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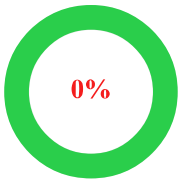

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ARTS, COMMERCE AND SCIENCE

COLLEGE

NEW PANVEL (Autonomous)

PROJECT ON

PREDICTIVE MODELING FOR SMARTPHONE PURCHASE BEHAVIOR

DEVELOPED BY

Mr. Mandar Sanjay Kajbaje

UNDER THE GUIDANCE OF

Mr. Aakif Shaikh

AADEMIC YEAR

2025-2026

CERTIFICATE

This attests to the project proposal's eligibility

“PREDICTIVE MODELING FOR SMARTPHONE PURCHASE BEHAVIOR”

Is successfully completed by Mr. Mandar Sanjay Kajbaje , Roll No: 36 ,Examination No: CS25643 under the guidance of Mr. Mr. Aakif Shaikh during the academic period of 1 July 2023 to 15 May 2024 as per the syllabus, fulfilment for the completion of the TYBSC CS (Semester – V) degree in the Computer Science of University of Mumbai . It is also to certify that this is original work of the candidate done during the academic year 2025-2026.

Place: New Panvel

Date:

Project Guide Head of Department

External Examiner Principal

ACKNOWLEDGMENT

It is indeed a matter of great pleasure and proud privilege to be able to present this project on "Project Parallax — Predictive Modeling for Smartphone Purchase Behavior."

I would also like to express my deep regards and the gratitude towards the principal Prof. Dr. S.K. Patil.

I respect and thank Head of the department Miss.(Dr) S. A. Kamble , for providing me an opportunity to do the project work and giving me all the support and guidance. Also, I would like to tender our sincere thank to all the teachers for their co-operation.

The completion of the project work is a milestone in student life and it execution is inevitable in the hands of guide. I am highly indebted the projects guide Mr. Aakif shaikh for his invaluable guidance and appreciation for giving form and substance to this report. This initiative has a feeling of direction and purpose because of his persistent efforts, patience, and enthusiasm, which have finally led to its success.

I would Wish to thank the non - teaching staff and my friends who have helped me.

Really it is highly impossible to repay the dept of all the people who have me all the time in one way or the other directly or indirectly helped me for performing the project.

Plagiarism Report (SelfAttested)

I, Mandar Kajbaje, hereby declare that this project report is my original work. Wherever contributions of others are involved, due acknowledgment has been made. I have checked this report using a plagiarism detection tool and confirm that the overall similarity index is within acceptable limits.

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1. ABSTRACT

The rapid evolution of the smartphone market demands datadriven strategies for customer acquisition, product positioning, and feature optimization. This project presents an endtoend predictive modeling system that estimates the probability of a user purchasing a smartphone based on demographic, behavioral, financial, and preferenceoriented attributes.

An interactive dashboard (SmartPredict) was developed using a Flask backend and JavaScriptbased visualization layer to democratize access to insights. The machine learning pipeline incorporates data cleaning, feature engineering, supervised classification (Random Forest core with extensible ensemble design), and interpretability via feature importance analytics.

Beyond raw prediction, the system reveals influential factors such as age, income, prior purchase behavior, and brand loyalty patterns. The platform supports scenario simulation, comparative brand analysis, and strategic decision assistance.

This report details the theoretical grounding, system design, implementation methodology, evaluation metrics, and future expansion pathways (e.g., SHAP explainability, streaming ingestion). The work demonstrates practical integration of machine learning, analytics engineering, and usercentric visualization for actionable consumer intelligence.

2. INTRODUCTION

2.1 Problem Context

Smartphone adoption cycles are increasingly influenced by compound interactions among price sensitivity, income level, generational preferences, perceived feature innovation, and marketing exposure. Organizations require predictive intelligence to allocate budget, personalize offers, and refine product development. Manual heuristics fail to scale across multifeature behavioral datasets; hence an automated, interpretable predictive system is essential.

2.2 Project Objective

To design, develop, and deploy an interpretable machine learning system that predicts smartphone purchase likelihood for an individual profile while simultaneously providing analytical layers for demographics, brand comparison, and strategic insight generation.

2.3 Scope

Includes: data preprocessing, feature engineering, model training, evaluation, dashboard integration, brand analytics, interpretability (global feature importances), and extensibility design.

Excludes: live production integration with CRM systems, streaming data pipelines, deep learning experimentation (reserved for future scope).

2.4 Significance

* Business Optimization: Supports targeted marketing and ROI allocation

* Customer Intelligence: Identifies highimpact demographic clusters

* Product Strategy: Highlights tradeoffs in feature prioritization

* Academic Value: Demonstrates full ML lifecycle with reproducibility

2.5 Challenges Addressed

* Data imbalance mitigation

* Categorical encoding consistency

* Avoiding feature leakage

* Generalization monitoring

* Interpretability vs. performance tradeoff

* Userexperience alignment in visualization

2.6 Deliverables

1. Cleaned dataset & preprocessing scripts

2. Trained model artifacts (model.pkl, scaler.pkl, model_columns.pkl)

3. Flask API (/api/predict, /api/feature_importance, /api/compare_brands, /api/dashboard_data)

4. Interactive dashboard sections: Overview, Demographics, Prediction Tool, Brand Comparison, Insights

5. Technical documentation & academic report (this document)

2.7 LITERATURE REVIEW & THEORETICAL BACKGROUND

Predictive Modeling Definition

Predictive modeling applies statistical and machine learning algorithms to historical labeled data to estimate future outcomes —in this case, binary purchase decision (Purchase / No Purchase). Core tasks: variable selection, pattern extraction, probability estimation, generalization validation.

Related Academic & Industry Studies

Prior studies in consumer electronics purchasing emphasize:

* (a) socioeconomic status drives upgrade cadence

* (b) brand loyalty moderates price sensitivity

* (c) age and feature adoption correlate with perceived utility

* (d) ensemble tree models frequently

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