Introduction

This report presents our approach to visualizing electric vehicle sales data (2011–2023) and the achievements of Carlos Alcaraz vs. Jannik Sinner in tennis. We utilized **Excel** and **MATLAB** for data representation, exploring various graph types to ensure effective visualization.

Problem 1: Electric Vehicle Sales Data (Excel)

Analysis

Before selecting the appropriate chart, we have analysed the structure of the dataset to identify trends in electric vehicle (EV) sales over the years.

- **Independent Variable:** Year (2011–2023) → **Categorical & Discrete**
- **Dependent Variable:** Number of EV Sales → **Quantitative & Continuous**

Based on this classification, we considered various graph types:
- **Line Chart:** Good for continuous trends but does not emphasize the contribution of different categories.
- **Bar Chart:** Works well for discrete data but does not provide cumulative insights.
- **Stacked Column Chart:** Best for visualizing categorical data (years) while showing cumulative sales over time.

Chart Type	Categorical	Discrete	Quantitative	Continuous	Cumulative Insights
Line Chart	✗	✗	✓	✓	✗
Bar Chart	✓	✓	✓	✗	✗
Stacked Column Chart	✓	✓	✓	✓	✓

### Why the Stacked Column Chart is the Best Choice?
1. Independent variable (Year) is discrete, making a column-based representation more intuitive.
2. Dependent variable (Sales) is continuous, and a stacked column chart helps show growth trends clearly.
3. The cumulative structure makes it easy to compare both individual category sales and total sales growth over time.

Finally, A ***stacked bar chart*** was chosen as it best represents the cumulative growth of different categories over time and allows for easy comparisons.

Implementation Steps

1. Imported the "***electric_vehicle_sales.xlsx***" file into Microsoft Excel.

2. Checked for missing or inconsistent values.

3. Inserted a stacked column chart with:

   o   Years (2011-2023) on the X-axis (Independent Variable, Discrete).

   o   EV Sales on the Y-axis (Dependent Variable, Continuous).

   o   Different colors for each sales category (if applicable).

4. Formatted the chart by adding labels, titles, and adjusting the color scheme for readability.

Results

Electric vehicle sales from 2011 to 2023
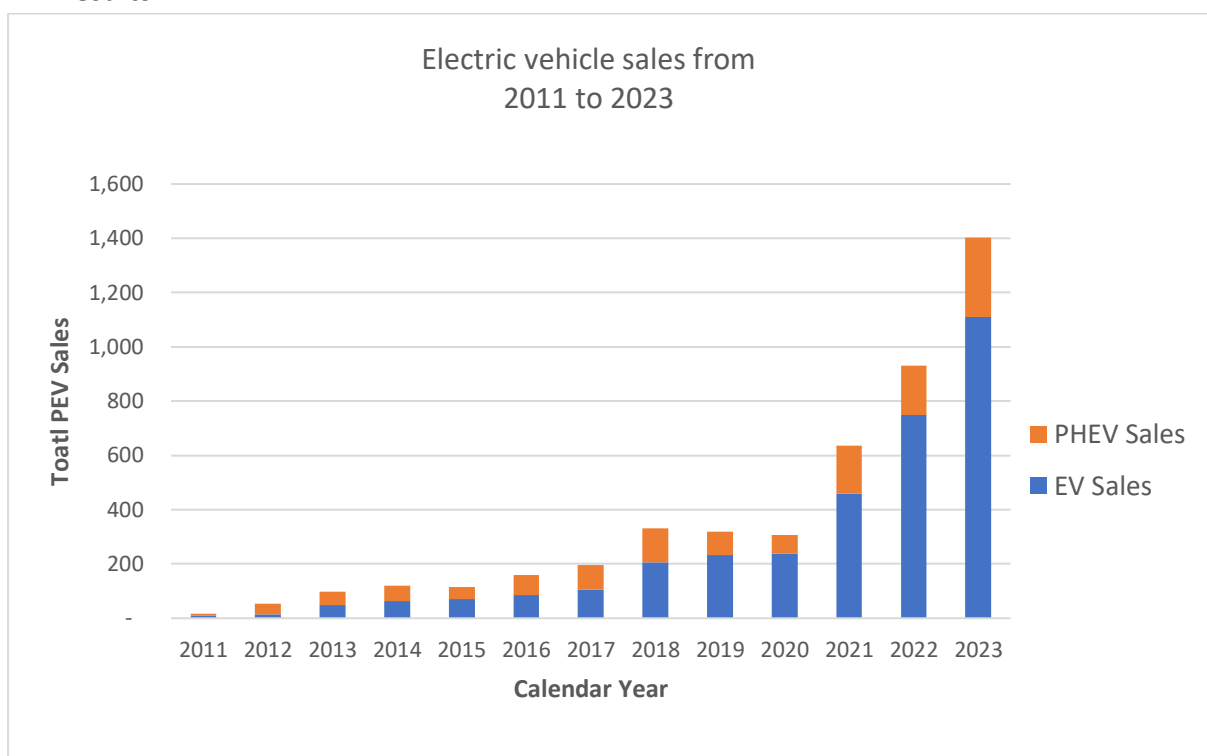
Problem 2: Electric Vehicle Sales Data (MATLAB)

Analysis
MATLAB was used to generate a similar visualization for EV sales. A **stacked bar chart** was chosen as it effectively displays the contribution of different categories to the total sales over time.

Implementation Steps
1. Imported the data using *"readtable"*.
2. Extracted the relevant columns (years and sales figures).
3. Used the bar function with the 'stacked' option to generate a stacked bar chart.
4. Added labels, titles, and grid lines for clarity.
5. Saved the *"**Problem_2.m**"* script.

Script: *Problem_2.m*
```matlab
clear all;
close all;
clc;

data = readtable('electric_vehicle_sales.xlsx');

years = data.('CalendarYear');
ev_sales = data.('EVSales');
phev_sales = data.('PHEVSales');
total_pev_sales = data.('TotalPEVSales');

figure;
bar(years, [ev_sales, phev_sales], 'stacked');
xlabel('Calendar Year');
ylabel('Sales (Thousands)');
title('Electric Vehicle Sales by Calendar Year, 2011-2023');
legend('EV Sales', 'PHEV Sales','Location','northwest');
grid on;
yticks(0:200:1600);
ylim([0 1600]);
```

Script Explanation
- Clears the workspace and resets MATLAB (clear all;, close all;, clc;).
- Reads data from an Excel file and extracts years, EV sales, PHEV sales, and total PEV sales (though total sales is not used in the plot).
- Creates a stacked bar chart using bar(), which displays EV and PHEV sales stacked for each year from 2011 to 2023.
- Adds labels and title to describe the data clearly:
  - xlabel() → X-axis labeled as "Calendar Year".
  - ylabel() → Y-axis labeled as "Sales (Thousands)".
  - title() → Title added to indicate the chart's purpose.
- Includes a legend and grid for better readability (legend() and grid on;).
- Customizes the y-axis to show sales values in steps of 200 and sets the limit to 1600 (yticks() and ylim()).

Results

Electric Vehicle Sales by Calendar Year, 2011–2023
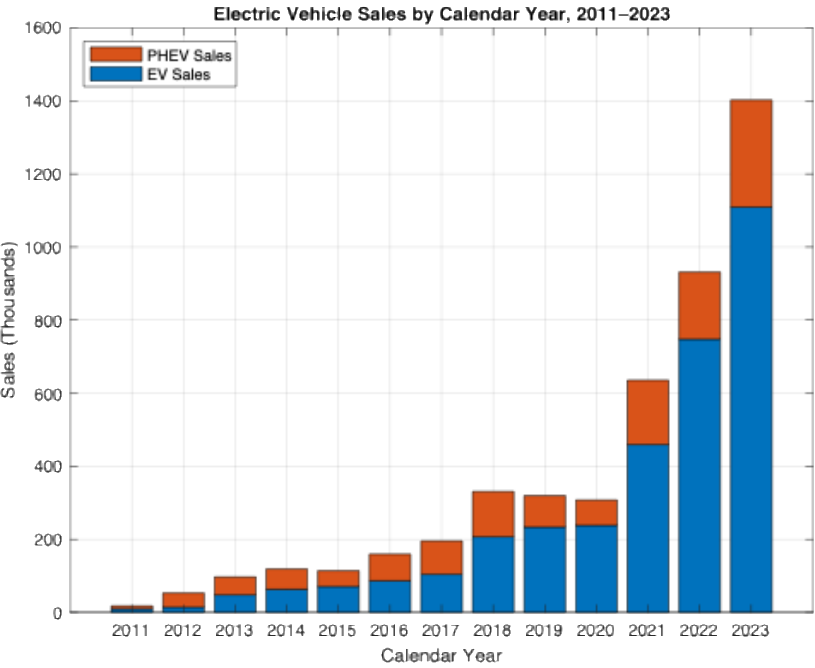
Problem 3: Tennis Achievements (Excel & MATLAB)

Analysis

A grouped bar chart was selected to compare Carlos Alcaraz and Jannik Sinner's achievements, as it effectively presents categorical data with side-by-side comparisons. The objective was to analyze their performances in Grand Slam titles, ATP Finals, and ATP Masters 1000 titles using both Excel and MATLAB.

Understanding the Data

Comparison of Big Titles: Alcaraz vs Sinner		
Grand Slams	4	3
ATP Finals	-	1
ATP Masters 1000	5	4
Total	9	8

- **Categories (Independent Variable - Discrete):**
  - Grand Slams
  - ATP Finals
  - ATP Masters 1000
  - Total Titles
- **Number of Titles (Dependent Variable - Continuous):**
  - Titles won by **Carlos Alcaraz**
 - Titles won by **Jannik Sinner**

Choosing the Right Chart Type

- Since we were comparing two players across multiple categories, a grouped horizontal bar chart was the most effective visualization.
- Reasons for choosing a horizontal bar chart:
  - Better readability when comparing values across multiple categories.
  - Bars of different lengths make it easy to distinguish differences.
  - Avoids overlapping which could happen in vertical bar charts with many categories.

Implementation Steps (Excel)

1. Entered the provided achievement data in an Excel table.
2. Inserted a grouped bar chart to compare their performance.
3. Customized the chart with appropriate colours, labels, and titles.
4. Saved the Excel file "*comparison_of_Big_Titles.xlsx*.

Results

Comparison of Big Titles: Alcaraz vs Sinner
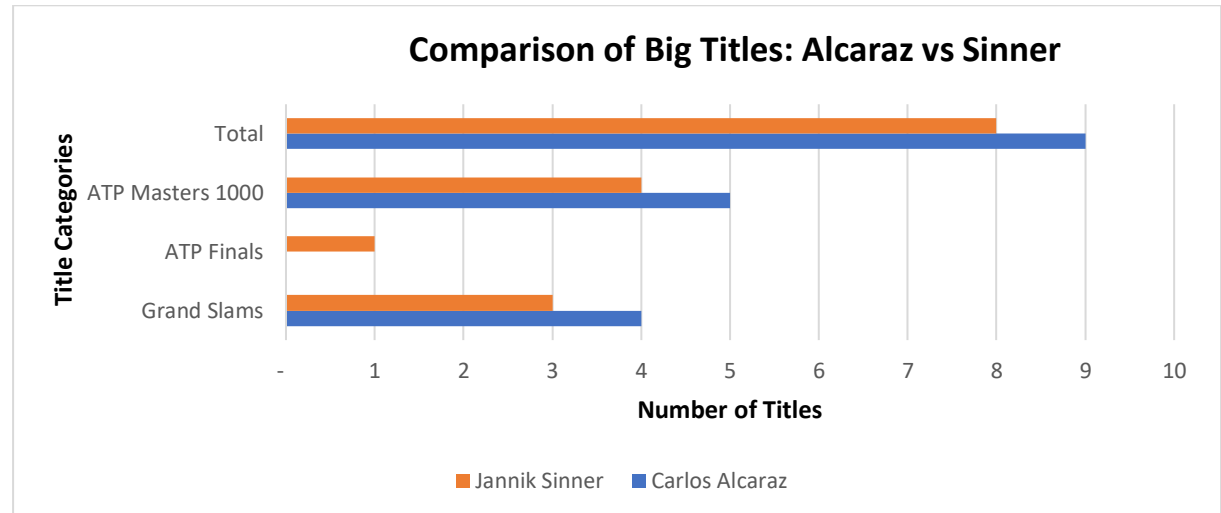
Implementation Steps (MATLAB)

1. Created a table in MATLAB with the achievement data.
2. Used the bar function to generate a grouped bar chart.
3. Customized the chart with labels, legends, and colours.
4. Saved the "*Problem_3.m*" script.

Script: Problem_3.m

```matlab
clear all;
close all;
clc;

data = readtable('comparison_of_Big_Titles.xlsx');

category = data.('Category');
carlosAlcaraz = data.('CarlosAlcaraz');
jannikSinner = data.('JannikSinner');

figure;
barh([carlosAlcaraz, jannikSinner], 'grouped');

set(gca, 'YTick', 1:length(category), 'YTickLabel', category);

xlabel('Number of Titles');
ylabel('Title Categories');
legend({'Carlos Alcaraz', 'Jannik Sinner'}, 'Location', 'SouthEast');
title('Comparison of Big Titles: Alcaraz vs Sinner');
grid on;
```

Script Explanation
- Clears workspace and resets MATLAB (clear all;, close all;, clc;).
- Reads data from an Excel file (readtable), storing title categories and each player's achievements.
- Creates a grouped horizontal bar chart (barh()) for comparing Alcaraz and Sinner's titles side by side.
- Adjusts y-axis labels (set(gca, 'YTick', ..., 'YTickLabel', category);) to match title categories.
- Adds labels, legend, and title for clarity (xlabel(), ylabel(), legend(), title()).
- Enables grid (grid on;) to improve readability.

Results
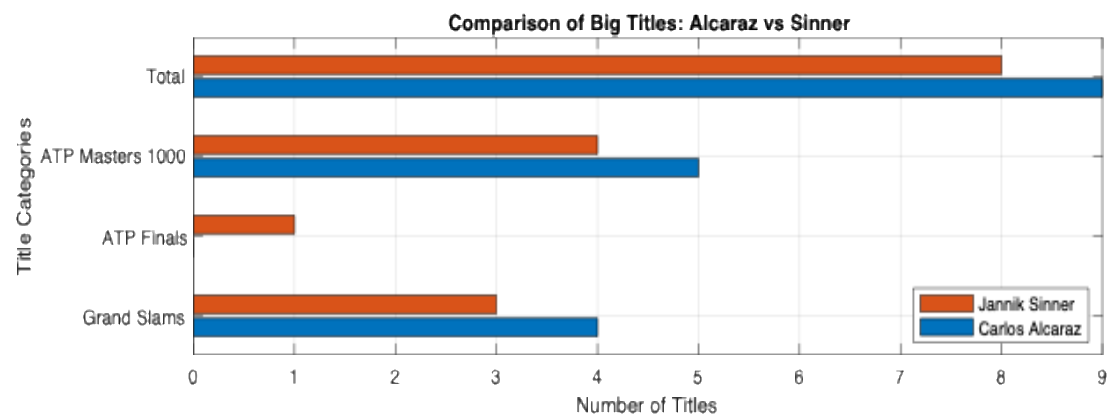
Conclusion

This project helped us gain hands-on experience in data visualization using Excel and MATLAB. We successfully identified and implemented suitable graph types, overcame challenges in data handling, and improved our collaborative teamwork skills.