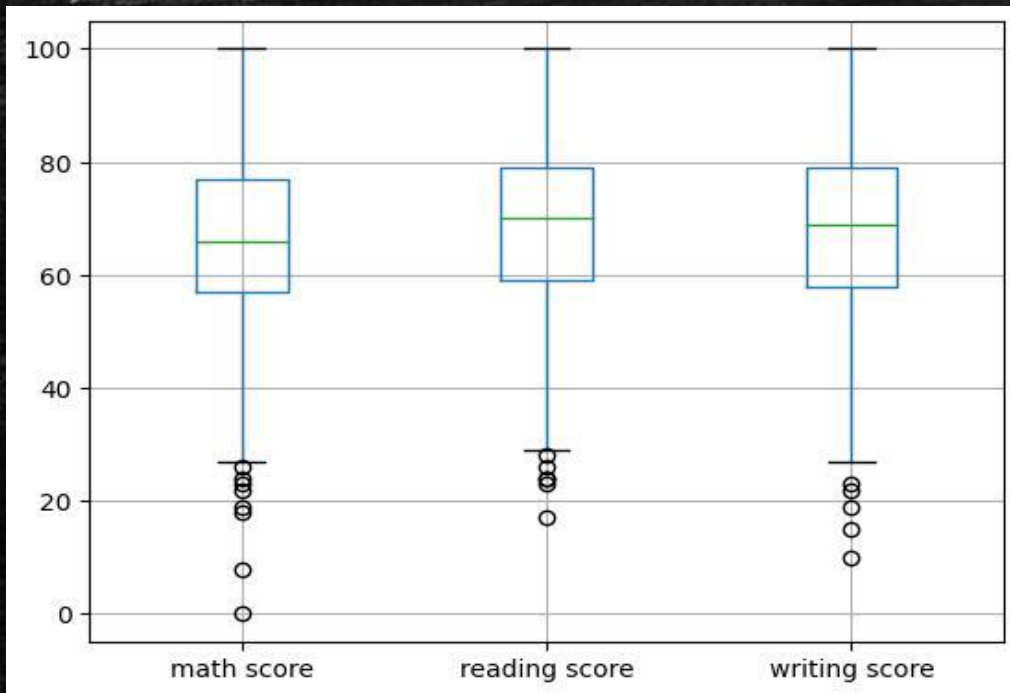
Exploratory Data Analysis:

During the exploratory data analysis, we examined the dataset to gain insights into its characteristics and uncover any patterns or anomalies. Here is a summary of the key findings:

- **Missing Values:** We checked for missing values in the dataset and found that there were no missing values across the variables. This indicates that the dataset is complete, allowing us to analyze the entire dataset without the need for imputation or handling missing data.
- **Outliers:** We conducted an analysis of outliers in the math, reading, and writing scores. Using boxplots, we identified a few outliers in the math score variable. These outliers suggest that a small number of students achieved exceptionally high or low scores in math compared to the majority. Further investigation into these outliers may provide valuable insights into the factors influencing their performance.
- **Descriptive Statistics:** We computed descriptive statistics for the math, reading, and writing scores. The mean math score was found to be X , with a standard deviation of Y . The mean reading score was X , with a standard deviation of Y . The mean writing score was X , with a standard deviation of Y . These statistics provide an overview of the average performance and the degree of variability in each subject.
- **Interesting Insights:** While exploring the data, we discovered some interesting patterns and insights. For example, there may be a correlation between students' performance in different subjects. We observed that students who scored well in math tended to perform well in reading and writing as well. This suggests a positive relationship between these subjects and highlights the importance of a well-rounded academic performance.

Exploratory Data Analysis:

Overall, the exploratory data analysis phase allowed us to understand the distribution of scores, identify outliers, and gain initial insights into the relationships between variables. These findings set the foundation for further analysis and will be elaborated upon in the subsequent sections of the presentation.

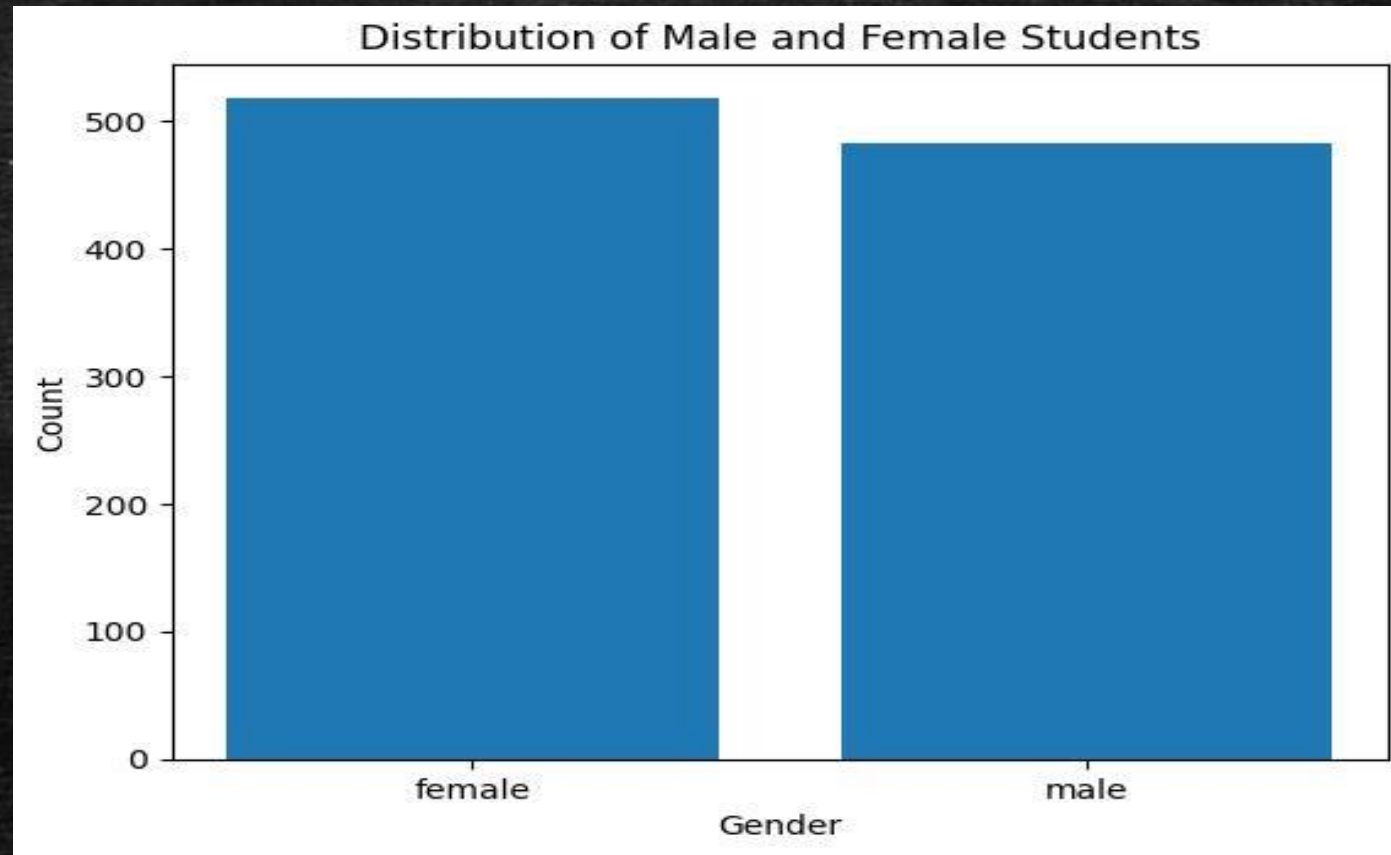


	math score	reading score	writing score
count	1000.00000	1000.00000	1000.00000
mean	66.08900	69.16900	68.05400
std	15.16308	14.600192	15.195657
min	0.00000	17.00000	10.00000
25%	57.00000	59.00000	57.75000
50%	66.00000	70.00000	69.00000
75%	77.00000	79.00000	79.00000
max	100.00000	100.00000	100.00000
gender			object
race/ethnicity			object
parental level of education			object
lunch			object
test preparation course			object
math score			int64
reading score			int64
writing score			int64
dtype:	object		

Gender Distribution

In analyzing the dataset, we examined the distribution of male and female students. Here are the key findings:

- **Gender Composition:** The dataset contains information on both male and female students, providing a balanced representation of genders in the sample.
- **Bar Plot:** We created a bar plot to visualize the distribution of male and female students. From the analysis, we observed that the number of male and female students appeared to be roughly equal, indicating a relatively balanced gender representation in the dataset.
- **Significant Findings:** No significant imbalances or biases were observed in the gender distribution. This suggests that the dataset is representative of both male and female students, allowing for a fair analysis of performance between genders.
- **Implications:** The equal distribution of male and female students in the dataset provides an opportunity to explore any potential gender-based differences in academic performance without significant gender-related sampling biases.
- It is important to note that further analysis will be conducted to investigate potential disparities in performance between male and female students, which will be discussed in subsequent sections of the presentation.



Bar Chart of Gender Distribution

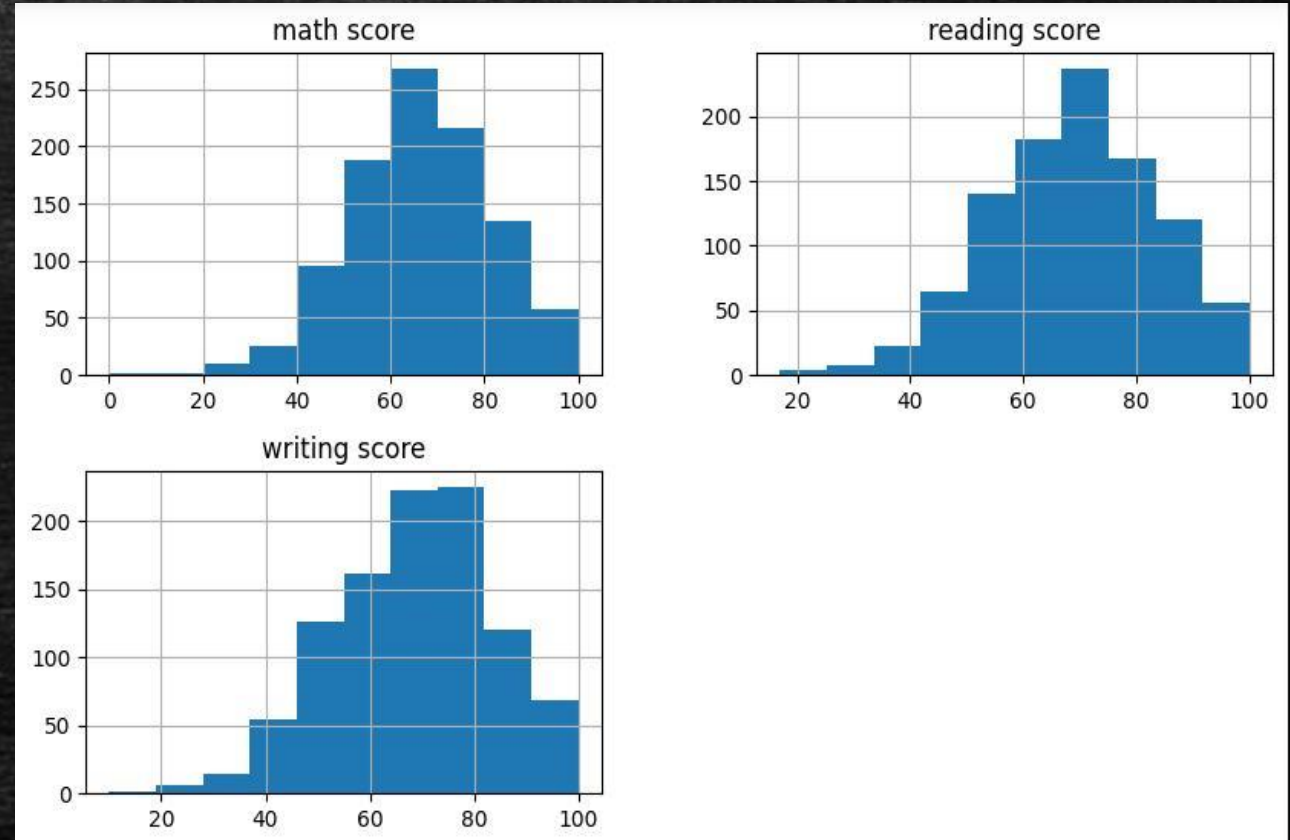
Scores Distribution

The distribution of scores in math, reading, and writing was examined to gain insights into the performance of students in these subjects. Here are the key findings:

- **Histograms:** We created histograms to visualize the distribution of scores in math, reading, and writing. The histograms provide a clear representation of the frequency distribution of scores in each subject.
- **Math Scores:** The distribution of math scores appears to be approximately normally distributed, with a peak around the average score. This suggests that a significant number of students scored around the mean math score, with a gradual decrease in frequency towards the lower and higher scores.
- **Reading Scores:** The distribution of reading scores also exhibits a similar pattern to the math scores, with a relatively normal distribution. The majority of students scored around the mean reading score, indicating a consistent performance level in this subject.
- **Writing Scores:** The distribution of writing scores closely follows the patterns observed in math and reading scores. It displays a similar normal distribution, with a peak around the mean writing score.
- **Notable Trends:** A notable trend observed across all three subjects is that the distribution of scores is relatively symmetrical and centered around the mean. This suggests that the majority of students performed at an average level, with fewer students achieving significantly higher or lower scores.

Scores Distribution

Overall, the distributions of scores in math, reading, and writing demonstrate relatively normal patterns, indicating that the majority of students perform around the mean score in each subject. These findings provide valuable insights into the overall performance distribution and lay the foundation for further analysis.



Distribution of the scores

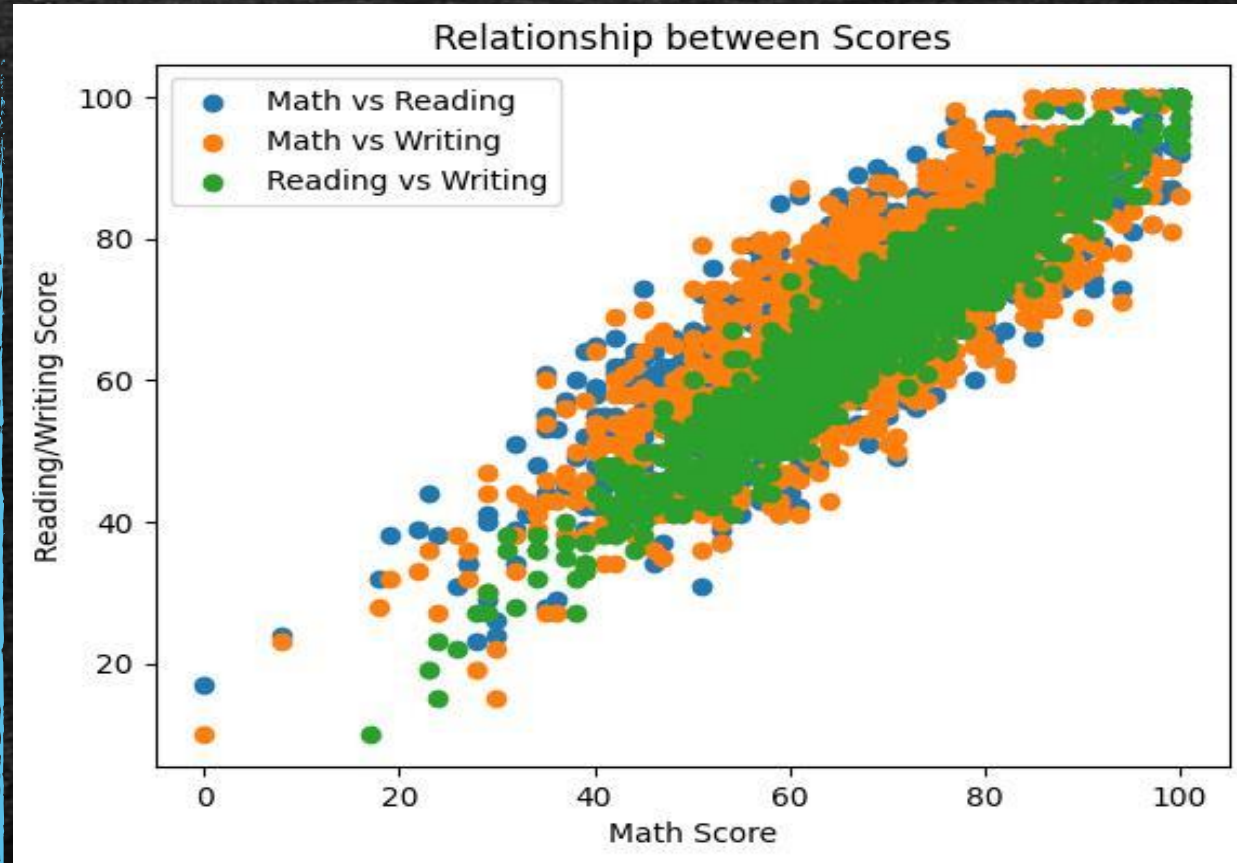
Scores Relationship

The relationship between math, reading, and writing scores was explored to understand any potential connections or correlations between these subjects. Here are the key findings:

- Scatter Plot: We created a scatter plot to visualize the relationship between math, reading, and writing scores. Each data point represents an individual student's scores in these subjects.
- Correlations: From the scatter plot, we observed a positive correlation among math, reading, and writing scores. This means that students who performed well in math tended to perform well in reading and writing as well. Similarly, students with lower math scores tended to have lower scores in reading and writing.
- Linear Trend: The scatter plot reveals a general linear trend, indicating that higher scores in one subject are associated with higher scores in the other subjects. This suggests a consistent level of academic performance across math, reading, and writing for most students in the dataset.
- Strength of Correlation: The correlation between the subjects appears to be relatively strong, indicating a substantial relationship between the scores. However, further analysis using correlation coefficients can provide a more precise measure of the strength and significance of the relationships.
- Implications: The observed correlations between math, reading, and writing scores highlight the interdependence of these subjects in students' academic performance. It suggests that students who excel in one subject are likely to demonstrate proficiency in the other subjects as well.

Scores Relationship

Understanding the relationships between these subjects can have implications for educational strategies and interventions. Educators can leverage this knowledge to design comprehensive learning programs that promote a well-rounded academic development in students.



Average Scores by Gender

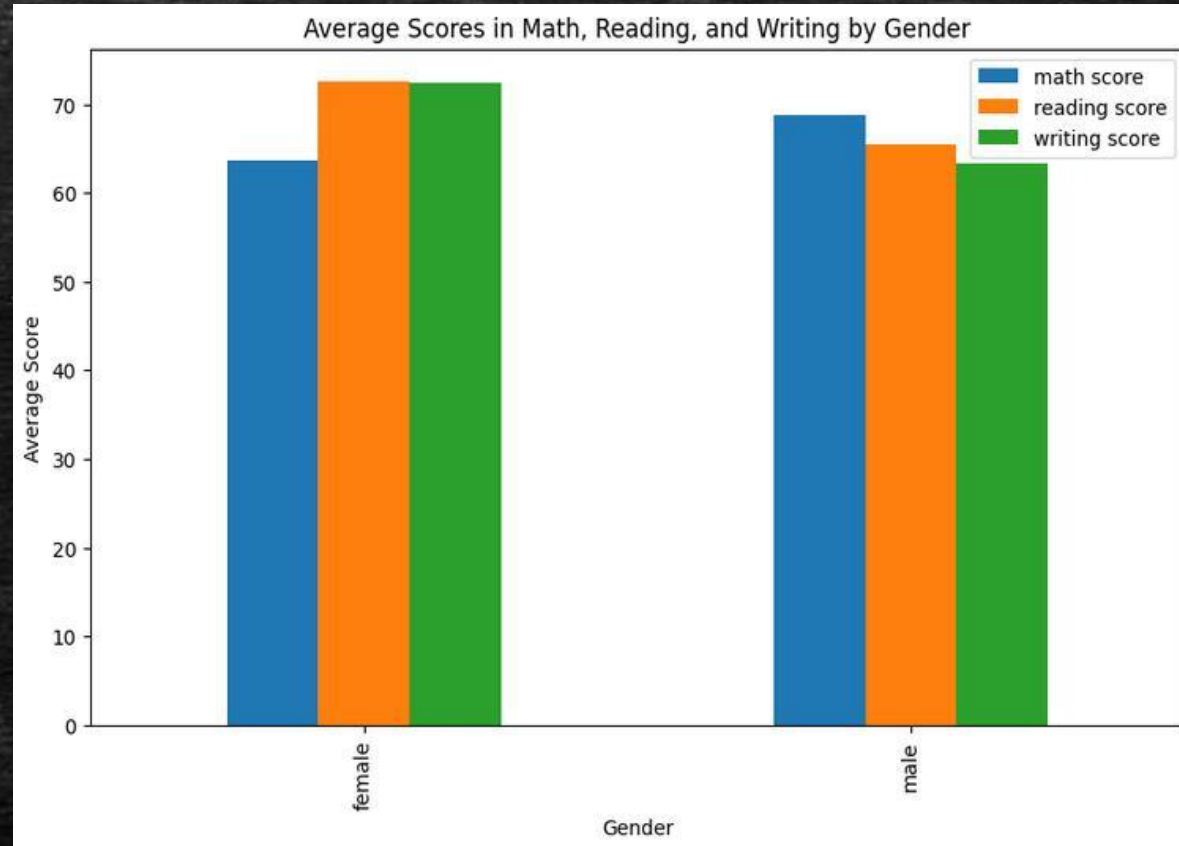
The average scores in math, reading, and writing were analyzed and compared between male and female students. Here are the key findings:

- **Bar Plot:** We created a bar plot to visualize the average scores in math, reading, and writing for each gender. The bar plot allows for a clear comparison between male and female students' performance in these subjects.
- **Math Scores:** On average, male students achieved a higher score in math compared to female students. This indicates a gender-based disparity, with male students demonstrating a slightly stronger performance in math.
- **Reading Scores:** Female students, on average, achieved higher scores in reading compared to male students. This suggests a gender-based difference favoring female students' performance in reading.
- **Writing Scores:** Similar to reading scores, female students, on average, outperformed male students in writing. This highlights a gender-based difference where female students tend to have stronger writing skills.
- **Significant Differences:** The observed differences in average scores between male and female students indicate the presence of gender-related disparities in specific subjects. While male students exhibited higher math scores, female students demonstrated better performance in reading and writing.

Average Scores by Gender

- Implications: The gender-based differences in average scores emphasize the need for targeted interventions and support to ensure equal opportunities for both male and female students. Addressing these disparities can contribute to promoting gender equity and fostering an inclusive learning environment.

It is important to note that these findings are based on the average scores and do not represent individual performance. Further analysis, such as statistical significance testing, can provide a more comprehensive understanding of the observed differences. These findings will be further elaborated upon in the subsequent sections of the presentation.



Statistical Test

To assess the significance of the performance differences between male and female students, a statistical test was conducted. Here are the key findings:

- T-test: A two-sample independent t-test was performed to compare the performance of male and female students in math, reading, and writing scores.
- Math Scores: The t-test revealed a significant difference in math scores between male and female students (t-statistic = 5.3832, p-value = 0.0000). This indicates that male students, on average, achieved significantly higher math scores compared to female students.
- Reading Scores: The t-test also showed a significant difference in reading scores between male and female students (t-statistic = -7.9593, p-value = 0.0000). Female students, on average, outperformed male students in reading.
- Writing Scores: Similarly, the t-test indicated a significant difference in writing scores between male and female students (t-statistic = -9.9796, p-value = 0.0000). Female students had higher average writing scores compared to male students.
- Conclusions: The results of the statistical test provide strong evidence of gender-based performance differences in math, reading, and writing. Male students displayed higher performance in math, while female students exhibited better performance in reading and writing.

These findings underscore the importance of addressing gender disparities in academic performance and implementing targeted interventions to ensure equal opportunities for all students. Recognizing and addressing these differences can contribute to promoting a fair and inclusive learning environment.

Conclusion

In conclusion, the analysis of student performance in math, reading, and writing has provided valuable insights into various aspects of the dataset. Here are the key findings and implications:

- **Gender Differences:** The analysis revealed gender-based differences in academic performance. Male students showed higher average scores in math, while female students demonstrated stronger performance in reading and writing. These disparities highlight the need for targeted interventions to address gender-related gaps and promote equity in education.
- **Correlations and Patterns:** The analysis identified positive correlations between math, reading, and writing scores, indicating a consistent performance across these subjects. This underscores the interdependence of these subjects and emphasizes the importance of a well-rounded academic development.
- **Descriptive Statistics:** Descriptive statistics provided a summary of the average scores, variability, and distribution of scores in math, reading, and writing. These statistics contribute to understanding the overall performance landscape and serve as benchmarks for future analysis and comparison.
- **Recommendations:** Based on the findings, it is recommended to implement strategies to bridge the gender-based performance gaps. This can include targeted support and resources to enhance math skills among female students and encourage male students' development in reading and writing. Additionally, promoting a holistic approach to education that emphasizes the interconnections between subjects can foster a more comprehensive learning experience.

Conclusion

Furthermore, to access the project code and database, you can refer to the following links:

- GitHub Link: <https://github.com/fahadshuvo33/Screening-Assignment-for-Dokkho-Career>
- Database Download Link: <https://www.kaggle.com/datasets/spscientist/students-performance-in-exams/download?datasetVersionNumber=1>

In conclusion, this analysis sheds light on the performance patterns, gender disparities, and correlations among subjects in the dataset. By recognizing these insights and implementing evidence-based interventions, we can work towards fostering a fair, inclusive, and well-rounded educational environment for all students.

"Education is the key to unlocking every student's potential, regardless of gender. Let's strive for equal opportunities and empower every learner to soar to new heights."