# Campaign Ads Analysis:

## Predicting Optimized Targeted Audience And Increasing Impressions

# Agenda

- Introduction
- Overall Recommendations
- Data Cleaning and Profiling
- Model approaches and results
- Insights
- New to Brand Reach and Optimal Bidding Strategy

# Introduction

"Developing audience targeting strategies that can significantly boost advertisers' reach and engagement, leading to more effective and efficient marketing efforts.

## Goal

- Maximize Viewable Impressions and Clicks
- Maximize New To Brand Reach
- Optimal Bidding Strategy

# Overall Recommendations

- **Prioritize Weekends & Specific Months**
  - Amongst Feb, Mar, Apr, May focus on advertising campaigns on weekends and during February and March

- **Refine Audience Targeting for maximum Reach**
  - Categories : Women's Running Shoes, Foundation Makeup, Sheet and Pillowcase Sets
  - Slots: Desktop and mobile app.

- **Refine Audience Targeting for maximum NTB (New-to-Brand) Reach**
  - Categories : Women's Running Shoes, Foundation Makeup, and Sheet and Pillowcase
  - Slots : Mobileapp / Mobileweb

- **Monitor & Adapt (monitor campaign performance)** for any changes in future.

- **Limitations**
  - There could be changes in optimal bidding and campaign performance based on external factors like economy, future target audience likings, future and historical data.

# Data cleaning And Profiling

- **Dataset Integration**: Merged datasets, removed duplicates by date.
- **Numerical Features**: Filled missing sales/orders with 0.
- **Categorical Features**: Filled missing 'vertical'/'sub_vertical' with 'Unknown', applied one-hot encoding to extract features.
- **Date Feature**: Extracted 'Month' and 'Day' from 'hit_day_utc'.

Note: Data is from Feb to May (we don't have complete data for month of May)

# Model And Evaluation Metrics Used

## Evaluation Metrics

1. **Mean Absolute Error (MAE) -** Average error between actual vs predicted

2. **Mean Squared Error (MSE) -** Like MAE, but squares errors before averaging.

1. **Evaluation Metric R-squared ($R^2$)-**

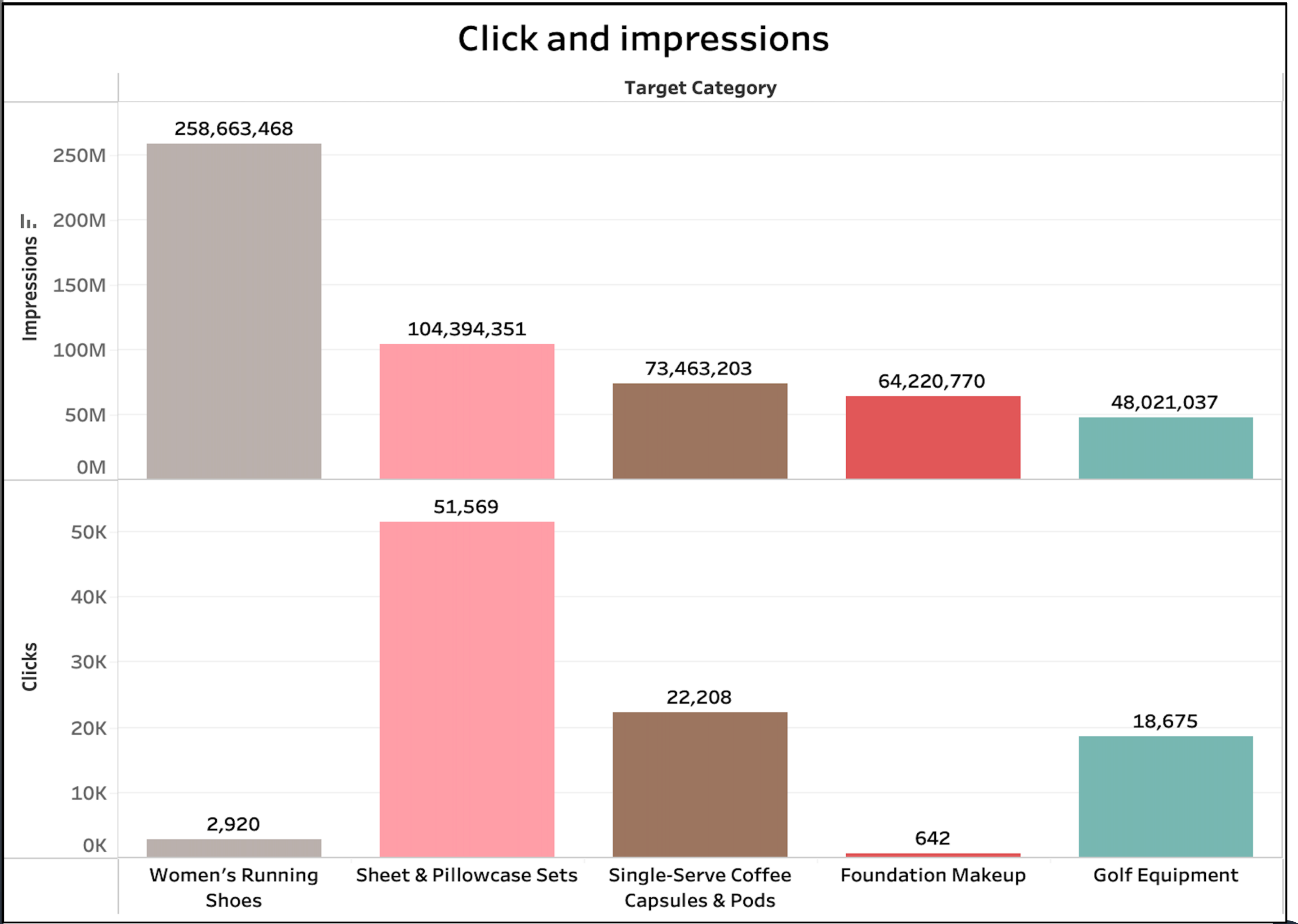
   How well our predictions match the actual data between 0 to 100%

## Model Approaches

**Gradient Boosting Regressor -** Adds new decision models to correct errors made by existing models
**Random Forest Regressor -** Builds multiple decision independently on random subset and averages

Note: For detailed definitions consider checking the documentation in Appendix

# Preliminary Analysis



# IMPRESSIONS

# Targeting for maximum Impressions: Approach

**Objective:-**

- Predicting features influencing Impressions on whole dataset

**Model Selection:-**

- **Model Used:** Gradient Boosting Regressor

**Parameters used and Target variable:-**

- **Filter criteria**: None
- **Target:** Impressions
- **Features:** clicks, placement slot, targeting secondary, vertical, sub vertical, month, day

# Targeting for maximum Impressions

| FEATURES | Feature Importance Results( In decreasing order) |
|---|---|
| **Placement slot** | Offsite mobileapp<br>Offsite Desktop |
| **Targeting category:(Top 5)** | 1. Women's Running Shoes<br>2. Foundation Makeup<br>3. Soap Opera<br>4. Sheet and Pillowcase Sets<br>5. Single-Serve Coffee Capsules & Pods |
| **Month** | 1. March<br>2. February |
| **Day of the Week** | 1. Sunday<br>2. Saturday |
| **Model Results** | **R-sq = 64.45%**<br>**MAE = 1,252.09**<br>**MSE = 5,092,641.23** |

# Optimized targeting for viewable Impressions

| | **Approach 1** | **Approach 2** |
|---|---|---|
| **Objective** | Predicting features influencing impressions where some products were sold from views | Predicting features influencing impressions where there has been some clicks |
| **Model Selection** | Random Forest Regressor (better R-sq and less error) than Gradient Boosting | Random Forest Regressor (better R-sq and less error) than Gradient Boosting |
| **Dataset Filter** | view_attributed_units_sold > 0 (blanks treated as 0) | clicks > 0 |
| **Target** | Impressions | Impressions |
| **Features** | clicks, placement slot, targeting secondary, month, day | clicks, placement slot, targeting secondary, month, day |

# Optimized targeting for viewable Impressions

## Feature Importance Results(In Decreasing order )

| FEATURES | Dataset with View attributed units sold > 0 | Dataset with Clicks > 0 |
|---|---|---|
| **Placement slot** | Mobile App<br>Mobile Web | Offsite Desktop |
| **Targeting category: (Top 5)** | 1. Women's Running Shoes<br>2. Foundation Makeup<br>3. Soap Opera<br>4. Sheet & Pillowcase Sets<br>5. Home & Kitchen | 1. Sheet and Pillowcase Sets<br>2. Women's Running Shoes<br>3. Kid's Electronics<br>4. Single-Serve Coffee Capsules & Pods<br>5. Foundation Makeup |
| **Month** | 1. February<br>2. March | 1. February<br>2. March |
| **Day of the Week** | 1. Sunday<br>2. Saturday | 1. Sunday<br>2. Saturday |
| **Model Results** | **R-sq = 84.60%**<br>**MAE = 733.30**<br>**MSE = 3,243,257** | **R-sq = 92.22%**<br>**MAE = 542.57**<br>**MSE = 1,748,221** |

# CLICKS

# Optimal targeting for maximum Clicks: Approach

**Objective:-**

- Predicting important features influencing clicks

**Model Selection:-**

- **Model Used:** Gradient Boosting Regressor

**Parameters used and Target variable:-**

- **Filter criteria**: click are at least 1( 58674 records)
- **Target:** Clicks
- **Features:** impressions, placement_slot, targeting_secondary, vertical, sub_vertical, month, day

# Optimal targeting for maximum Clicks

| FEATURES | Feature Importance Results( In decreasing order) |
|---|---|
| **Placement slot** | Offsite desktop<br>Offsite mobile web |
| **Targeting category:(Top 5)** | 1. Sheet and Pillowcase sets<br>2. Single-Serve Coffee Capsules & Pods<br>3. Pipe Fittings & Pipes<br>4. Golf Equipment<br>5. Bed Pillows & Positioners |
| **Month** | 1. February<br>2. March |
| **Day of the Week** | 1. Saturday<br>2. Sunday |
| **Model Results** | **R-sq = 74.15%**<br>**MAE = 1.22**<br>**MSE = 3.98** |

# Key Insights: Top features for better reach

Below are the features to focus to maximize impressions and clicks based on previous approaches

## Placement Slot

Offsite Desktop

Offsite mobile app

## Targeting Categories

**Impressions:**

Women's Running Shoes
Foundation Makeup
Soap Opera
Sheet and Pillowcase Sets
Kid's Electronics

**Clicks:**

Sheet and Pillowcase sets
Single-Serve Coffee Capsules & Pods
Pipe Fittings & Pipes

## Seasonality

**Month:**
March, February

**Day of week:**
Sunday and Saturday

# NEW TO BRAND REACH

# Maximizing “new to brand” reach: Approach

**Objective:-**

- Predicting 'New To Brand' reach through impressions where some NTB products have been sold

**Model Selection:-**

- **Models Used:** Random Forest and Gradient Boosting Regressor
- **Model Selected:** Random Forest Regressor (less error and better R-sq)

**Parameters used and Target variable:-**

- **Filter criteria**: ntb_view_attributed_units_sold is not ‘0’ and not in blank
- **Target:** ‘impression’
- **Features:** targeting_secondary, placement_slot, month, day

# Maximizing “new to brand” reach

## Feature Importance Results

| FEATURES | Feature Importance Results( In decreasing order) |
|---|---|
| **Placement slot** | Offsite mobileapp<br>Offsite mobileweb |
| **Targeting category:(Top 5)** | 1. Women's Running Shoes<br>2. Foundation Makeup<br>3. Sheet and Pillowcase Sets<br>4. Home & Kitchen<br>5. Oral Care Products |
| **Month** | 1. March<br>2. February |
| **Day of the Week** | 1. Sunday<br>2. Saturday |
| **Model Results** | **R-sq = 79.24%**<br>**MAE = 904.47**<br>**MSE = 4,553,859** |

# OPTIMAL BIDDING

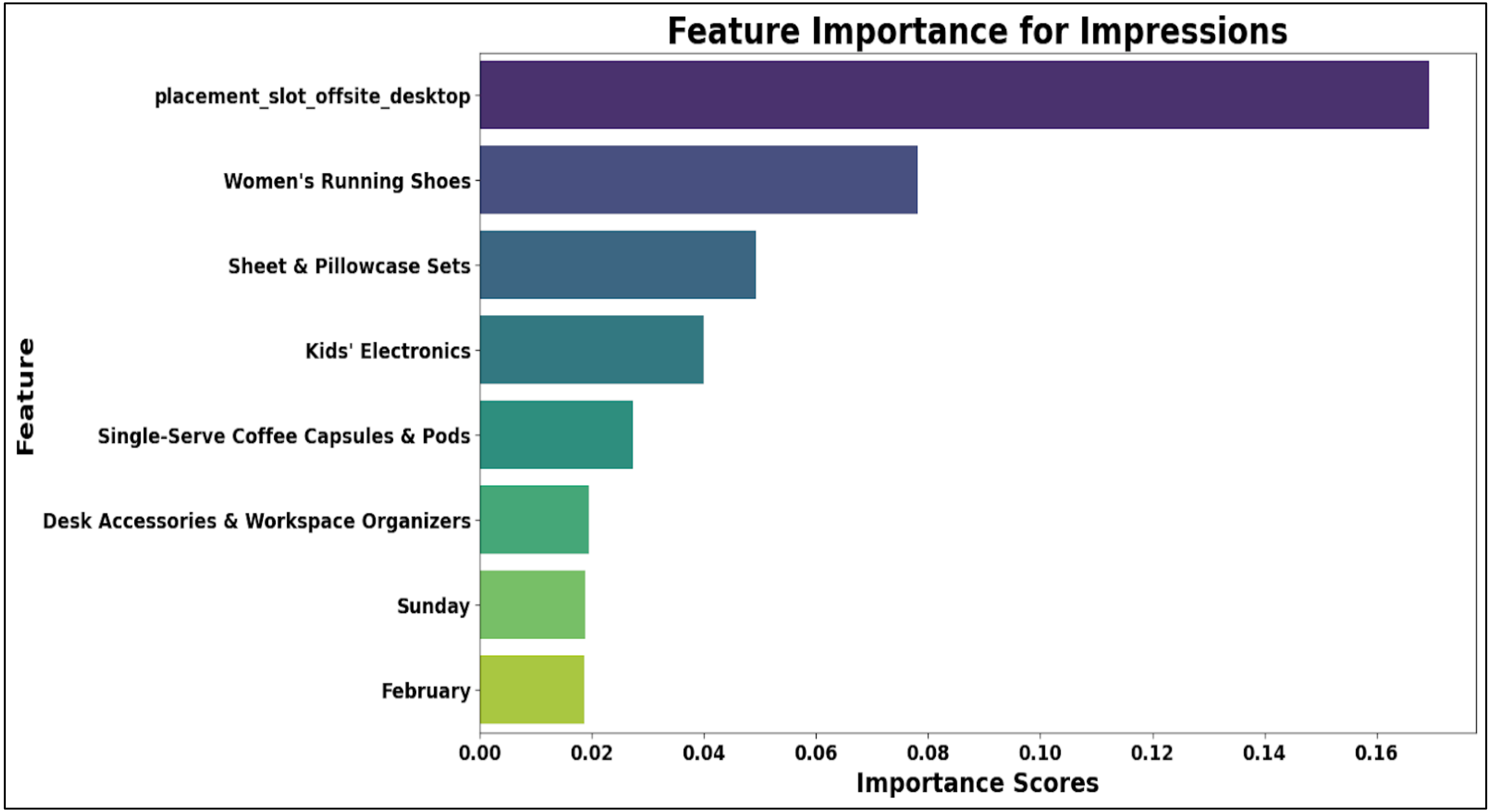
# Optimal Bidding Strategy: Approach

## Objective:-

- Predicting features for optimal bidding through maximum impressions with at least one click.
- Increased bidding on a combination of these top features based on importance and applied on Adjusted Cost to see difference

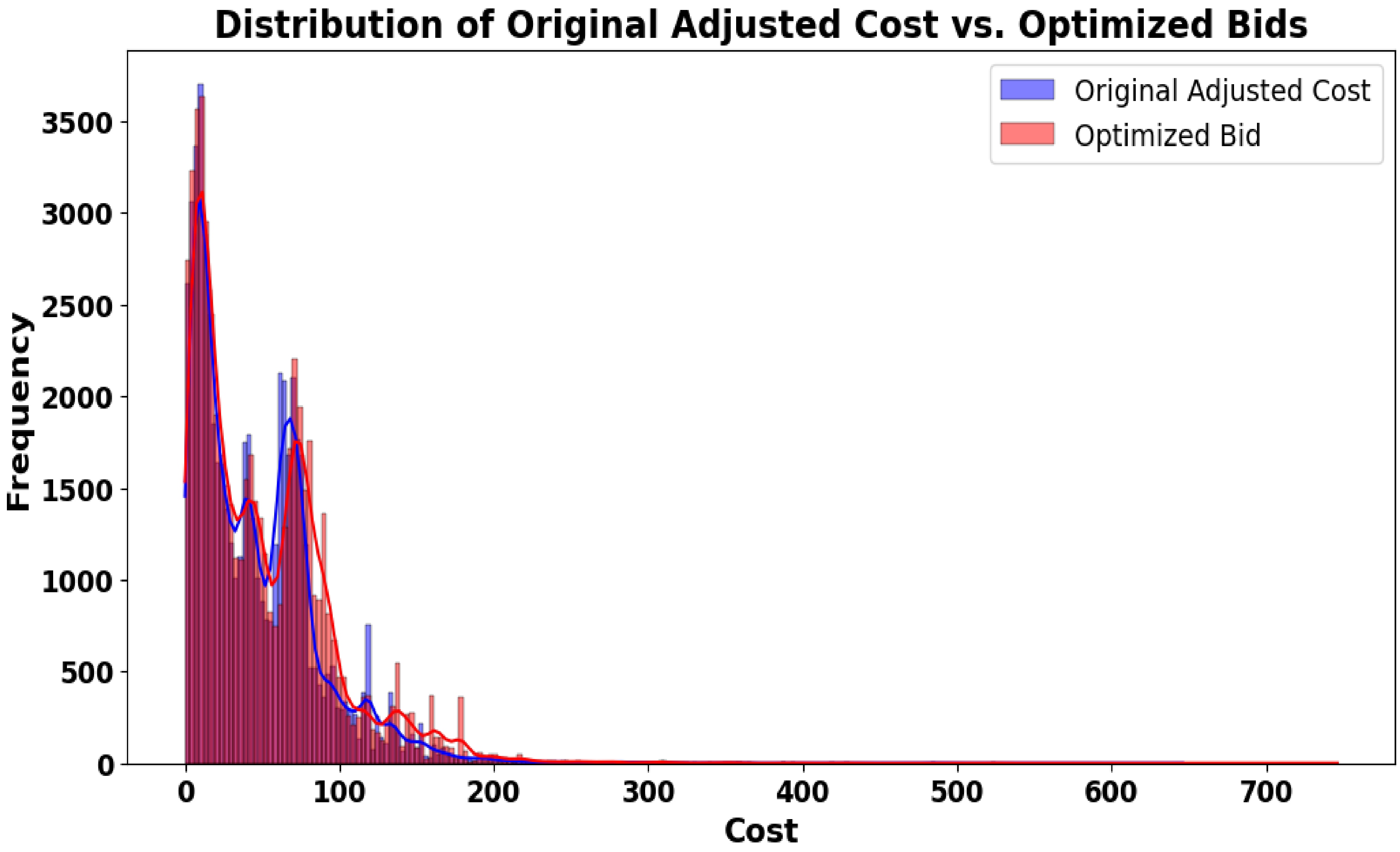
| | |
|---|---|
| • **Model: Random Forest Regressor**<br><br>• **Filter criteria**: Click is > 0<br>• **Target:** Impressions<br>• **Features:** 'Clicks', 'targeting_secondary', 'placement_slot', 'month', 'day' | **Results**:<br><br>**R-sq = 92.18 %**<br>**MAE = 542.57**<br>**MSE = 174,221** |

# Features To Consider for Bidding




Note: For detailed analysis consider checking the documentation in Appendix

# Bidding Strategy Implementation




- **Incrementing Adjusted Cost based on feature Importance:**
  - **Placement Slot**: +10% for offsite desktop
- **Top 5 Categories**:
  +5%, 4%, 3%, 2%, 1%
- **Month**: +5% for February
- **Day**: +5% for Sunday

# Thank you!
# Q & A

# Appendix

- Submitted document and code in Assignment to supplement this presentation.

- Documentation link