

“Analyzing and Predicting User Behaviour from Mobile Usage Data”

D C Abhinandan , Mr. Vinay Patel G L ,

Assistant Professor P.G. Student, Department of Master of Computer Applications, BIET, Davangere-577004.

abhinandanaabhi52gmail.com, Davangere, Karnataka, India¹ Department of Master of Computer

Applications, BIET, Davangere-577004.

vinaypatel.gl@gmail.com, Davangere, Karnataka, India²

ABSTRACT

One of the prominent effects of the skyrocketing smartphone usage is the creation of numerous behavioural records that open up essential possibilities to understand user interaction patterns and digital engagement. The primary goal of this research shows title is literally self-explanatory that is analyzing and predicting user behaviour from mobile usage data, is to analysis users behaviours in app usage, screen-on time, data consumption, and battery usage through machine learning techniques. The system detects significant patterns and relationships in mobile usage behaviour by categorizing user into different levels of engagement varying from low to high through the use of such algorithms as random forest, K nearest neighbours (KNN), and adaboost, this predictive insight, which are capable of repurposing raw behavioural data into a valuable resource, can be used to optimize mobile experiences, facilitate personalized recommendations, and improve digital well-being.

Moreover, a flask-based web application is a part of the work that shamelessly integrates secure user management, machine learning powered prediction, and data visualization. User scan input their mobile usage features and obtain the predictive output through a simple interface, while administrators have the capability to manage users and FAQs. In order to make the system more understandable, the system also uses visual analytics to show correlations, engagement trends, and distribution insights by calling programmes like flip and seaborn. This undertaking is a shameless and interaction integration of web technologies, artificial intelligence, and data visualization to offer a smart behaviour analysis solution. It plays the way for data-driven decisions that lead to better and more informed mobile usage habits.

INTRODUCTION

Using Mobile Usage to Analyze and Forecast User Behavior Data attempts comprehend how people interact with their mobile devices by analyzing various usage patterns including app activity screen time data consumption and battery usage. The system collects and analyzes this behavioral data analyzed ML techniques like Random Forest K-Nearest Neighbors (KNN) and AdaBoost to identify trends and classify users into low-to-high engagement levels. The analysis offers insights into digital habits and enables predictive models can foresee the future user behavior. With the potential to improve digital well-being optimize app performance and generate customized recommendations the study is an important step toward intelligent data-driven mobile analytics.

This project presents a Flask-based web application that integrates machine learning-driven behavior prediction user management and administrative control. By analyzing user behavior data with an emphasis on mobile device usage habits the system is intended to employ machine learning algorithms to forecast the user's engagement class. The program also provides a feature-rich online interface for administrators and users including registration authentication data visualization and prediction capabilities. It uses HTML templates for view rendering a MySQL or similar database for data storage and retrieval and the Flask framework for Python for backend routing.

I LITERATURE REVIEW

II. EXISTING SYSTEM

Mobile usage data is frequently gathered and examined manually or using simple statistical techniques that lack predictive intelligence in the current system. The majority of apps available today concentrate on monitoring screen time or app usage without offering further in-depth analysis of user behaviour trends. These technologies are unable to categorise involvement levels or forecast future behaviour using machine learning or advanced data analytics. Effective data interpretation is further hampered by users' and administrators' restricted access to interactive dashboards and visual analytics. Because of this, current solutions don't provide intelligent, predictive insights that may enhance user engagement and digital health; instead, they merely provide descriptive statistics.

II PROPOSED SYSTEM

The suggested solution presents a sophisticated, machine learning-based platform that uses mobile usage data to automatically analyse and forecast user behaviour. It uses algorithms like Random Forest, KNN, and AdaBoost to categorise people into various engagement groups according to screen time, data usage, and device attributes. Additionally, the system has a Flask-based online application that offers information visualization dashboards, behaviour prediction tools, and safe login access to both users and administrators. The suggested system provides actionable insights through graphical representations in addition to reliably predicting user interaction through the integration of data preparation, feature analysis, and model evaluation. By converting unprocessed mobile data into useful behavioural information, this clever method encourages healthy digital usage habits and improves decision-making.

III. Feasibility Study

Technical Viability

The suggested system uses Python libraries like pandas, scikit-learn, seaborn, and matplotlib for data analysis, visualisation, and machine learning, as well as contemporary web technologies like Flask for backend development. Custom utility functions manage the database activities, guaranteeing smooth communication with a relational database, most likely MySQL or PostgreSQL. Because it makes use of popular frameworks and libraries, doesn't require any specialised hardware other than a regular server for

hosting, and uses a dataset of mobile usage behaviour to train predictive models, the system is technically possible.

Financial Viability

The project is cost-effective. Standard programming tools, storage for the dataset and visualizations, and a server to host the application are the primary prerequisites. Because Flask and Python are open-source, no commercial software licenses are required. This project is financially viable and cost-effective for academic or small-scale business reasons because implementation costs are mostly restricted to development work and tiny hosting fees.

Viability of operations.

SYSTEM ARCHITECTURE

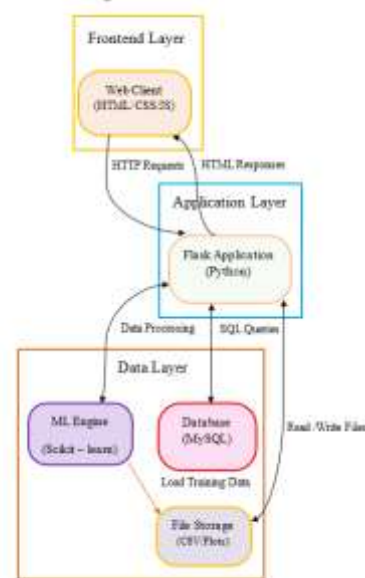


Fig: 4.2.1 Architecture Diagram

IV. IMPLEMENTATION

Proposed Methodology

The recommended methodology of the system includes data collection preprocessing machine learning modeling and web-based deployment. First information about users mobile usage is collected including demographics screen time data consumption operating system device model and app usage. The dataset is cleaned and preprocessed to ensure accuracy and consistency. This includes standardizing categorical features removing duplicates and resolving missing values. Label encoding is used to transform categorical information into a machine learning-friendly numerical

formate. Several models including Random Forest K-Nearest Neighbors and AdaBoost are trained and evaluated using parameters such as accuracy recall precision and F1-score in order to determine which model is best for predictive analysis. The system is created as a web-based application using Flask which enables users to input data about their mobile usage and receive expected behavior classifications and succinct explanations. The system also generates visualizations like distribution plots correlation heatmaps and confusion matrices to illuminate patterns in user behavior. The methodologies emphasis on a data-driven modular and scalable approach makes future improvements possible such as adding more sophisticated models analytics dashboards or expanding the dataset for continuous improvement.

V. RESULT



Figure 8.1.1: Home Page for Behavior Prediction



Figure 8.1.2: Admin Sign in Page

VI. CONCLUSION

Performance testing ensures that predictions and data visualisations are produced effectively even with numerous concurrent users by evaluating the system's responsiveness and performance under various loads. Security testing confirms that session management stops unwanted access and that sensitive information, such as user credentials, is appropriately safeguarded. Lastly, real users engage with the system during User

Acceptance Testing (UAT) to ensure that it satisfies their needs & offers a positive experience. When taken as a whole, these testing methods guarantee that the system is dependable, strong, and prepared for implementation.

VII. FUTURE ENHANCEMENT

There are numerous methods to improve the system's functionality, accuracy, and user experience. In order to improve forecast accuracy, further studies might incorporate deeper learning methods or more advanced models for ML like XGBoost. Additionally, the application might use APIs to track mobile usage in real time, enabling dynamic and ongoing behaviour analysis. Furthermore, adding more varied people and gadgets to the dataset will enhance the generalization of the model. To offer deeper insights and engagement, elements like automated notifications, personalized recommendations, and interactive dashboards can be added to the user interface. Lastly, adding multi-platform support—like cloud-based deployment or mobile apps—would improve accessibility and scalability for bigger audiences.

VIII. REFERENCES

1. . User Behavior Pattern Analysis and Prediction Based on Mobile Phone Sensors; Jiqiang Song, Eugene Y. Tang, Leibo Liu; Lecture Notes in Computer Science (Vol. 6289) – IFIP International Conference on Network and Parallel Computing (NPC 2010); DOI 10.1007/978-3-642-15672-4_16; E-ISSN 1611-3349
2. Prediction of user app usage behavior from geo-spatial data; Xiaoxing Zhao, Yuanyuan Qiao, Zhongwei Si, Jie Yang, Anders Lindgren; Proceedings of the Third International ACM SIGMOD Workshop on Managing and Mining Enriched Geo-Spatial Data (GeoRich'16); DOI 10.1145/2948649.2948656.
3. User demographics prediction based on mobile data; E. Zhong, B. Tan, K. Mo, Q. Yang; Pervasive and Mobile Computing (Vol. 9, Issue 6, 2013); DOI 10.1016/j.pmcj.2013.07.009; ESSN 1574-1192.
4. .Web-Based User Behaviour Analysis and Prediction System Using Machine Learning; K R Yashaswini, Mrs Veena B; International Journal of Progressive Research in Engineering Management and Science (IJPREMS), Vol. 05, Issue 09, September 2025, pp. 123-129; DOI 10.58257/IJPREMS43699; e-ISSN 2583-1062.
5. Predicting Mobile Payment Behavior Through Explainable Machine Learning and Application Usage Analysis; M. Lee, I. Choi, W.-C. Kim; Journal of Theoretical and Applied Electronic Commerce Research (Vol. 20, Issue 2) – 2025; DOI 10.3390/jtaer20020117; E-ISSN 0718-1876.