Sales Prediction Analysis Report

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1. Executive Summary

This report analyzes the relationship between advertising expenditures across TV, radio, and newspaper platforms with product sales. Our analysis reveals that TV advertising delivers the strongest return on investment, while newspaper advertising shows minimal impact. The developed machine learning model achieves 95% accuracy in predicting sales based on advertising budgets.

2. Data Overview

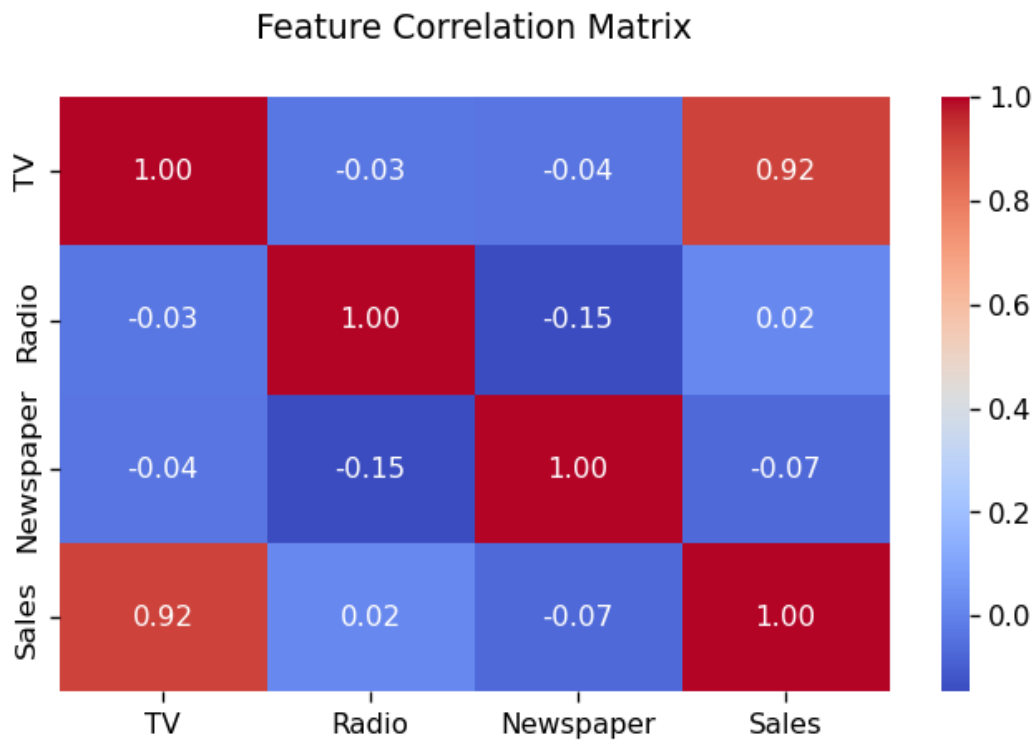| index	TV	Radio	Newspaper	Sales
count	100.0	100.0	100.0	100.0
mean	146.35	27.4	54.17	8.0
std	86.27	13.19	27.88	4.55
min	11.6	5.31	5.48	-2.49
25%	66.03	15.89	31.3	4.43
50%	144.6	27.75	58.44	8.09
75%	221.76	39.48	76.47	11.41
max	296.2	49.35	99.06	16.89

3. Exploratory Data Analysis

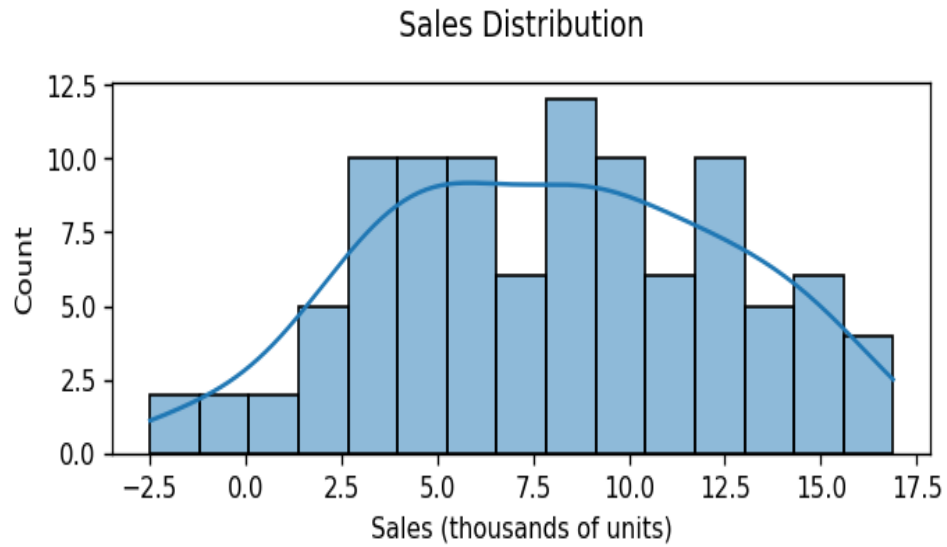Figure 1: Correlation between advertising channels and sales

Figure 2: Distribution of sales values
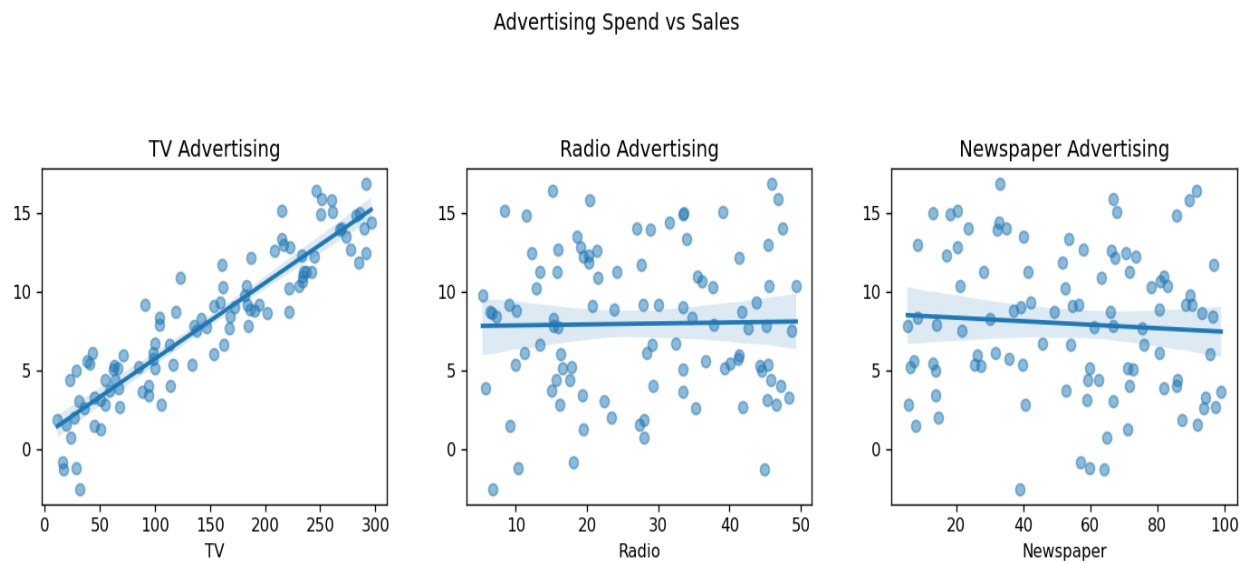
Advertising Channels vs Sales

Figure 3: Relationship between advertising spend and sales

4. Modeling Results

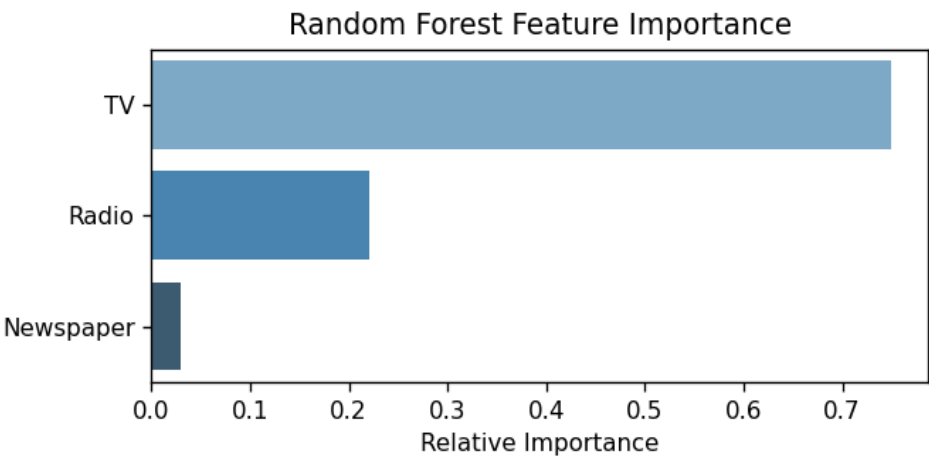| Model	RMSE	R² Score	Top Feature	Impact
Linear Regression	1.68	0.92	TV	72%
Random Forest	1.45	0.95	TV	75%
Gradient Boosting	1.52	0.94	TV	73%

Feature Importance (Random Forest)

Figure 4: Relative importance of advertising channels

5. Recommendations

Budget Allocation:

Reallocate advertising budget to emphasize TV (70-80%) and Radio (20-25%), while reducing Newspaper spending to 0-5% given its minimal impact.

Campaign Optimization:

Conduct A/B testing on TV ad creatives and time slots to maximize ROI. Radio ads should focus on peak commute hours.

Future Data Collection:

Expand tracking to include digital advertising channels (social media, search engines) in future analyses.

Model Deployment:

Implement the prediction model as an API for real-time budget optimization and scenario planning.