Link to final web page: <https://vedantgupta67.github.io/>

Scatterplots (“scatterplots.html”) :

This interactive scatter plot visualization, created using Altair, explores the relationships between "Exam\_Score" and various numerical variables—Hours\_Studied, Attendance, Previous\_Scores, Tutoring\_Sessions, and Sleep\_Hours—within the "StudentPerformanceFactors" dataset. By incorporating a selection interval along the x-axis, the visualization not only highlights correlations between exam scores and these metrics but also allows for dynamic comparison of how these variables interact with one another across specific ranges. Key takeaways include a clear positive correlation between exam scores and both hours studied and attendance, indicating that increased study time and class presence tend to boost performance. In contrast, exam scores and previous scores show only a slight positive correlation, suggesting little consistent influence, while sleep hours exhibit no strong correlation with exam scores, implying minimal impact on performance. Interestingly, students with the highest exam scores tend to have fewer tutoring sessions, possibly indicating self-sufficiency or diminishing returns from additional support.

Bar charts (“boxplots.html”) :

This visualization consists of three side-by-side bar charts, each illustrating the distribution of "Exam\_Score" across different levels (Low, Medium, High) of three categorical variables: Parental Involvement, Teacher Quality, and Access to Resources. These charts allow for a direct comparison of how exam scores vary with different degrees of support and resources available to students. For Parental\_Involvement, the bar chart shows a clear progression—Low involvement corresponds to a distribution skewed toward lower exam scores, Medium involvement reflects slightly higher scores, and High involvement shifts the distribution further right with notably higher scores, indicating a strong positive relationship between parental support and academic performance. In the Access to Resources chart, Low access results in fewer students achieving high scores, Medium access shows an uptick in students with better scores, and High access stands out with the highest average exam scores, underscoring the role of resource availability in boosting outcomes. The Teacher Quality chart reveals a subtler pattern: Low and Medium quality levels display similar average scores with comparable distributions, while High quality shifts the distribution slightly right, suggesting a modest improvement in scores, though its impact appears less pronounced than that of parental involvement or resource access. Together, these side-by-side bar charts effectively highlight how varying levels of Parental\_Involvement, Teacher Quality, and Access to Resources shape exam score distributions, with parental support and resource availability demonstrating more substantial influences on student performance compared to teacher quality.

Bound Bar and Scatter (“ScoreAndMotivation.html”) :

This data visualization features a scatterplot and a linked bar chart to explore the relationship between hours studied, exam scores, and student motivation levels within the "StudentPerformanceFactors" dataset. The scatterplot plots "Hours\_Studied" on the x-axis against "Exam\_Score" on the y-axis, with each point colored by motivation level (e.g., Low, Medium, High), revealing a positive correlation between study time and exam performance at a glance. However, the intermixed colors suggest no clear relationship between motivation level and exam score, a pattern confirmed by the even distribution of motivation levels among the highest exam scores. The bar chart below, dynamically bound to a selection interval on the scatterplot, displays the count of students by motivation level for the selected data points. For the lowest exam scores, low motivation dominates, though high and medium levels are nearly equal, indicating some influence of motivation at the lower end. Among students who studied the most hours, motivation levels are evenly split, while those who studied the least show a majority with medium motivation, with high and low levels equally represented. This visualization highlights that while hours studied strongly predict exam scores, motivation’s impact is less consistent, varying subtly across different study and performance ranges.

Side by Side Bar Plot (exam\_score\_barplot.html)

This bar chart compares the average exam scores of students with and without learning disabilities, separated by public vs. private school. The chart shows a slight performance gap between students with and without learning disabilities, regardless of school type. In both school types, students without learning disabilities perform slightly better on average than those with learning disabilities. Because the difference in average scores is so small, it indicates that while learning disabilities may have some impact on test performance, it is not significantly larger for public and private schools. This suggests that public and private schools are providing fairly equitable academic support, but there may still be some room for improvement when it comes to students with learning disabilities to help close the gap fully.

Histogram (exam\_histogram.js)

These histograms display the distribution of exam scores across all students, with additional filters for male and female students. The overall distribution is bell-shaped, and is akin to a normal curve with the center being around the mid-to-high 60s. This indicates that most students score in that range. When broken down by gender, both male and female student distributions have the same shape and center, which suggests that there is no significant performance gap between genders. However, the male distribution has a slightly higher spread, having more students at both ends of the score range. In turn, the female distribution is more concentrated in the center and has fewer outliers on either side. This could suggest that female students might score more consistently than male students, but further analysis would be required to test the significance of this observation. Overall, the histograms shows an expected distribution of test scores with slight differences in variability between male and female students.