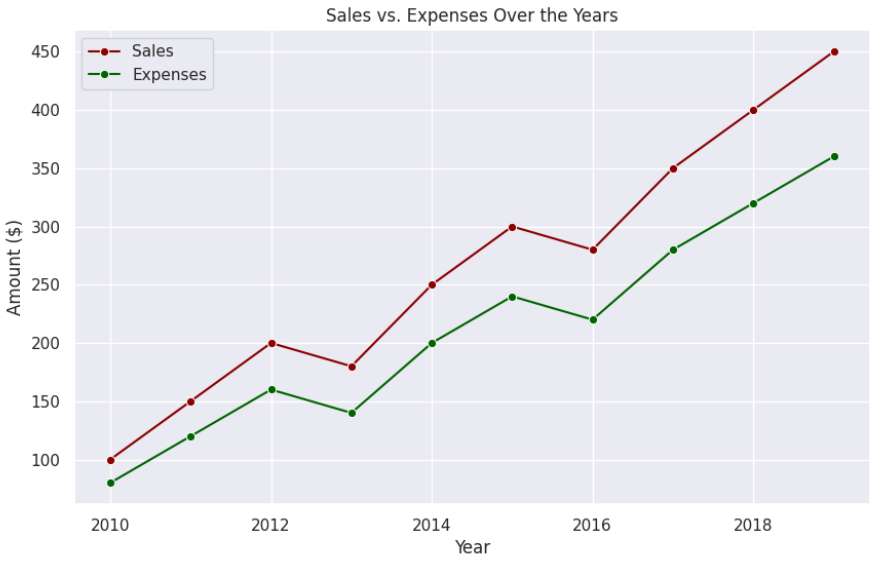
How to interpret line chart for bivariate analysis – numerical vs numerical



A. Interpreting the Trends of Sales and Expenses Over Time:

By examining the lines, we can understand the trends of sales and expenses over the decade:

- **Sales Trend (Maroon Line):**
    - Sales started at a relatively low amount in 2010 (around $100).
    - Sales generally show an increasing trend over the years, with some fluctuations. There's a noticeable dip between 2013 and 2014, but the overall trajectory is upward.
    - The most significant increase in sales appears to have occurred in the later years, particularly between 2016 and 2019, reaching the highest point around $450 in 2019.
- **Expenses Trend (Green Line):**
    - Expenses also started at a lower amount in 2010 (around $80).
    - Expenses generally show an increasing trend as well, although the rate of increase and the fluctuations differ from sales.

    - There's a dip in expenses between 2012 and 2013.
    - While expenses have increased over the decade, the final amount in 2019 (around $360) is lower than the sales figure for the same year.
- **Comparison of Sales and Expenses:**
    - In all the years shown, Sales have been higher than Expenses.
    - The gap between Sales and Expenses (representing profit) varies over time. The profit margin appears to have increased significantly in the later years due to the faster growth of sales compared to expenses.

Line charts are the best choice for visualizing the relationship between two numerical variables when:

- **One of the variables represents a continuous scale, especially time.** Line charts are excellent for showing trends over time (years, months, days, hours, etc.).
- **You want to emphasize the change or trend of one variable as the other variable changes.** The connected points clearly illustrate the direction and magnitude of change.
- **You are comparing the trends of multiple variables over the same continuous scale.** As seen in the example, it's easy to compare the evolution of sales and expenses over the years on the same chart.
- **The order of the data points is important.** Line charts inherently show the sequence of data points, making them suitable for time series data or data where the order has meaning.
- **You want to identify patterns, such as seasonality, cycles, or long-term trends.** The lines can reveal these patterns visually.

In summary, line charts are powerful for visualizing trends and changes in numerical data over a continuous scale, particularly time. They are effective for showing the evolution of one or more variables and for comparing their patterns.