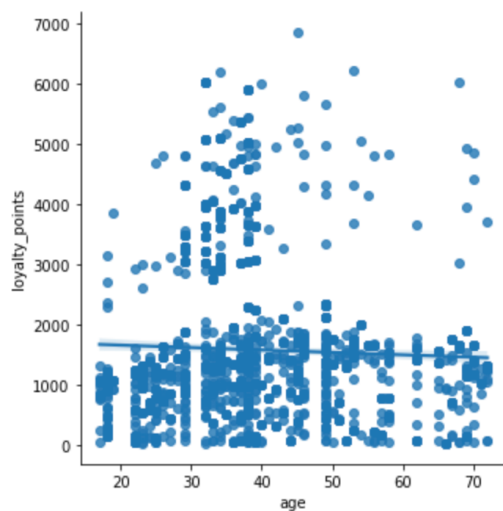
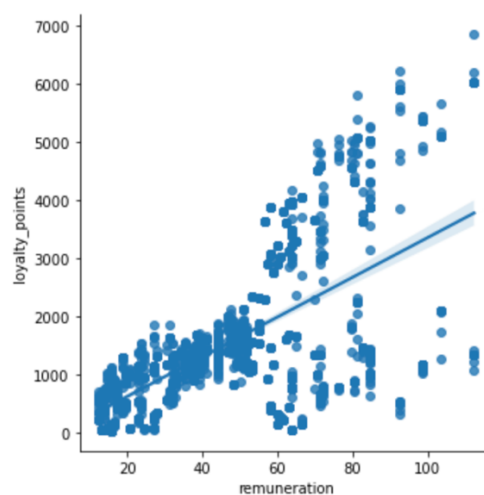
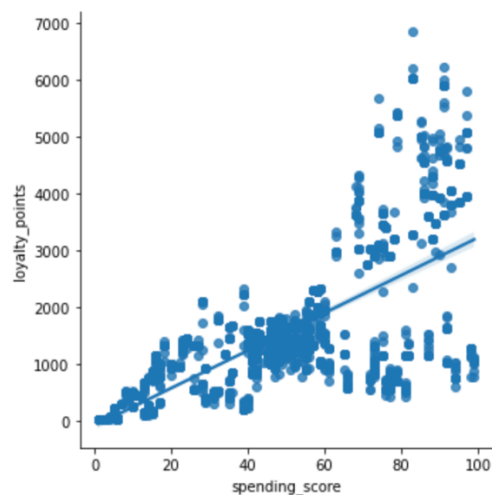


Improving Sales Performance for Turtle Games: A Data-Driven Approach

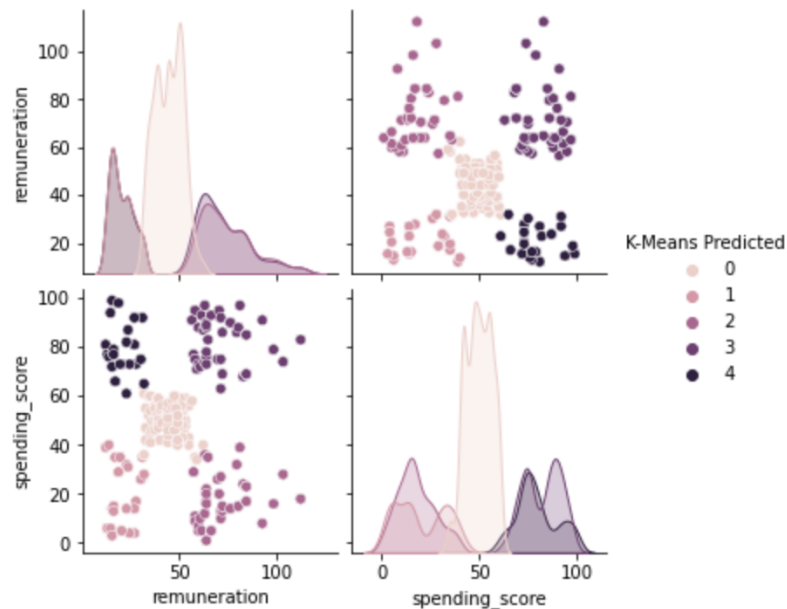
Turtle Games, a global game manufacturer and retailer, offers a diverse range of products including books, board games, video games, and toys. They aim to improve their overall sales performance by leveraging customer trends. To address this business problem, our team of data analysts was contracted to explore sales data, customer demographics, and online reviews, identify key patterns, and offer actionable insights to inform the company's marketing campaigns and product development strategies.

Our analytical approach involved importing, cleaning, and analysing data using Python and R. We began by importing sales, customer, and review data into Python, utilizing libraries such as pandas and numpy for data manipulation and matplotlib and seaborn for visualization. We cleaned the data by handling missing values, and inconsistencies to ensure accurate analysis.

For customer analysis, we examined age, remuneration, spending scores, and loyalty points. We used linear regression to identify correlations between these variables, finding positive relationships between spending scores, remuneration, and loyalty points. Age, however, showed no significant impact on loyalty points.



Next, we utilized k-means clustering to segment the customer base for targeted marketing. By employing elbow and silhouette methods, we determined that five clusters provided the best grouping between spending scores and loyalty points. This segmentation enables Turtle Games to target specific market segments effectively.

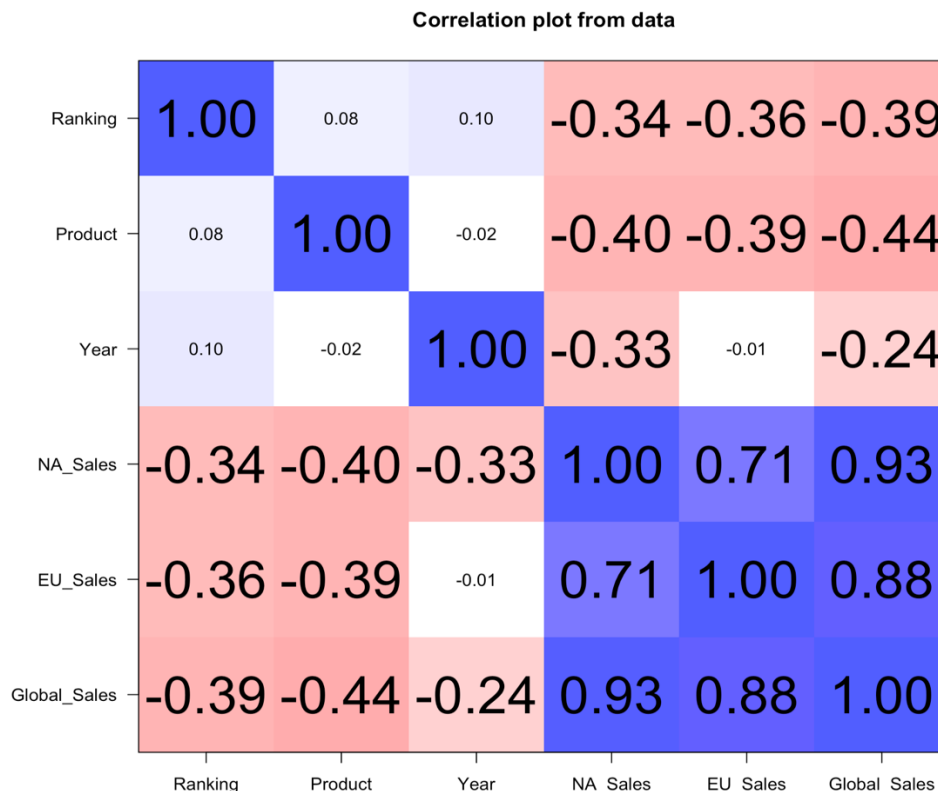


We then applied Natural Language Processing (NLP) techniques, including tokenization and stop words removal, to analyse customer reviews. We generated word clouds and frequency distributions to identify the most common words and themes in online product reviews. This information helps inform the marketing department about customer sentiments and preferences.



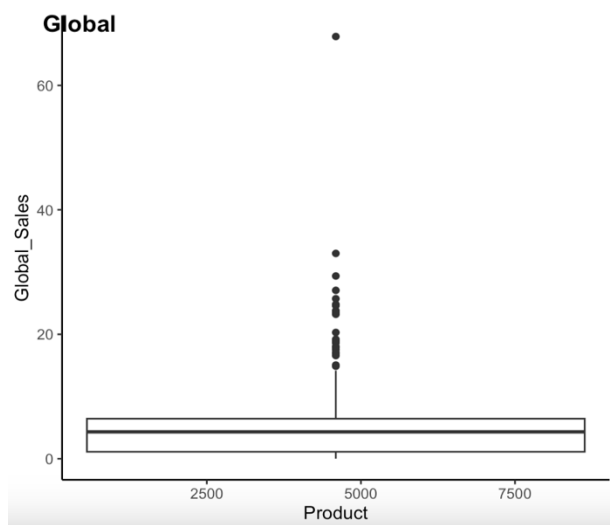
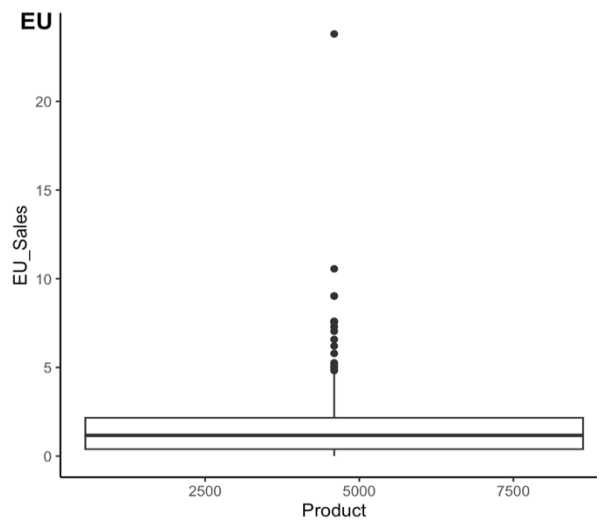
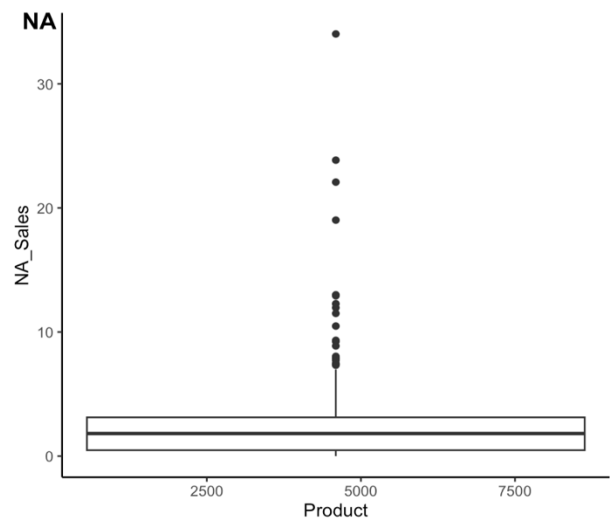
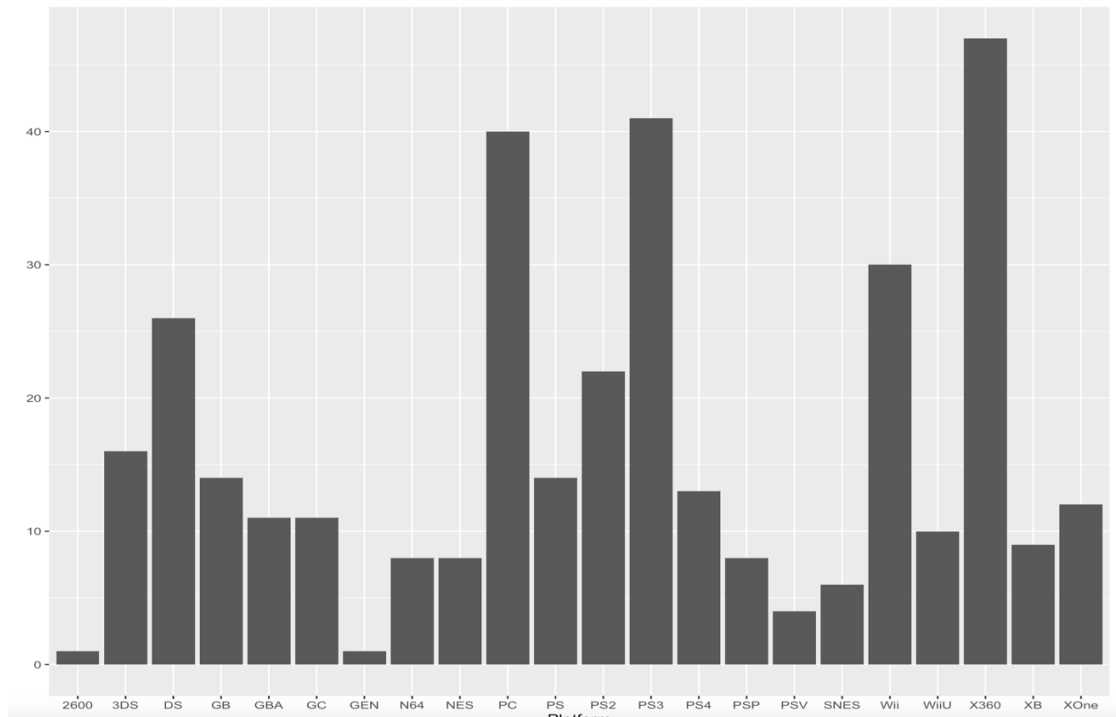
In R, we further analysed sales data by region and platform. We compared game sales using scatterplots, histograms, and boxplots created with ggplot2. We assessed normality using Q-Q plots and Shapiro-Wilk tests, determining the data was not normally distributed and exhibited positive skewness and mesokurtic distribution. We also found strong correlations among regional sales, indicating that products performing well in one region are likely to succeed in others.

The histograms of sales by platform and boxplot graphs consistently showed that global sales are the highest, confirming our previous findings. With p-values < 0.05 for all sales, we conclude that the data is not normally distributed. Additionally, all sales data exhibits positive skewness, indicating that the majority of the products have lower sales, while a few products have exceptionally high sales.



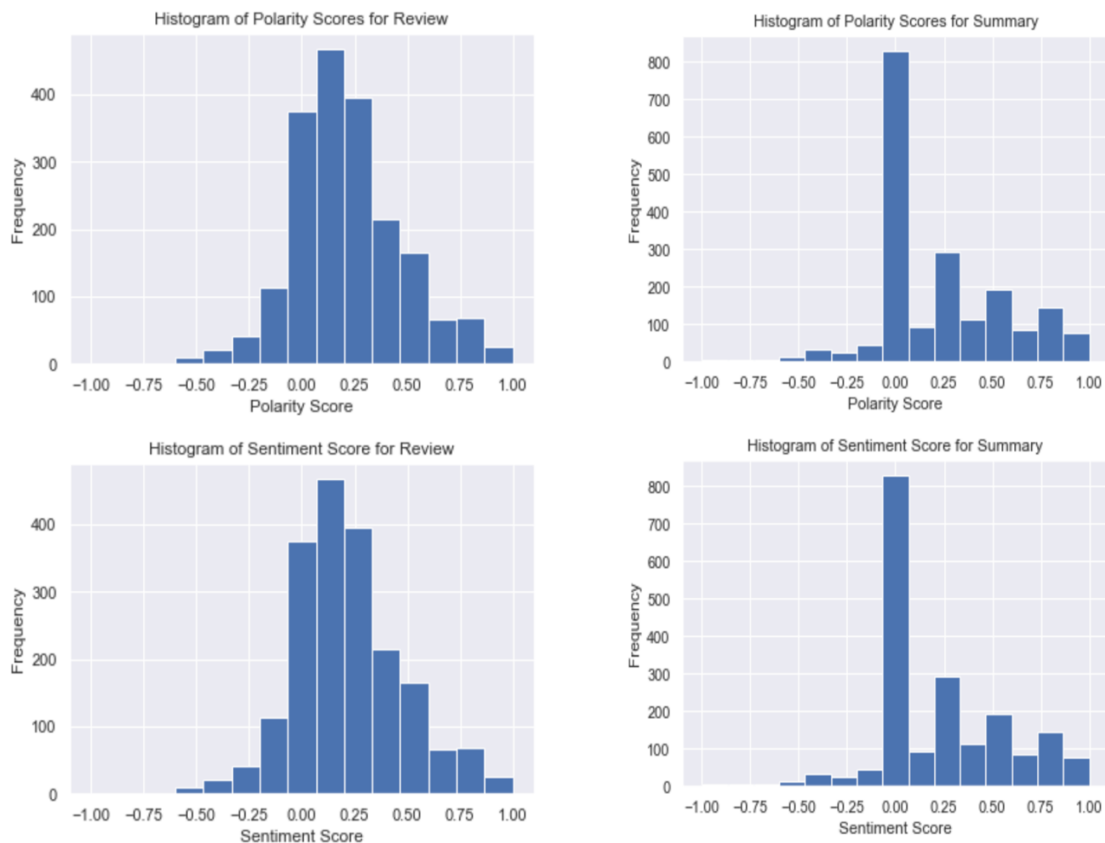
We selected various visualizations to represent our findings, ensuring they effectively conveyed insights relevant to Turtle Games' objectives. Histograms were used to visualize the distribution of sales by platform, while boxplots demonstrated regional sales differences. Scatterplots and cluster plots helped identify relationships between variables and customer segments, respectively.

Our analysis revealed that global sales surpassed North American and European sales, with Europe having the smallest share. PC, PS3, and X360 dominated the market in terms of number of games published, while Wii also had a strong presence. This information helps Turtle Games focus their marketing efforts on popular platforms and explore potential growth opportunities in different regions.



The k-means clustering visualization allowed us to identify five distinct customer segments, providing a clear picture of the relationships between spending scores and loyalty points. This information can be used to create targeted marketing campaigns and optimize product offerings.

We created histograms to visualize the distribution of these scores. Most scores ranged between 0 and 1, indicating that the majority of reviews and summaries had a positive sentiment and polarity. Word clouds and frequency distributions from customer reviews revealed common themes and sentiments. These visualizations offer insights into customer preferences, enabling the marketing department to design campaigns that resonate with their audience.



Positive reviews focus on the quality, enjoyment, educational value, and overall satisfaction with the products. Customers appreciate toys and games that stimulate thought, provide entertainment, and offer a rewarding experience. They also value products that meet or exceed their expectations, as well as those that are helpful for teaching and learning purposes.

Negative reviews tend to highlight issues with the quality, entertainment value, and overall disappointment with the product. Common criticisms include products being boring, low-quality materials, or not meeting expectations. Additionally, some reviews mention that certain products are difficult to use or not suitable for specific age groups. In some cases, customers express frustration with the product's focus or approach to certain themes, such as anger management or role-playing scenarios.

```
# Top 20 negative summaries.
df_sorted_asc2 = df3copy.sort_values(by='summary_polarity', ascending=True)

# View output.
top_neg_summary = df_sorted_asc2.head(20)['summary'].tolist()
top_neg_summary
```

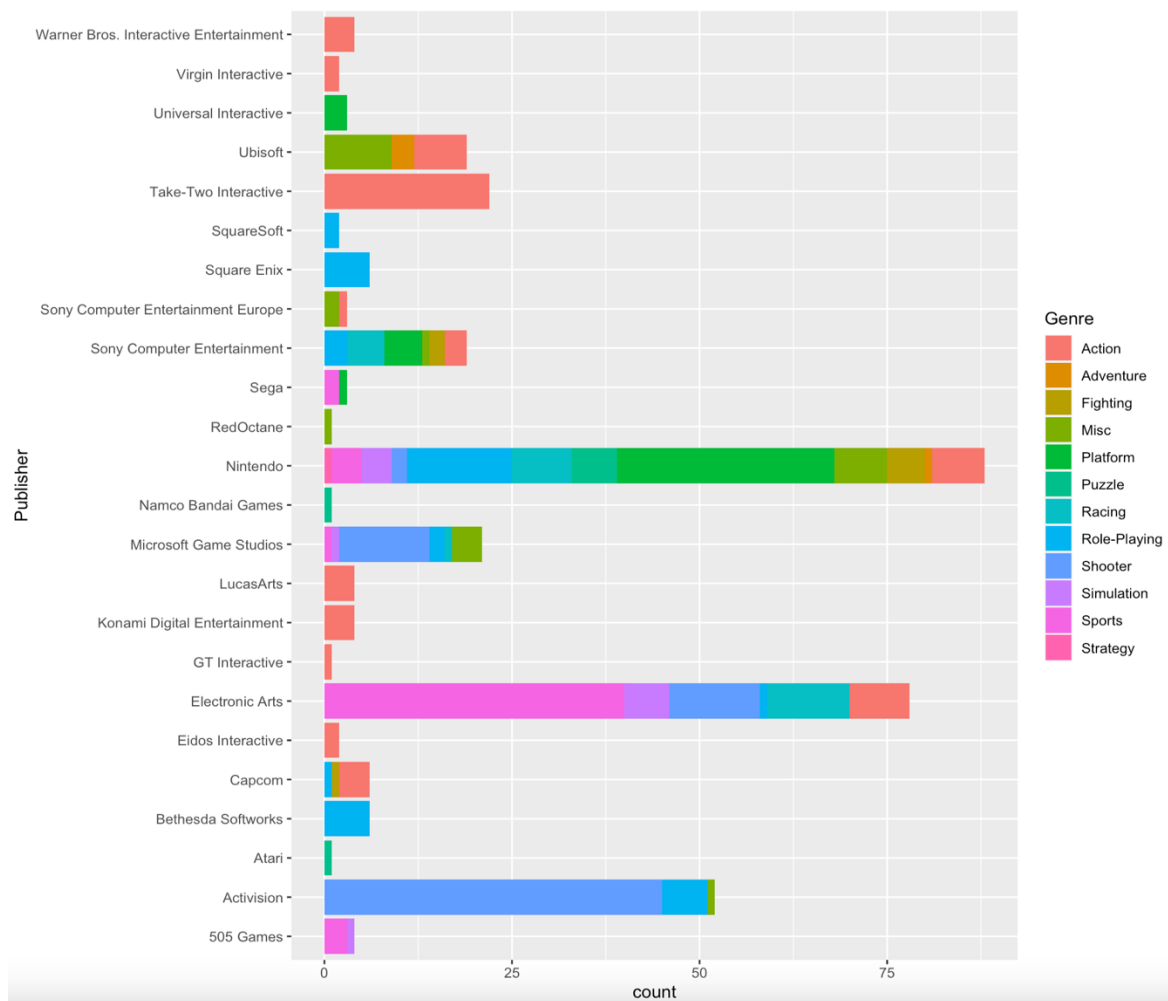
```
['boring unless you are a craft person which i am ',
 'the worst value ive ever seen',
 'boring',
 'before this i hated running any rpg campaign dealing with towns because it ',
 'another worthless dungeon masters screen from galeforce9',
 'disappointed',
 'disappointed',
 'disappointed',
 'disappointed',
 'promotes anger instead of teaching calming methods',
 'too bad this is not what i was expecting',
 'bad qualityall made of paper',
 'at age 31 i found these very difficult to make ',
 'mad dragon',
 'small and boring',
 'disappointing',
 'disappointing',
 'disappointing',
 'disappointing',
 'then you will find this board game to be dumb and boring']
```

```
# Top 20 positive reviews.
df_sorted_desc = df3copy.sort_values(by='review_polarity', ascending=False)

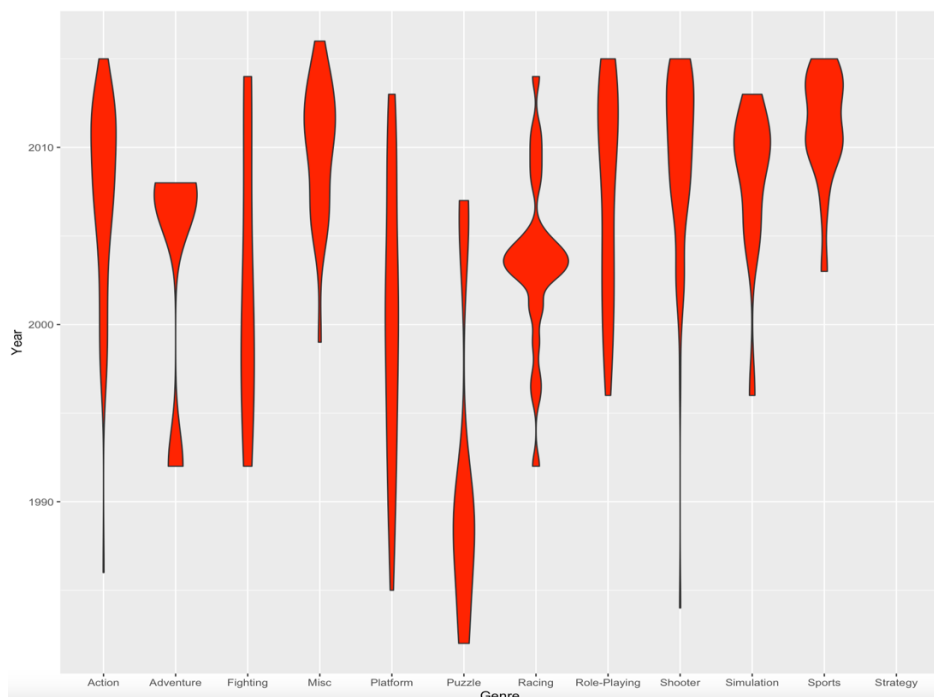
# View output.
top_pos_reviews = df_sorted_desc.head(20)['review'].tolist()
top_pos_reviews
```

```
['perfect',
 'excellent toy to simulate thought',
 'awesome gift',
 'perfect for tutoring my grandson in spelling',
 'awesome addition to my rpg gm system',
 'best set buy 2 if you have the means',
 'perfect just what i ordered',
 'awesome toy',
 'it is the best thing to play with and also mind blowing in some ways',
 'wonderful for my grandson to learn the resurrection story',
 'awesome set',
 'this was perfect to go with the 7 bean bags i just wish they were not separate orders',
 'one of the best board games i played in along time',
 'delightful product',
 'its awesome',
 'came in perfect condition',
 'awesome book',
 'wonderful product',
 'awesome',
 'excellent activity for teaching selfmanagement skills']
```

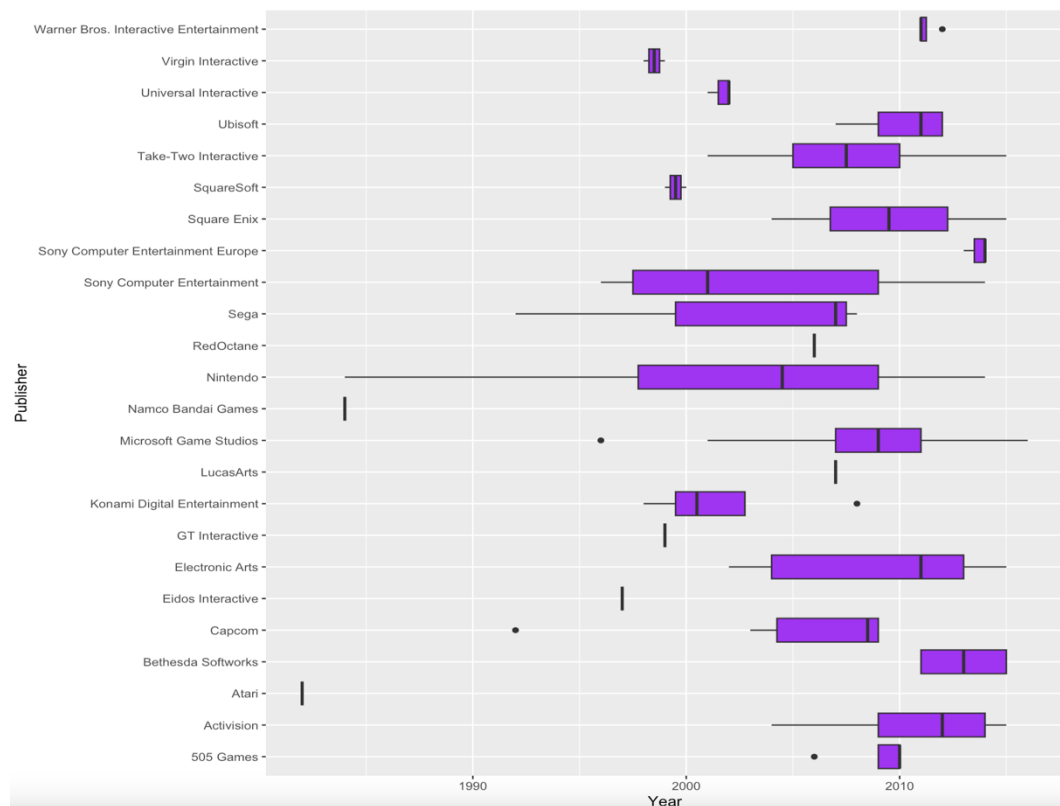
We conducted an analysis comparing game genres and publishers to gain insights into their diversity and market presence. Our findings indicate that Nintendo and Electronic Arts have the most diverse selection of genres, which could be a contributing factor to their success in the market.



When examining genre trends across the years, we observed that puzzle games were popular in the 1990s but saw a decline in publishing during the 2000s. On the other hand, platform games have maintained a steady presence in the market throughout the years, suggesting a sustained interest in this genre.



In terms of longevity, Nintendo has been producing games for the longest period, while Atari, despite being the oldest publisher, is now defunct. Nintendo's dominance is evident in every region, further highlighting its strong market position.



Patterns and Predictions

Our analysis uncovered several key patterns and predictions. The strong correlations among regional sales suggest that successful products in one region are likely to perform well in others. Since there is a strong correlation among regional sales, Turtle Games can promote high-performing products across multiple regions. This strategy will help in expanding the company's global reach and tapping into new markets.

In terms of game genres and publishers, Nintendo and Electronic Arts offer the most diverse selection, with Nintendo dominating the market in every region. Genre trends revealed that puzzle games were popular in the 1990s but declined in the 2000s, while platform games maintained a steady presence throughout the years. Turtle Games can partner with top publishers, which have diverse genre offerings and strong market presence. Such collaborations can boost Turtle Games' product portfolio and increase its competitiveness in the industry. Keeping track of genre trends can ensure the company stays relevant in the market. For instance, focusing on platform games, which have consistently maintained their popularity, while considering opportunities for reviving interest in once-popular genres like puzzle games might be a good idea.

Considering that some customers purchase games as gifts for their children, Turtle Games can develop and promote a range of family-friendly games and products suitable for children of various age groups. This might increase their sales.