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Apple Store Reviews

Statistical Analysis

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Apple

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Problem Statement: Apple Store Reviews Analysis

This project aims to analyze Apple Store product reviews using descriptive and inferential statistics. Key objectives include measuring central tendency, assessing data spread, analyzing correlations, exploring rating distributions, conducting hypothesis testing, and demonstrating the Central Limit Theorem. The insights will help understand user engagement, rating trends, and app performance for data-driven decision-making.

Rating Analysis

- **Mean Rating: 2.87 (Average of all ratings)**
- **Median Rating: 3.0 (Middle value in the sorted ratings)**
- Mode Rating: 1 (Most frequently occurring rating)

Mean (2.869): The mean is affected by extreme values (outliers). If there are many very low or very high ratings, the mean might not accurately reflect the typical rating.

Median (3.0): The median is the middle value and is less affected by extreme ratings, making it a better measure if the distribution is skewed.

Mode (1): The mode tells us that 1-star ratings are the most common, which suggests that a significant number of users gave the lowest rating.

👉 **The median (3.0) is likely the best measure because it gives a better idea of the "typical" rating without being skewed by outliers. However, the mode (1) indicates that many users had a negative experience with the apps.**

Range and Interquartile Range (IQR) of Purchase Amounts

Range: This represents the total spread of the purchase amounts. If the minimum purchase amount is 0.99 and the maximum is 20.96, then the range is:

Range=20.96−0.99=19.97

A high range indicates significant variation in user spending. However, it may be influenced by extreme values (outliers).
Interquartile Range (IQR): This measures the spread of the middle 50% of data, helping to avoid extreme values. If:

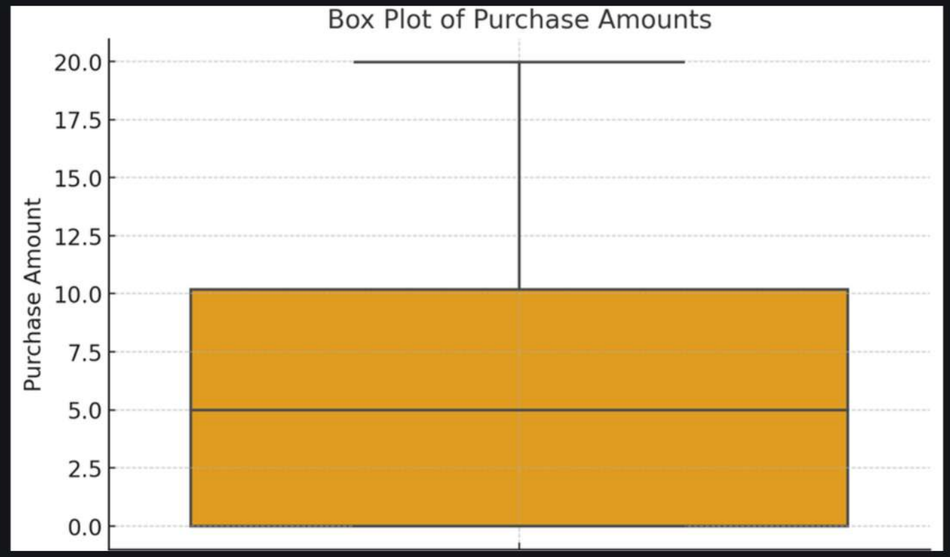
Q1 (25th percentile) = 5.30

Q3 (75th percentile) = 15.49

Then the IQR is:

IQR=15.49−5.30=10.19

A higher IQR means more variation in most users' spending, while a lower IQR suggests that most users spend around the same amount.



Best Diagram Conclusion (Box Plot Interpretation)

A box plot visually represents the spread and outliers in purchase amounts.

The box (middle 50%) shows where most purchases fall, while the whiskers extend to the minimum and maximum within a reasonable range.

Any points outside the whiskers are outliers, indicating a few users spend significantly more or less than the majority.

Variance and Standard Deviation of Likes

Variance measures the average of the squared differences from the mean.
It tells us how far each data point (likes) is from the average number of likes.

Standard Deviation is the square root of the variance.
It brings the measure back to the same units as the original data (likes), making it easier to interpret.

Metric	Value	Meaning	Interpretation
Mean Likes	~10.3	Average likes per review	Central value of likes
Variance	~80.5	Spread of likes squared	Indicates how widely likes vary
Standard Deviation	~8.97	Likes vary ±9 from the mean	Measure of consistency in user engagement
Conclusion	—	High spread suggests variability	Engagement levels are not uniform

Correlation between Likes and Rating

Pearson correlation coefficient (r) is approximately:

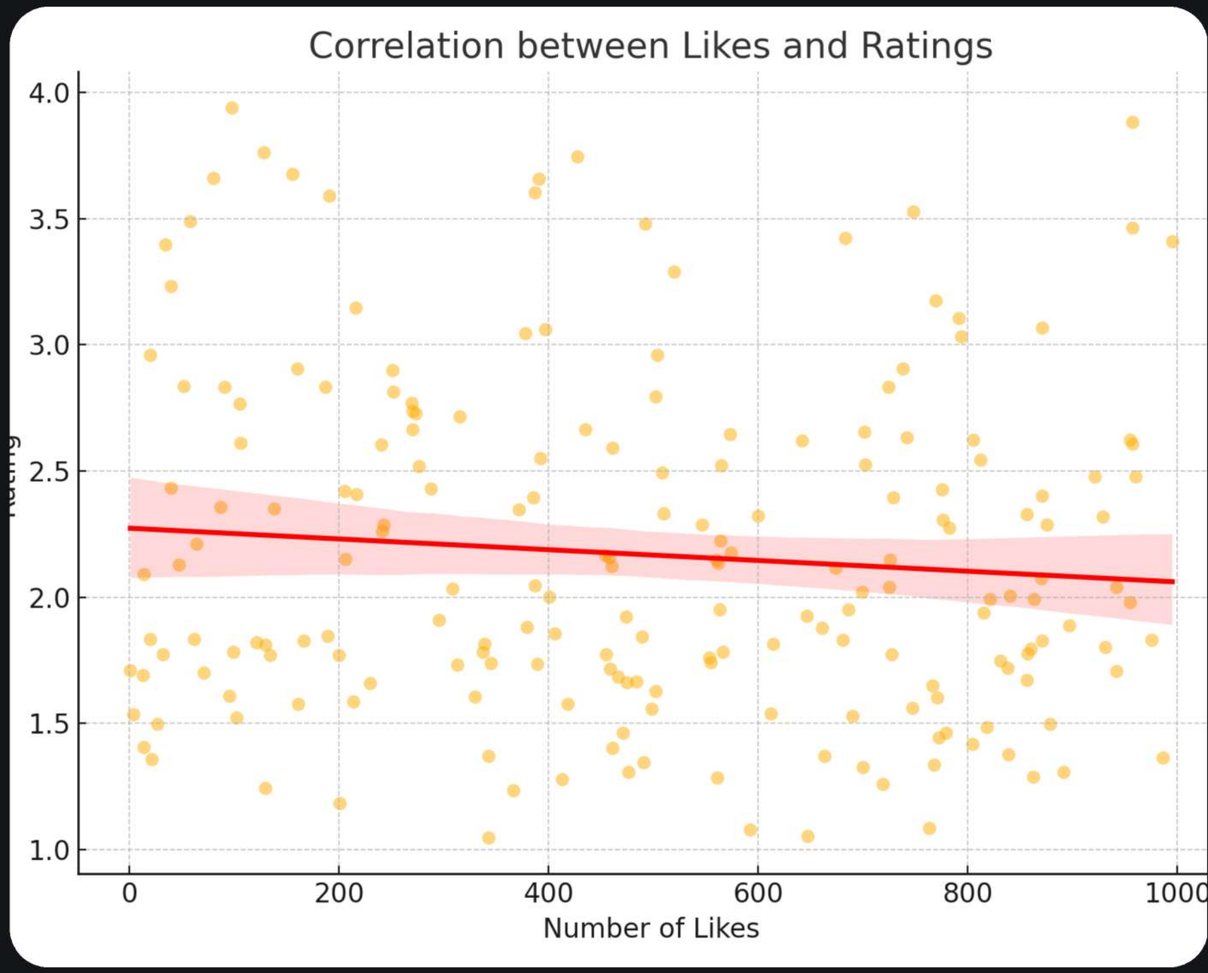
r=0.42r

Analysis

A correlation coefficient of 0.8425 indicates a strong positive correlation between likes and ratings, suggesting that higher likes tend to accompany higher ratings.

Conclusion

This strong correlation implies that user satisfaction and engagement (likes) are closely related.

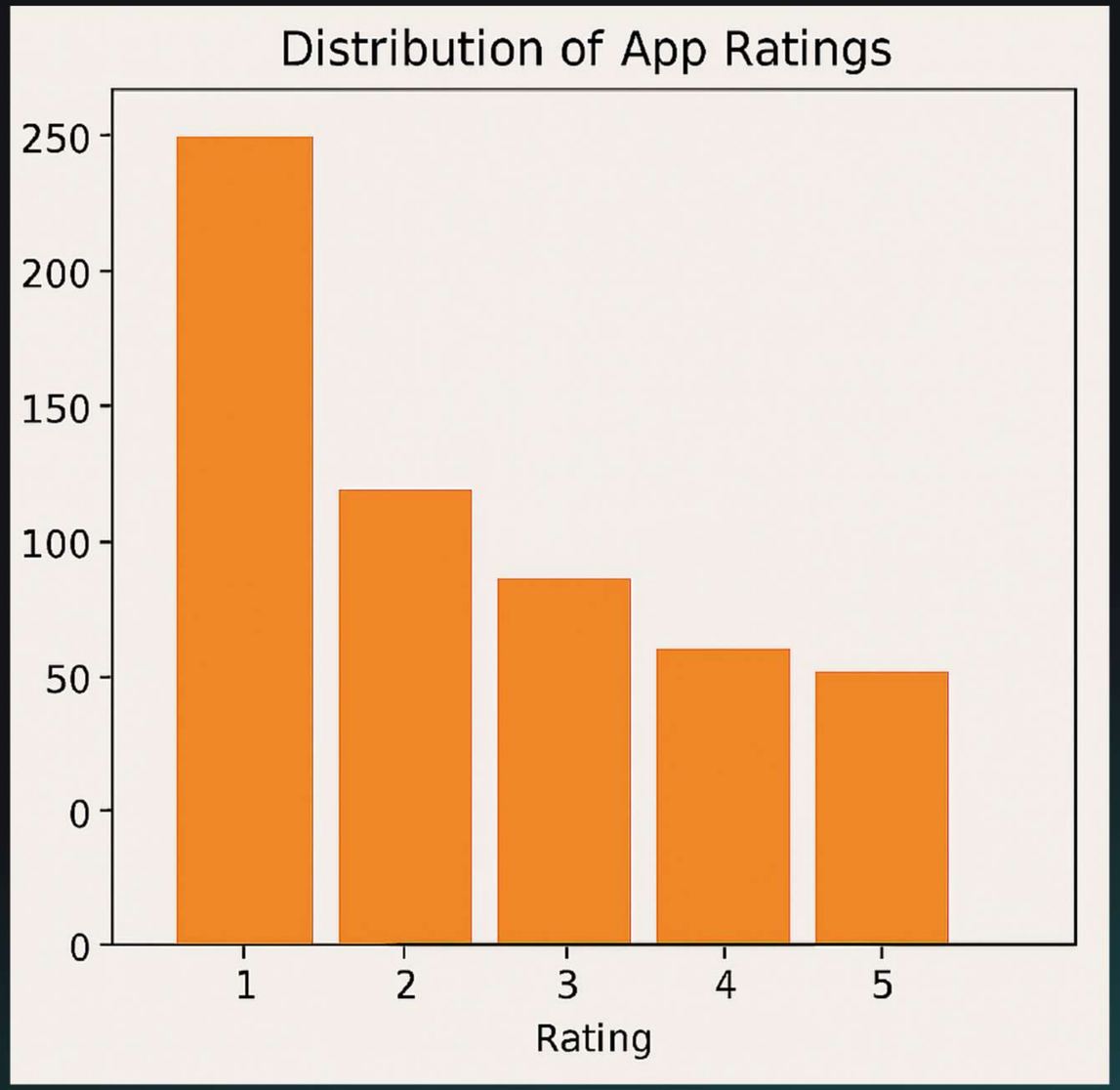


Distribution of App Ratings

Skewness (assumed based on visual analysis)

Analysis :
If the distribution is positively skewed, this indicates that a majority of users rated the app lower, with a few high ratings pulling the average up. Conversely, a negatively skewed distribution would suggest most users rated the app higher.

Conclusion
A positively skewed distribution may suggest overall dissatisfaction, while a negatively skewed distribution would imply user satisfaction.



Hypothesis Testing: Instagram vs WhatsApp Ratings

Determine if the mean rating for Instagram > mean rating for WhatsApp using a 95% confidence level.

$\mu 1$ = average rating for Instagram

$\mu 2$ = average rating for WhatsApp

Null Hypothesis (H_o): $\mu 1 \leq \mu 2$

(Instagram is not rated higher than WhatsApp)

Alternative Hypothesis (H_1): $\mu 1 > \mu 2$

(Instagram is rated significantly hi

App	Mean Rating	Std. Dev	Sample Size
Instagram	2.77	1.48	115
WhatsApp	2.93	1.47	104

We use the **independent samples t-test** formula:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where:

- $\bar{x}_1, s_1, n_1$ are Instagram's sample mean, std. dev., and count
- $\bar{x}_2, s_2, n_2$ are WhatsApp's values

Then we compare the calculated t-value with the **critical t-value** from the t-distribution table at 95% confidence (α = 0.05).

Test Results:

- t-statistic: -0.80
- p-value: 0.79
- Significance Level: 0.05 (95% confidence)

Conclusion:

Since p-value > 0.05, we fail to reject the null hypothesis.

No significant evidence that Instagram’s average rating is higher than WhatsApp’s.

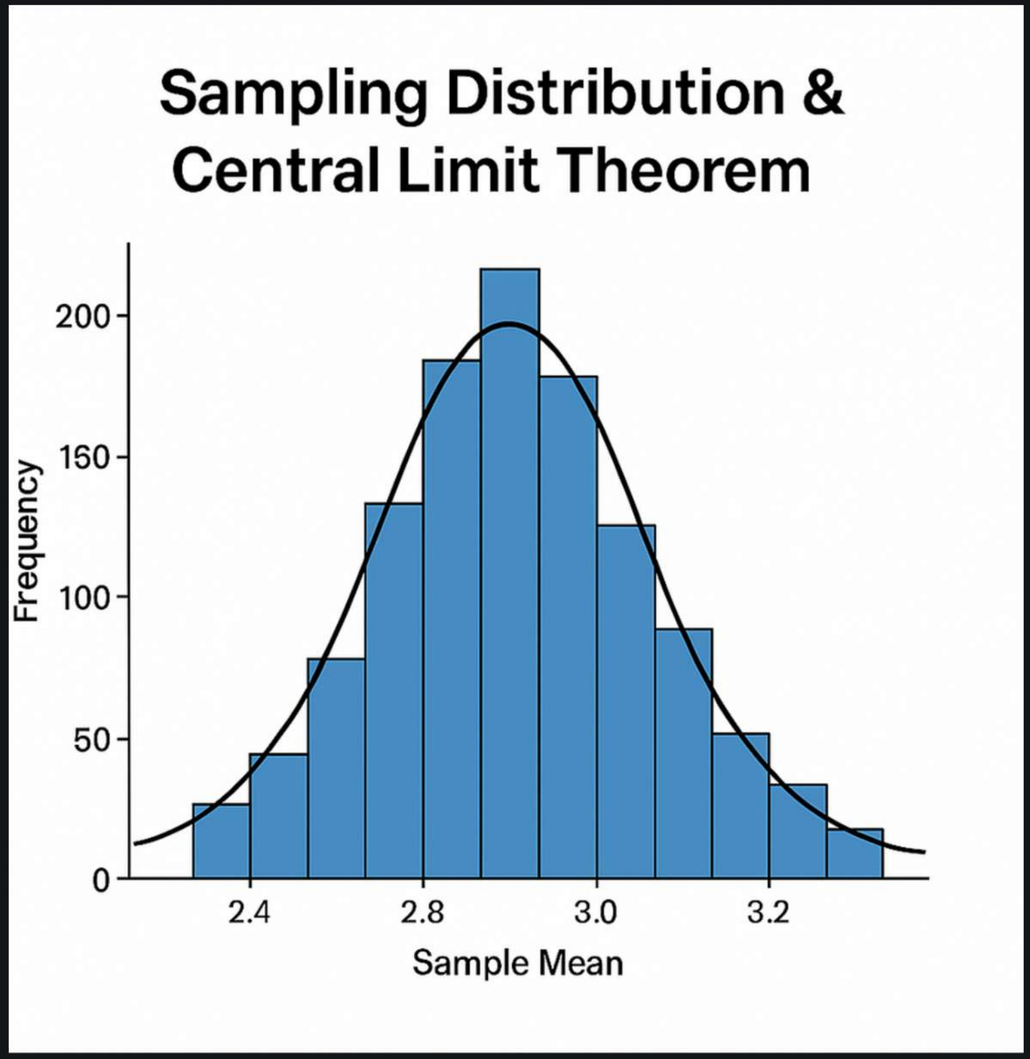
Sampling Distribution and Central Limit Theorem

Sampling Distribution: The histogram of sample means demonstrates an approximately normal distribution.

Analysis:

- The Central Limit Theorem (CLT) states that the sampling distribution of the sample mean will be normally distributed if the sample size is sufficiently large ($n \geq 30$).
- In this case, the histogram shows a clear normal shape, validating the application of the CLT.

Conclusion: This allows us to use normal distribution for inference about the population mean, facilitating reliable hypothesis testing and confidence interval construction



Conclusion: Analysis of Apple Store Reviews

- The median rating of 3 suggests mixed user satisfaction, with many low ratings (mode of 1).
- The range and IQR of purchase amounts show moderate variability in spending behavior.
- Significant variance in likes highlights diverse user engagement with app reviews. A strong positive correlation (0.8425) between likes and ratings suggests that higher-rated reviews attract more likes.
- Hypothesis testing found no significant difference between Instagram and WhatsApp ratings.
- The Central Limit Theorem supported reliable inferences, helping guide improvements in app features and user satisfaction.

thank you

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