Project Title: Marketing Spend Effectiveness Analysis Using Statistical Techniques

Project Overview: This project explores the effectiveness of various marketing channels using a comprehensive campaign performance dataset (~200,000 records). The focus is on uncovering statistically significant differences in conversion rates, click-through rates (CTR), and cost-efficiency across multiple channels such as Social, Email, and Search.

PACE Strategy Document

Phase 1: PLAN

Objective: To evaluate the effectiveness of marketing channels and guide budget allocation decisions using statistical analysis.

Key Questions: - Which marketing channels yield the highest conversion and click-through rates? - Are differences in performance across channels statistically significant? - What is the ROI per channel?

Tools: - Python (Pandas, NumPy, Matplotlib, Seaborn, SciPy, Statsmodels) - Power BI (for visualization)

Data Overview: - Fields include: Channel, Impressions, Clicks, Conversions, Cost, Revenue, Date

Phase 2: ANALYZE

Step-by-Step Analysis Plan:

1. **Data Cleaning & EDA:**
    - Check for nulls, duplicates, inconsistent values
    - Convert data types (e.g., date)
    - Distribution plots for Impressions, Clicks, Conversions
    - Correlation matrix for numeric variables
2. **Descriptive Statistics:**
    - Mean, median, std dev for each channel's metrics
    - Aggregated KPIs: CTR = Clicks/Impressions, CVR = Conversions/Clicks, CPC = Cost/Clicks, CPA = Cost/Conversions
3. **Probability & Sampling:**
    - Estimate conversion probability for each channel
4. **Confidence Intervals:**
    - Calculate 95% confidence intervals for CTR and CPA.
5. **Hypothesis Testing:**
    - One sample tests for CTR and CPA.
    - Interpret p-values for significance

6. **Inferential Insights:**
    - Compare which channel has statistically higher performance
    - Identify underperformers that might need revisiting or budget reduction

Phase 3: CONSTRUCT

Data Modeling (optional): - Linear regression model to predict revenue based on impressions/clicks/spend - Identify multicollinearity (VIF), test assumptions

Power BI Dashboards: - Channel Performance Overview (CTR, CVR, CPC) - Conversion Funnel Visualization - CI Bar Charts comparing channel metrics - ROI heatmap by month & channel

☑ Phase 4: EXECUTE

Deliverables: - Cleaned dataset - Python Jupyter Notebook - Power BI Dashboard - Project Report (Word/PDF) - GitHub Repository - LinkedIn Summary Post

Stakeholder Actions: - Reallocate spend towards high-ROI channels - Optimize or pause underperforming campaigns - Plan A/B tests to refine channel strategies

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Project Proposal / Scope of Work

Title: Data-Driven Optimization of Marketing Channels using Statistical Analysis

Prepared by: Shijin Ramesh, Data Analyst

Client: Prospective Employer / Portfolio Showcase

Goals: - Statistically evaluate channel performance - Create actionable recommendations for budget reallocation - Present results using Python and Power BI

Project Timeline: 2 weeks - Week 1: EDA, Statistics, Confidence Intervals, Hypothesis Testing - Week 2: Modeling, Dashboarding, Reporting, GitHub

Business Value: This analysis will help stakeholders make data-backed decisions on where to increase, reduce or maintain ad spend, ultimately improving marketing ROI.

Next Steps: Begin Phase 1 by loading the dataset, running EDA and documenting initial observations.
