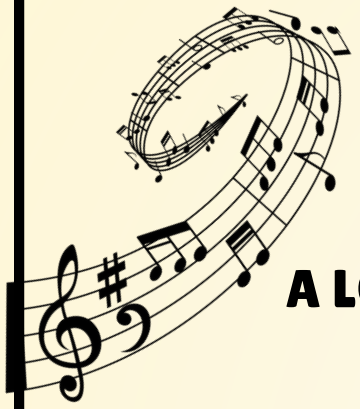

GEOTUNES

A LOCATION BASED MUSIC RECOMMENDATION SYSTEM

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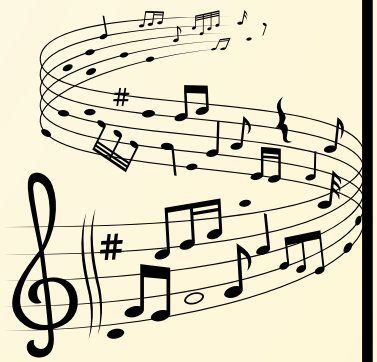

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PROBLEM STATEMENT

With millions of available songs, listeners struggle to find music that matches their current environment, activity, and emotional state.

Existing recommendation engines lack:

- Context-awareness (location, time, surroundings)
- Emotion/vibe detection
- Dynamic playlist generation
- This leads to generic recommendations that often fail to resonate with a user's real-time mood or setting.

GEOTUNES

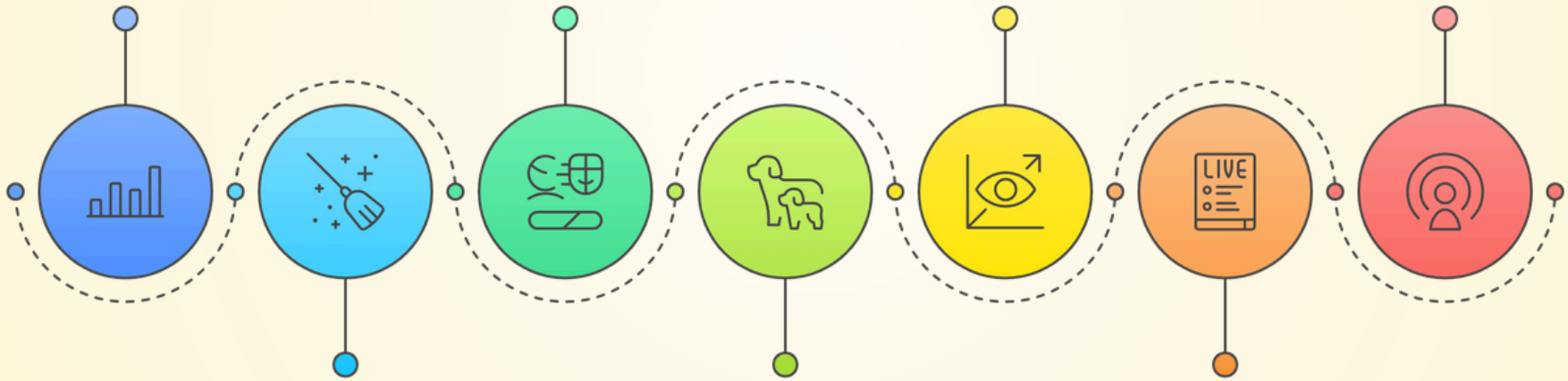
Your Place. Your Vibe. Your Music.

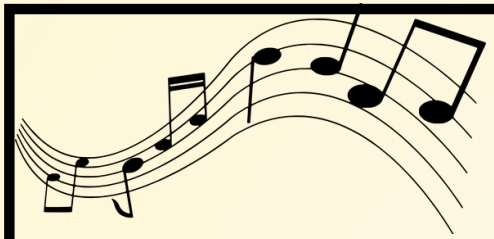
A Smart Web App That Syncs Music with Your Location and Vibe.
Experience melodies that adapt to where you are and how you feel.

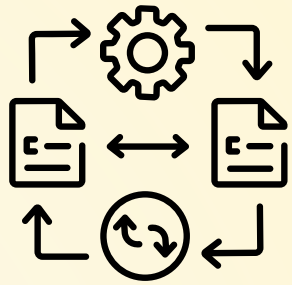
INTRODUCTION

GeoTunes is an intelligent music recommendation system that merges geo-location data, user vibe analysis, machine learning, and real-time personalization to deliver context-aware music suggestions. Unlike traditional music apps that rely solely on listening history, GeoTunes adapts dynamically to where the user is and how they feel, creating a uniquely immersive audio experience.

COMPUTATIONAL WORKFLOW

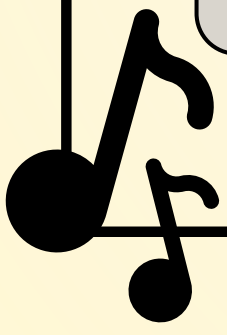


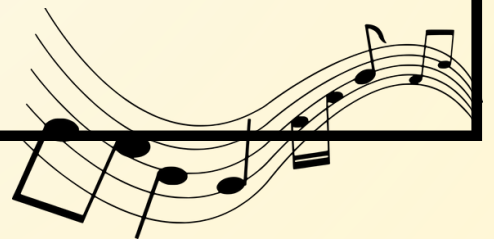




METHODOLOGY OVERVIEW

1. Problem Understanding & Requirement Analysis
2. Dataset Compilation & Label Creation
3. Data Cleaning & Pre-processing
4. Feature Selection
5. Model Training & Evaluation
6. Recommendation Engine Development
7. Full-stack integration with UI





TOOLS & TECHNOLOGIES

1. Programming & ML Stack

- **Python** – Core development language
- **NumPy, Pandas** – Data pre-processing
- **Scikit-Learn** – Model training

2. Frontend Technology

- **Streamlit –** Handles application logic, routing, prediction flow, and user interaction

3. Backend Technology

- **Flask –** Used to manage API endpoints

4. Location & Mapping Services

- **Browser Geolocation API** – Captures real-time latitude and longitude
- **OpenStreetMap (Nominatim API)** – Performs reverse geocoding to obtain city, state, and country details

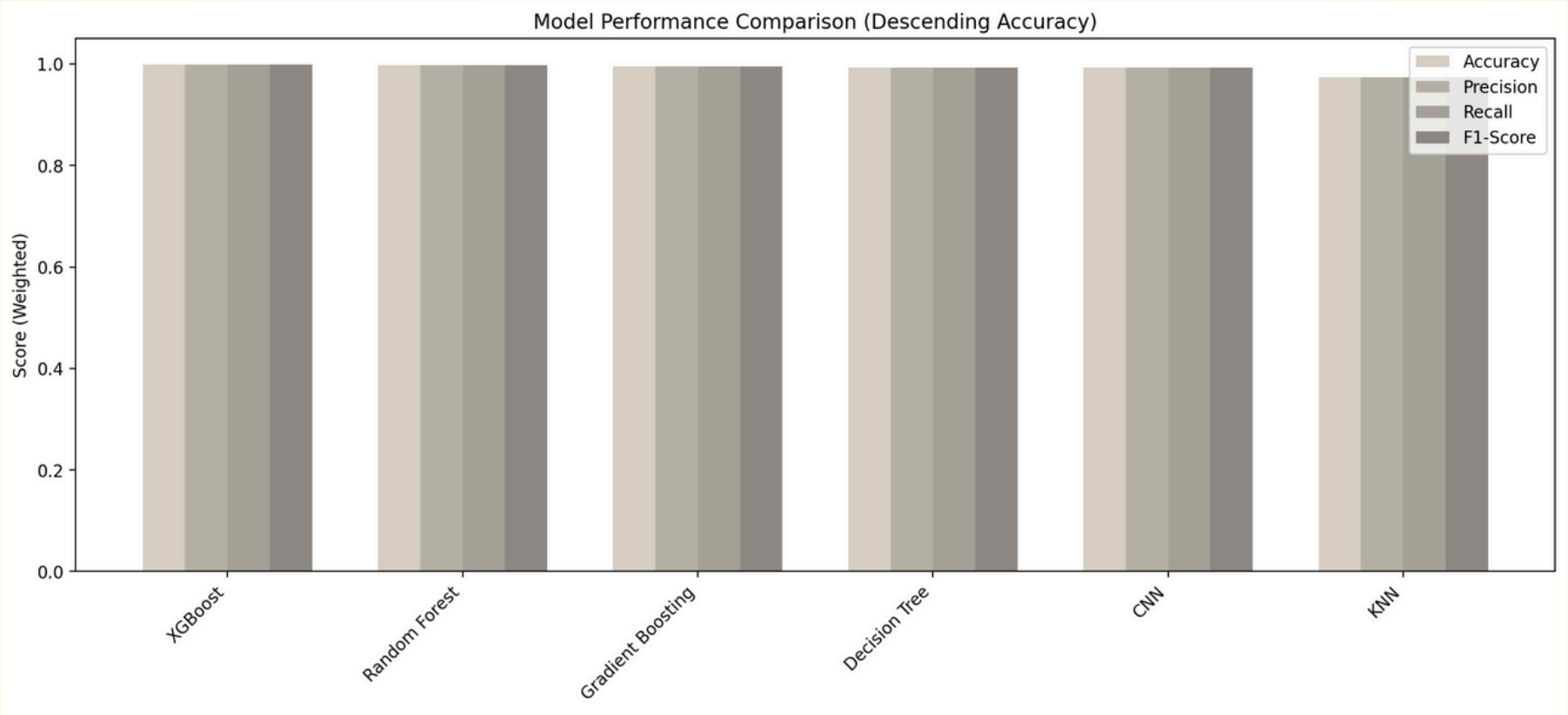
5. Music Storage & Retrieval

- **Google Drive API –** Stores and streams vibe-based audio files dynamically based on prediction results

COMPARISON OF MODELS

Algorithm	Accuracy	Precision	Recall	F1-Score
XGBoost	0.99862	0.99863	0.99862	0.99862
Random Forest	0.99793	0.99795	0.99793	0.99793
Gradient Boosting	0.99517	0.99529	0.99517	0.99518
Decision Tree	0.9931	0.99317	0.9931	0.9931
CNN	0.99241	0.99243	0.99241	0.9924
KNN	0.97308	0.97329	0.97308	0.97305

GRAPHICAL ANALYSIS



RESULTS & FINDINGS

Overview of Model Performance

- Multiple machine learning models were evaluated using Accuracy, Precision, Recall, and F1-Score.
- All models demonstrated high performance, with accuracy consistently above 97%.

Selected Model for Deployment – KNN

KNN - Accuracy 97.3%

- Strong alignment with the dataset's characteristics and the nature of the recommendation task.
- Used for recommendation, not critical decision-making
- Leverages feature proximity, making it well-suited for vibe-driven music recommendation where similarity between data points is critical.

Model Performance Breakdown

1. Best Performing Model

XGBoost – Accuracy: 99.86%

- Demonstrates excellent generalization and stability.

2. Strong & Reliable Models

Random Forest – Accuracy: 99.79%

- Highly consistent and robust.

Gradient Boosting – Accuracy: 99.52%

- Balanced performance with strong predictive capability.

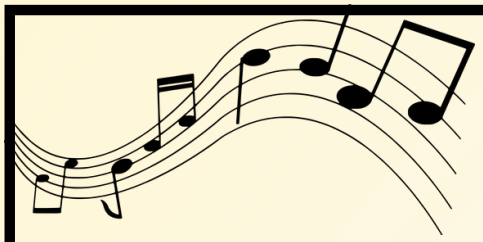
3. Baseline Models

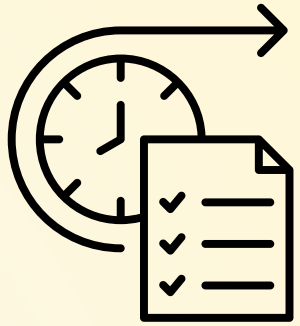
Decision Tree – Accuracy: 99.31%

- Simple and interpretable model with competitive results.

APPLICATIONS

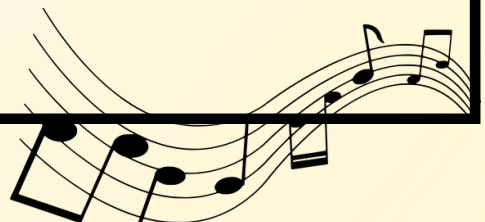
- Personalized Streaming: Creates playlists automatically based on your location and environment.
- Travel & Tourism: Matches music to locations, like beach tunes at the coast or cultural tracks at heritage sites
- Outdoor Activities: Adjusts music for hiking, jogging, cycling, or trekking to motivate or relax you.
- Smart Car Entertainment: Plays music suited to traffic, highways, or scenic drives for mood and safety.
- Entertainment & Media: Curates music for events or locations to enhance ambience.





FUTURE SCOPE OF THE PROJECT

1. Continuous Model Learning using real-time user feedback
2. Multi-feature Vibe Detection (weather, time).
3. User Playlist Uploads and personalized vibe collections.
4. Offline Music Caching for no-internet usage.
5. Google Authentication
6. Cloud Deployment for scalability.
7. Commercial Expansion via subscriptions and music platform partnerships.



SIGNIFICANCE OF THE PROJECT

Technological Significance

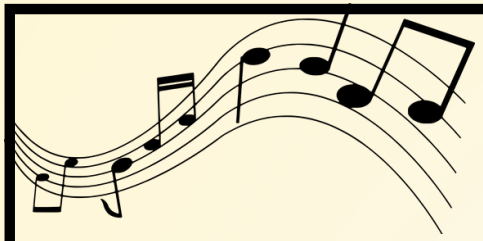
- Real-time context extraction allows the system to convert raw geolocation coordinates into meaningful details like neighbourhood, postcode, city, and state, enabling more accurate contextual ML decisions.
- Fast KNN-based vibe classification predicts environmental moods instantly from latitude–longitude inputs, eliminating the need for user history or stored personal data.
- Integrated API workflow combines browser geolocation, OpenStreetMap Nominatim reverse geocoding, and Google Drive cloud services into a seamless end-to-end pipeline.

Practical & Societal Significance

- Enhances engagement by offering music that adapts to the user's surroundings during travel, outdoor activities, or everyday use.
- Supports context-aware systems like tourism apps, lifestyle platforms, and smart devices that adjust content based on location.

Academic Significance

- Provides hands-on experience connecting ML models to real-time APIs like browser geolocation and reverse geocoding.
- Offers practical exposure to dataset engineering for geo-based classification using large coordinate–vibe datasets.

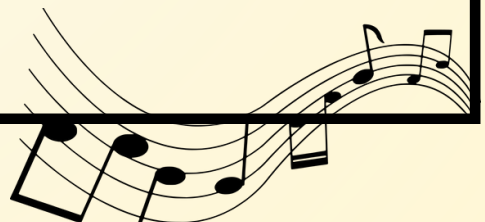


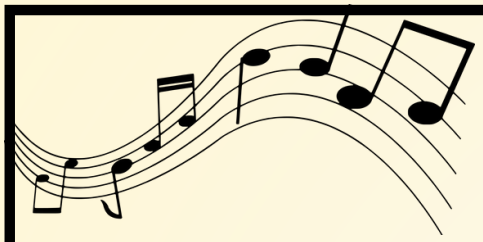
CONCLUSION

The project offers contextual music by intelligently matching playlists to specific locations and vibes, creating a personalized auditory experience.

It enhances engagement by adapting to both the listener's mood and the surrounding environment, resulting in a richer and more immersive experience.

Designed as a scalable prototype, the system is prepared for integration with GPS, AI-driven vibe analysis, and premium features, laying the foundation for a versatile and future-ready music platform.





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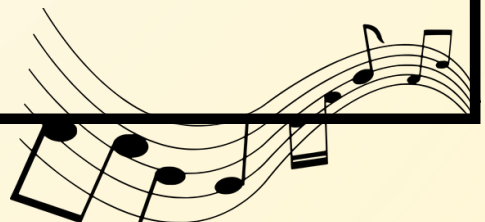
2. S. Chakrabarty, R. Islam, E. Pricop, and H. K. D. Sarma, “An approach to discover similar musical patterns,” *IEEE Access, vol. 10, pp. 47322–47339, 2022.*



Thank You