Bayesian A/B Test Analysis Report

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Introduction

This report presents the results of a Bayesian A/B test analysis. Bayesian A/B testing provides a more nuanced understanding of the differences between variants compared to traditional frequentist methods. It allows us to quantify our uncertainty about the true conversion rates and make more informed decisions based on the posterior distributions.

Data Description

The analysis includes synthetic A/B test data with 200 samples for each variant. The data simulates a binary outcome (conversion) for two variants, A and B. The true conversion rates are 15% for variant A and 18% for variant B.

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Conversion Distribution by Variant
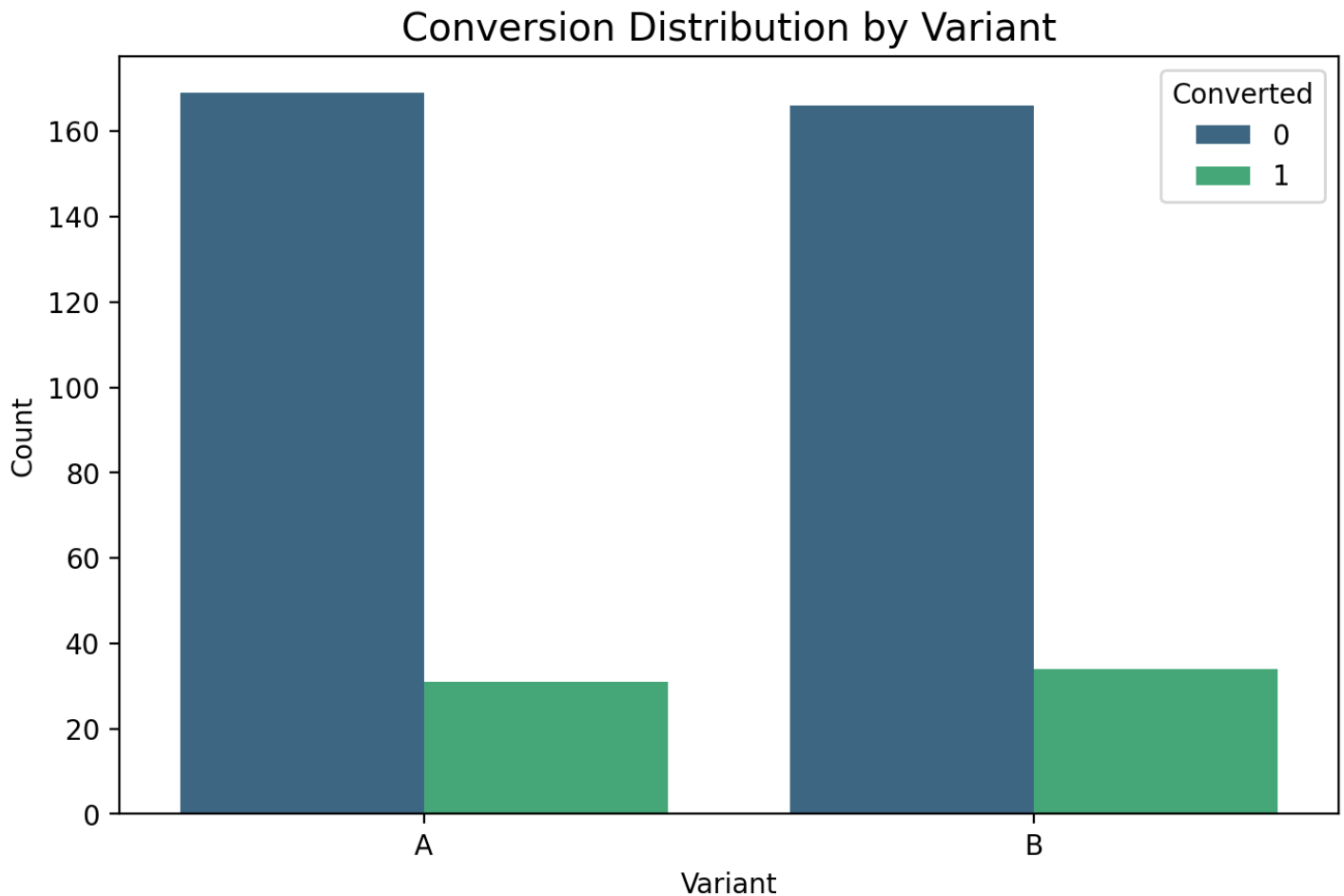
Frequentist Analysis (for Comparison)

The frequentist analysis using a chi-square test resulted in a p-value of 0.7863. This suggests no statistically significant difference between the variants at the 5% significance level.

Bayesian Analysis

The Bayesian analysis provides a more nuanced understanding of the differences between variants. The posterior mean conversion rate for variant A is 0.1593 (95% CI: 0.1135 - 0.2198), while for variant B it is 0.1691 (95% CI: 0.1254 - 0.2198).

The absolute difference between variants (B - A) is 0.0098 (95% CI: -0.0763 - 0.0723). The relative improvement of B over A is 9.58% (95% CI: -34.36% - 56.76%).

The probability that variant B is better than variant A is 61.50%.

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Posterior Distribution of Conversion Rates | Posterior Distribution of Absolute Difference (B - A)
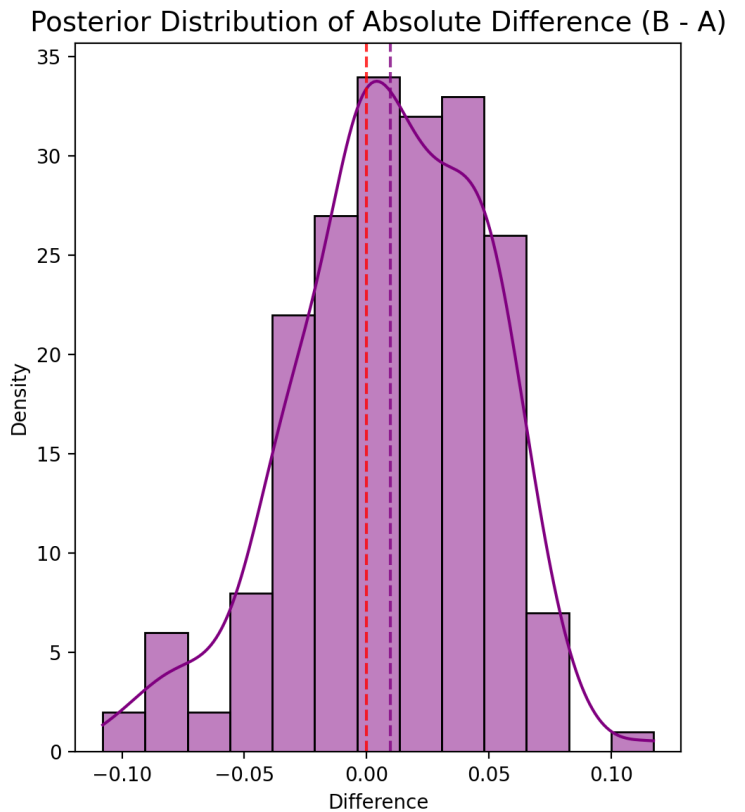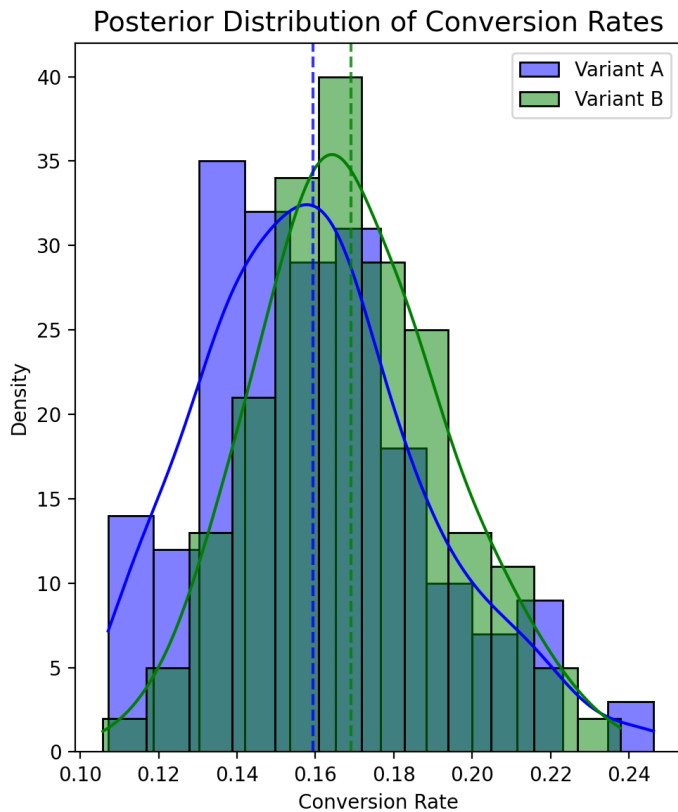
ROPE Analysis

The Region of Practical Equivalence (ROPE) analysis defines a range of values around zero where differences are considered practically equivalent. Using a ROPE of ±0.01, we find:

- Probability of practical equivalence: 22.50%

- Probability that B is practically better than A: 51.00%

- Probability that B is practically worse than A: 26.50%

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## ROPE Analysis for Absolute Difference (B - A)
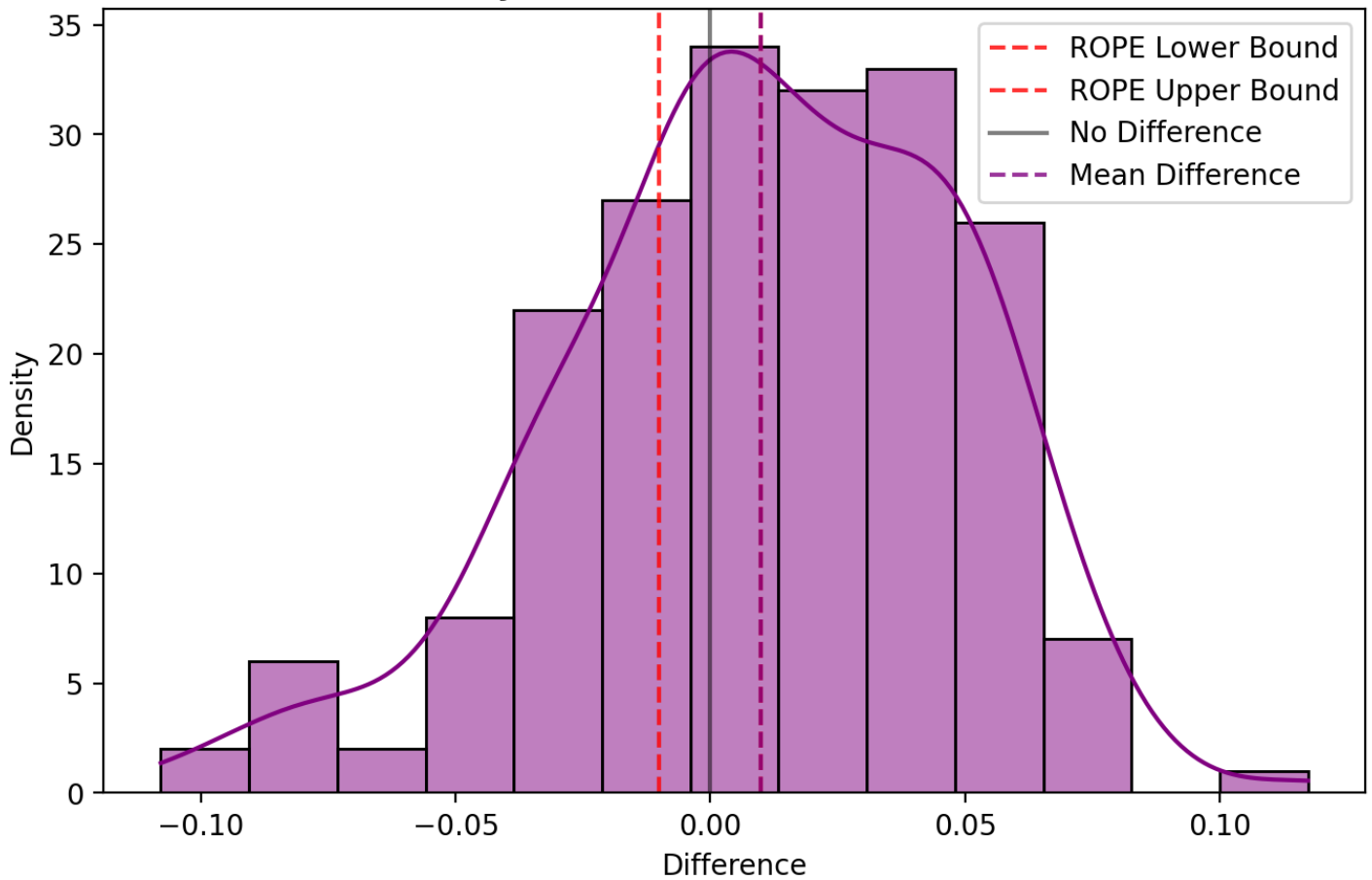
Expected Loss Analysis

The expected loss analysis quantifies the potential cost of making the wrong decision. The expected loss of choosing variant A is 0.020799, while the expected loss of choosing variant B is 0.010963.

Based on this analysis, the recommended variant is B.

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Expected Loss Analysis
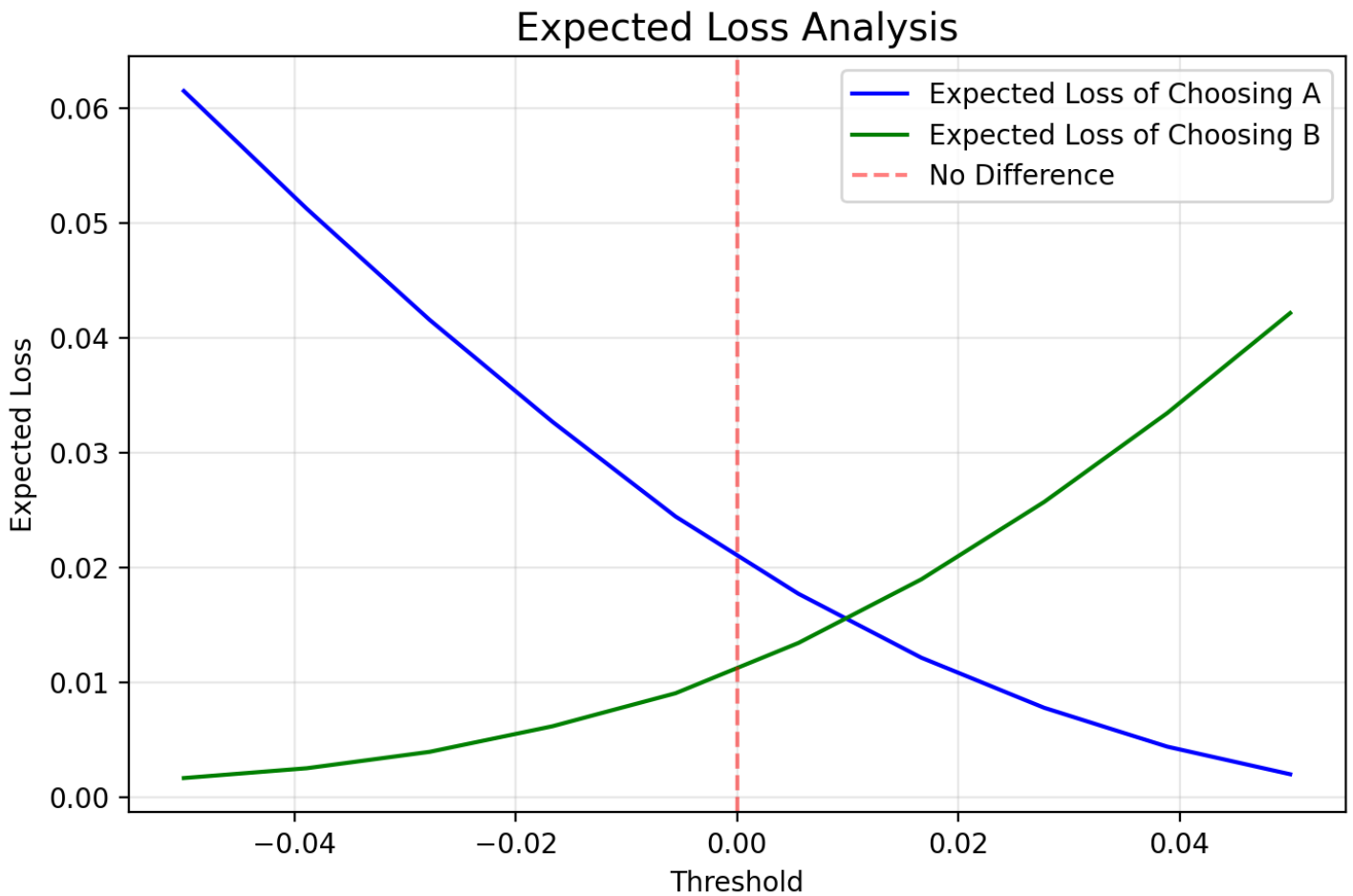
Conclusion

Based on the Bayesian A/B test analysis, we can conclude that:

1. The posterior mean conversion rate for variant A is 0.1593 (95% CI: 0.1135 - 0.2198).
2. The posterior mean conversion rate for variant B is 0.1691 (95% CI: 0.1254 - 0.2198).
3. The probability that variant B is better than variant A is 61.50%.
4. The expected loss of choosing variant A is 0.020799, while the expected loss of choosing variant B is 0.010963.

The recommended action is to implement variant B.