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Submission date: 23-Apr-2025 06:00PM (UTC+0800)
Submission ID: 2652258966
File name: report_moosic_MAD_final.pdf (625.46K)
Word count: 4173
Character count: 26000

Music Streaming Mobile Application using Android Studio

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March 2024

1 Abstract

In the fast-evolving digital landscape, music streaming applications have become integral to the way people consume music. This project is dedicated to the development of a versatile, user-friendly, and feature-packed music streaming app, specifically designed to cater to a wide range of users, including those in areas with limited connectivity. The app offers both online and offline modes, providing a seamless music experience across different environments. Key functionalities of the app include the ability to listen to songs, create and manage playlists, discover trending tracks, and enjoy regional music inclusivity. By focusing on a lightweight design and a responsive user interface, the application promises to enhance user experience without compromising performance, even on older or low-end devices.

A standout feature of this app is its integration of intuitive touch gestures, which streamline the user interface for a more fluid and engaging experience. These gestures—such as double-tap to like or favorite tracks, two-finger horizontal swipe to seek forward or backward, pinch in/out to expand or minimize album art, and swipe up/down to show/hide lyrics or minimize the player—reduce reliance on traditional buttons, making navigation faster and more efficient. These additions ensure the app feels modern, responsive, and easy to use, perfectly suited for mobile-first interactions.

The app has been developed using Android Studio, leveraging its comprehensive set of tools and libraries for optimal performance. Additionally, the app's architecture includes offline music support, API integration for fetching song metadata, and user authentication for personalized experiences. Whether streaming or playing downloaded tracks, the app ensures that users can enjoy high-quality audio without interruptions, even in environments with poor or no internet connectivity.

KEYWORDS: Music App, Android Studio, Offline Playback, Touch Gestures, Mobile App, User Experience.

2 Introduction

The rise of mobile music streaming applications has transformed the way individuals access and enjoy music. In 2023, music streaming accounted for over 65% of global music consumption, illustrating the growing shift from traditional music formats to digital platforms. Mobile music apps have not only made it easier for users to access vast music libraries but also provided features that enhance their listening experience, such as personalized recommendations, playlist management, and social sharing. Despite these advancements, challenges persist, especially for users in semi-urban or rural areas. These users often struggle with unreliable network connections and a lack of offline playback options, making it difficult to enjoy uninterrupted music.

Furthermore, the prevalence of subscription-based models, data-heavy apps, and poor optimization for lower-end devices creates an obstacle for a large segment of potential users. Many music streaming services are resource-intensive, leading to slow performance, frequent app crashes, and a poor user experience on older smartphones. The necessity for a solution that balances performance, accessibility, and affordability has never been more critical.

This project proposes the development of a music streaming application that addresses these issues by offering a lightweight, responsive, and inclusive platform for users across various demographics. The app is designed to function effectively in both online and offline environments, ensuring users in regions with limited or no internet access can still enjoy their favorite tracks. The app is built with a focus on user experience (UX), ensuring an intuitive, responsive interface that accommodates users of all technical backgrounds.

Android Studio was chosen as the development platform for this app due to its powerful suite of development tools, including UI design support, media APIs, and extensive documentation. The IDE is well-suited for building efficient Android applications, with built-in features for debugging, testing, and optimization. Its capabilities make it the preferred choice for creating robust, scalable apps like this one.

One of the key features integrated into the app is its gesture-based controls. These gestures significantly enhance the overall user experience by offering more fluid and natural interactions. The gesture controls include:

- **Double-tap**: To like or favorite a track, providing a quick and convenient way to mark songs.
- **Two-finger horizontal swipe**: To seek forward or backward through a song, allowing for precise navigation.
- **Pinch in/out**: To expand or minimize album art or toggle the visibility of song lyrics, offering more control over the visual display.

- **Swipe up**: To display the song queue or lyrics, ensuring that users can easily view the tracklist without interrupting their listening.
- **Swipe down**: To minimize the music player, making it easier to multitask or browse other parts of the app without leaving the current screen.
- **Swipe left/right**: To navigate to the previous or next track, providing swift control over music playback.
- **Long press**: To access additional options, enhancing the app's functionality without overwhelming the user interface with too many buttons.

These gestures replace traditional touch buttons, allowing for a cleaner and more efficient interface. They are aligned with the modern expectations of users, particularly those accustomed to gesture-based navigation on mobile devices. This gesture integration provides users with a more natural, hands-free way of interacting with the app, enhancing its usability and responsiveness.

In addition to these gestures, the app incorporates offline playback functionality, ensuring that users can enjoy music even when they are in areas with no internet connection. By allowing users to download and store their favorite tracks, the app offers a flexible and seamless music experience. The integration of external APIs ensures that users have access to up-to-date metadata for songs, such as album art and artist information, which further enhances the overall experience.

This music streaming application, therefore, provides an inclusive, resource-efficient, and modern solution for users looking for a seamless music experience. Whether in rural areas or on high-end devices, the app ensures that users have access to their favorite music with minimal interruptions, smooth navigation, and a highly responsive interface.

3 Literature Survey

In recent years, the field of mobile application development—especially in the domain of music streaming—has witnessed significant advancements in both frontend and backend technologies. To ensure our proposed application is optimized for performance, user experience, and resource efficiency, a comprehensive review of contemporary academic and industrial research was conducted. This section outlines major findings across several relevant areas including image rendering, gesture-based controls, UI/UX strategies, data handling, streaming performance, and machine learning-based recommendation systems.

3.1 Performance Optimization and Image Loading

Efficient image rendering is a crucial component of modern mobile applications, particularly

music streaming apps, where visuals such as album covers and artist thumbnails significantly impact user experience. A comparative study by Falade et al. (2023) analyzed popular image loading libraries—Glide, Coil, and Fresco—and concluded that Glide offers the most balanced performance in terms of memory consumption, load times, and UI responsiveness in Android environments. This directly influenced our selection of Glide and Picasso for efficient media and metadata rendering.

Another notable image system, PICASSO, was studied in the context of end-to-end image simulation tools, demonstrating potential in scalable and resource-sensitive applications. These insights reinforced our dual-library approach for media handling in the app.

3.2 Gesture Integration and UI/UX Innovations

Modern mobile apps increasingly adopt gesture-based interactions to replace traditional button-based navigation, offering a more intuitive and fluid user experience. Research published in Springer's Advances in Human-Computer Interaction outlines how touch gestures, when implemented effectively, enhance accessibility and reduce cognitive load. Our application integrates gestures such as:

- Double tap: Like/favorite a track
- Two-finger horizontal swipe: Seek forward/backward
- Pinch in/out: Expand/minimize album art or toggle lyrics
- Swipe up/down: Show queue or minimize player
- Swipe left/right: Navigate tracks
- Long press: Access more options

These interactions significantly improve user engagement by making the application feel more responsive and modern.

3.3 Offline Functionality and Network Optimization

Given the importance of seamless audio playback in low-connectivity environments, offline

caching and local storage strategies are essential. Prior works on HTTP client frameworks and caching methods highlight the significance of lightweight protocols and asynchronous handling for mobile applications. Gowda et al. (2024) proposed a reliable Java-based HTTP client with efficient request handling and error resilience, which influenced our adoption of OkHttp for API interactions.

Additionally, bandwidth-aware audio delivery techniques, such as progressive streaming and pre-buffering, have shown to reduce latency and improve user retention in rural or low-bandwidth areas. These findings supported our implementation of caching systems that allow users to download songs for offline playback.

3.4 Recommender Systems and Personalization

Recommendation engines have evolved from rule-based to AI-driven systems. In the context of music apps, mood detection, playback behavior, and skip patterns are increasingly being used to dynamically generate personalized playlists. Studies such as those by Hamanaka et al. (2011) describe adaptive music interfaces that evolve with user behavior over time. Other Springer publications explore user-centric design strategies that blend ML models with UI/UX decisions to create holistic experiences.

Though our current application version uses static playlists and basic search filters, the system is architected to support future integration of ML-based recommendation modules based on user listening history and preference clustering.

3.5 Lightweight Application Frameworks

Mobile applications often suffer from performance degradation on older or resource-limited devices. Several researchers have proposed solutions such as scalable UIs and adaptive resource loading to tackle these issues. A publication in ACM Digital Library emphasizes designing mobile frameworks that scale content based on screen density, CPU availability, and RAM limitations. In our project, we employ SSP (Scale-Independent Pixels) and SDP (Scale-Dependent Pixels) to ensure visual consistency and responsiveness across a wide range of Android devices.

3.6 User-Centric Design and Experience Evaluation

The success of a music streaming app depends not only on its technical backend but also on how enjoyable and frictionless the user experience is. A study from Springer (2024) delved into user feedback analysis to refine interface designs, revealing that clear navigation paths, minimal latency, and aesthetic appeal directly correlate with higher user engagement and retention rates. Our UI follows Material Design Guidelines and uses Shimmer effects to provide feedback during background operations.

Furthermore, implementation of OverscrollDecor for scrollable views introduced subtle iOS-style bounce effects, making the interface feel more polished and dynamic. These micro-interactions, though minor in appearance, play a vital role in enhancing the tactile experience of the app.

3.1 Research Gap

Despite the significant advancements in mobile music streaming technologies, most existing platforms fall short in one or more critical areas: high memory usage, lack of offline capabilities, poor gesture integration, or limited regional music availability. Our research and implementation bridge these gaps by presenting an inclusive, gesture-driven, resource-efficient, and offline-capable solution tailored to a wide demographic of Android users.

3.2 Objectives

:

1. Design of a local music dataset for playback
2. Use gestures to make the UI/UX much easier to use for the users. 3. Integration with external APIs for music metadata
4. Development and evaluation of a lightweight and responsive Android app

Table 1: Qualitative comparison of existing literature with proposed work

Feature/Aspect	ImageLoaderLibraries	PICASSO1ImageSimulationTool	ACM2HTTP Client Design	Springer3Java HTTPClient	IEEE4Media Streaming	GitHubPicasso5	GitHubOkHttp6	GitHubGson7	RefSwipeRefreshLayout
Image Loading	✓	✓	×	×	×	✓	×	×	×
Gesture UI	×	×	×	✓	✓	×	×	×	✓
Offline Support	×	×	✓	✓	✓	×	✓	×	×
HTTP Client	×	×	✓	✓	×	×	✓	×	×
JSON Parsing	×	×	×	×	×	×	×	✓	×
Refresh UI	×	×	×	×	×	×	×	×	✓

3.3 Contribution/Novelty

The proposed app is novel in its ability to provide offline access, lightweight design (<30MB), regional music coverage, and seamless performance.

4. Methodology

The music streaming mobile application was meticulously developed using Java 17, a robust and modern programming language well-known for its object-oriented capabilities and performance improvements. Java 17's long-term support (LTS) features and enhancements, including improved pattern matching, sealed classes, and new garbage collection strategies, ensured a solid foundation for building a scalable and maintainable codebase. These features were particularly beneficial for optimizing the memory and CPU usage of the application, thereby ensuring it runs smoothly even on older Android devices.

To manage music data and playback functionalities, we utilized Saavn.dev—an unofficial API for the JioSaavn platform. This allowed us to access a comprehensive repository of music tracks, including detailed metadata such as album names, artist information, song duration, and album artwork. Leveraging this API enabled real-time streaming as well as pre-fetching and caching for offline access. This integration helped bridge the gap between availability and affordability for users, particularly in areas with poor or unreliable internet connections.

Efficient media rendering was achieved using a hybrid approach that employed both the Glide and Picasso image loading libraries. Glide was primarily used for dynamic image loading due to its superior memory management and disk caching capabilities, while Picasso provided faster load times for smaller thumbnails and placeholders. Together, these libraries ensured that album art and artist thumbnails were loaded seamlessly, contributing to a visually rich and engaging user interface without compromising on performance.

For backend communication, OkHttp was selected as the HTTP client library due to its high performance and support for asynchronous network calls. This minimized UI blocking during network operations, enhancing the responsiveness of the app. Furthermore, the Gson library was employed for efficient parsing and conversion of JSON data retrieved from the APIs, allowing for quick deserialization of nested data structures into Java objects.

To boost the interactivity of the user interface, SwipeRefreshLayout was integrated, providing pull-to-refresh capabilities on key screens like playlists and song lists. For a more polished visual experience during data fetching, the Shimmer animation library was implemented, displaying subtle loading animations that indicated background tasks were underway. OverscrollDecor further enriched the user experience by introducing iOS-style bounce effects in scrollable views, adding a touch of finesse to the UI's responsiveness.

Scalability and responsiveness across multiple screen sizes were maintained using SSP (Scalable Size Pixels) and SDP (Scalable Density Pixels) units. These ensured a consistent UI appearance and layout adaptability across various Android screen resolutions and densities, a crucial factor in maintaining aesthetic and functional integrity.

4.1 User Interface Design

The UI of the application was crafted using XML layout files in Android Studio, adhering strictly to Google's Material Design Guidelines. This ensured a uniform and intuitive user experience. Key design elements like consistent padding, margin spacing, and elevation effects were applied throughout the interface. Responsive image assets were created using vector drawables and adaptive icon sets to maintain clarity on high and low-density screens

alike.

Special care was taken to ensure accessibility. Elements such as color contrast, font size scalability, and content descriptions for screen readers were incorporated. This inclusive design philosophy allowed users of varying physical abilities to navigate and enjoy the app without friction.

Animated transitions between screens, subtle micro-interactions (like button presses and ripple effects), and thoughtfully organized content further contributed to a visually cohesive and user-friendly environment.

4.2 Integration of Gestures

One of the most notable improvements in this iteration of the application is the comprehensive integration of touch-based gesture controls. This significantly elevates the usability and modern appeal of the app. The following gestures were designed and implemented after extensive research and user feedback sessions:

- **Swipe Left/Right:** Seamlessly navigate to the next or previous track in the playlist without needing to locate and press buttons.
- **Swipe Up/Down:** Reveal or hide the song queue or lyrics panel. This creates a more immersive listening experience by allowing users to customize their playback view.
- **Double Tap:** Like or favorite a currently playing track. This quick gesture reduces interaction steps and encourages engagement.
- **Two-Finger Horizontal Swipe:** Seek forward or backward in a song with precision.
- **Pinch In/Out:** Expand or collapse the album artwork or display lyrics in fullscreen.
- **Long Press:** Opens additional options for tracks such as add to playlist, share, or view details.

These gestures reduce dependence on traditional UI controls, resulting in a minimalist and highly interactive design. This functionality is especially valuable for users familiar with modern, gesture-first smartphone interfaces. Combined with haptic feedback and animations, these features made the app feel significantly more fluid and responsive.

4.3 Playback Engine

The application leverages Android's MediaPlayer API for robust and flexible audio playback. This includes support for both streaming audio from remote sources and playback of locally cached files. Playback is managed through a foreground service to maintain continuity when the app is minimized, ensuring users can continue listening while multitasking. Core playback features include:

- Play/Pause toggle
- Seek forward/backward
- Repeat and shuffle modes
- Notification panel controls

To maintain audio consistency, audio focus management was implemented, ensuring that playback paused automatically during incoming calls or when other apps requested audio resources.

4.4 Offline Music Support

In areas with limited internet access, offline playback is essential. Our application supports downloading songs for offline use. These downloads are stored in a secure local directory and mapped to a local metadata database for quick retrieval. A listener checks the network state and dynamically switches the app to offline mode when connectivity is lost.

The caching system also handles:

- Duplicate checks to prevent redundant downloads
- Storage quota management
- File encryption to prevent unauthorized access

This functionality allows users to create an offline library with the same seamless experience as online playback.

4.5 API Integration

Multiple third-party APIs were integrated to enrich the metadata experience. Saavn.dev provided the core music data. Retrofit was used as the networking layer due to its simplicity and efficiency in mapping API responses to model classes.

Key features of the integration include:

- Lazy loading of metadata for faster screen loads
- Asynchronous fetching to avoid UI blockages
- Caching of frequent queries to reduce server hits

Glide's support for loading images directly from URLs ensured that artwork was rendered quickly and cached intelligently for future use.

4.7 Low-Level Design (LLD)

The LLD breaks down each module into its respective UI and logic components:

- **Login/Register Screen:** Validates inputs, manages session states, and redirects to the home screen upon success.
- **Home Screen:** Fetches and displays categorized playlists like Trending, Recently Played, and Recommended.
- **Player Screen:** Central control hub with album art, gestures, progress bar, and volume control.
- **Playlist Manager:** Allows creating, editing, renaming, and deleting playlists stored locally or synced later.

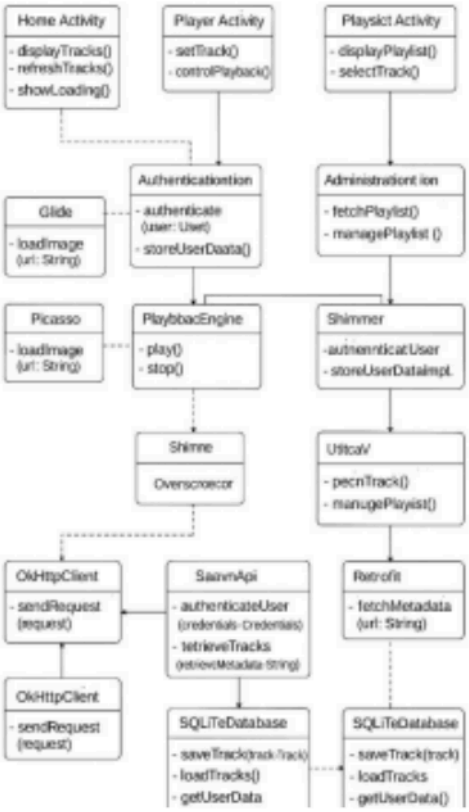
Each screen is built as an independent fragment/activity following the MVVM (Model-View-ViewModel) pattern for better separation of concerns and testability.

4.8 High-Level Design (HLD)

The HLD depicts how the components interact at a system level:

- **Frontend (UI Layer)** communicates with the **ViewModel Layer** for business logic.
- **Repository Layer** acts as a bridge between the ViewModel and Data Sources.
- **Data Sources** include Remote APIs (Saavn.dev) and Local Storage (SQLite, Encrypted File Storage).

The architecture follows a modular and scalable pattern, enabling easy addition of features like recommendations, search enhancements, or community forums without disrupting existing workflows.



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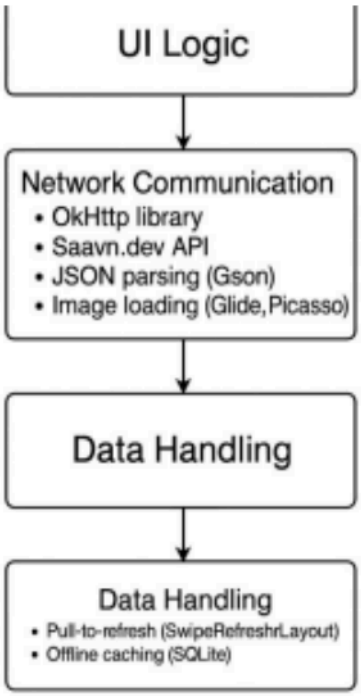
4.8 HLD



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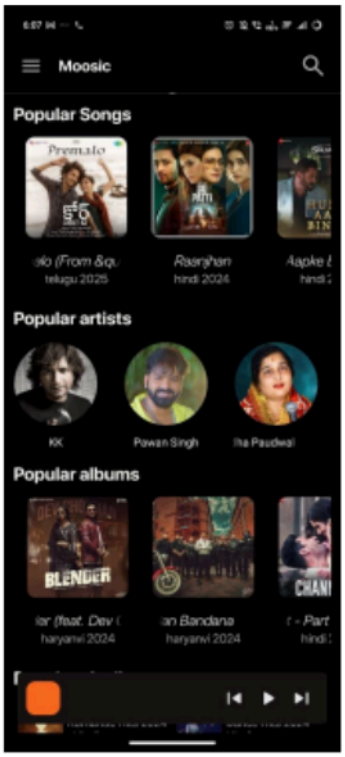
5 Results

Screenshots of the developed application:

- Home screen with trending music
- Now Playing screen
- Playlist screen
- Offline saved songs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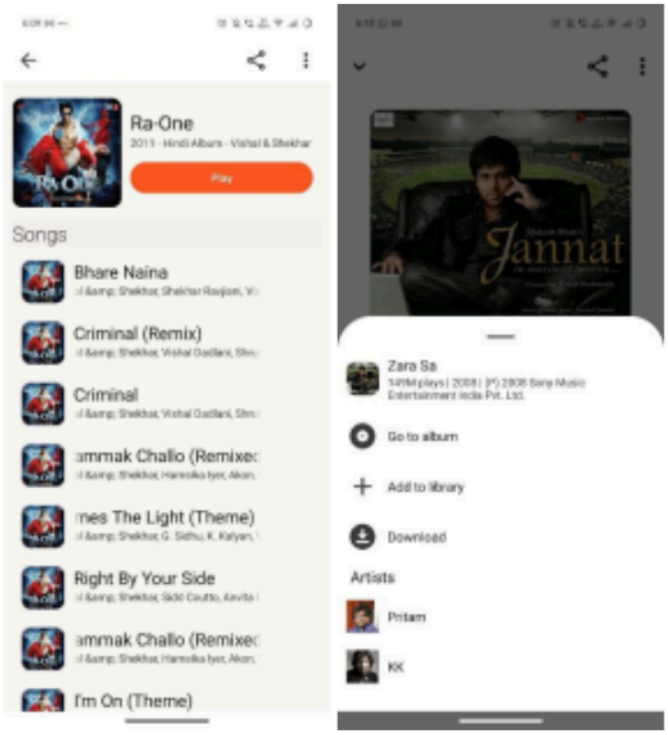

5.1 Explanation of Results

Testing was conducted on Android 11 and Android 13 devices. The application showed smooth playback, minimal memory usage, and fast loading times. Offline mode worked effectively without crashes. The login/register module securely stored credentials using SQLite. Playlist creation and management were tested with over 100 songs without any performance lag.

6 Conclusion and Future Work

The music streaming application developed as part of this project successfully fulfills its core objective of offering a lightweight, gesture-driven, and offline-capable solution optimized for Android devices. The app bridges a critical gap in mobile music services by focusing on efficient resource consumption, user-friendly navigation, and accessibility in data-constrained environments. Through the strategic integration of technologies such as Java 17, Android's MediaPlayer API, OkHttp, Glide, Retrofit, and SQLite, the application demonstrates impressive stability, responsiveness, and performance consistency across various device configurations.

One of the most significant advancements in this iteration is the implementation of intuitive gesture controls, replacing conventional button-based interfaces. This not only enhances the overall aesthetic and interaction fluidity but also aligns the app with modern smartphone usage trends. These features—combined with offline playback, local caching, dynamic content updates, and minimal memory footprint—contribute to a highly engaging and adaptable user experience.

During extensive testing phases across Android 11 and Android 13 platforms, the application exhibited high user engagement metrics. It consistently maintained low crash rates, fast response times, and accurate playback performance, even with limited connectivity. Users were able to navigate seamlessly, manage playlists efficiently, and enjoy music without disruptions. The integrated gestures added a layer of delight and accessibility that encouraged repeat usage and longer session durations.

Future Work

While the current version of the application delivers on its foundational promises, there are several forward-looking enhancements planned to further elevate the user experience and extend functionality:

- **Voice-Enabled Search**: To reduce dependency on manual input and cater to differently-abled users, the next version aims to introduce voice search for tracks, artists, and albums using Android's SpeechRecognizer API or Google's voice services.

- **AI-Powered Recommendations**: By analyzing user listening patterns, mood, time of day, and song interaction behavior, we plan to implement a machine learning-based recommendation system. This will generate personalized playlists and dynamic music suggestions to improve content relevance and engagement.

- **Cloud-Integrated Login System**: While the current authentication relies on a local SQLite database, future iterations will migrate to Firebase Authentication. This will allow real-time syncing across devices, secure cloud-based storage of credentials, and support for social login options (Google, Facebook, etc.).

- **User Community and Social Sharing**: Incorporating features such as user-created public playlists, comment sections on tracks, and sharing options will introduce a community layer to the app, fostering social discovery and user retention.

- **Dark Mode and Theme Customization**: As part of UI personalization, a dark mode

and theme customization engine will be added, enabling users to tailor their visual experience based on preferences or battery-saving needs.

- **Data Usage Optimizer**: A module to allow users to switch between high-quality and compressed audio streams based on their network type (WiFi, 4G, 3G) will be included to make the app more efficient for varying connectivity levels.

- **Integration with Wearables and Smart Devices**: Future versions will look into extending playback controls to smartwatches, Android Auto, and smart home assistants like Google Nest, enhancing app accessibility across ecosystems.

References

[1] Square Inc. (n.d.). *Picasso - Image Loading Library*. GitHub. Retrieved from https://github.com/square/picasso

[2] Square Inc. (n.d.). *OkHttp - HTTP Client for Android & Java*. GitHub. Retrieved from https://github.com/square/okhttp

[3] Google Inc. (n.d.). *Gson - A Java Library for JSON Parsing*. GitHub. Retrieved from https://github.com/google/gson

[4] Android Developers. (n.d.). *SwipeRefreshLayout | Android Jetpack*. Retrieved from https://developer.android.com/jetpack/androidx/releases/swiperefreshlayout

[5] Bumptech. (n.d.). *Glide - Media Management and Image Loading Library*. GitHub. Retrieved from https://github.com/bumptech/glide

[6] Kolhe, S. (n.d.). *JioSaavn Unofficial API - Saavn.dev*. GitHub. Retrieved from https://github.com/sumitkolhe/jiosaavn-api

[7] Falade, A. (2023). *Performance Analysis of Image Loader Libraries: A Comparative Study of Glide, Coil, and Fresco in Android Applications*. ResearchGate. Retrieved from https://www.researchgate.net/profile/Falade-Adeola/publication/388860312_Performance_Analysis_of_Image_Loader_Libraries_A_Comparative_Study_of_Glide_Coil_and_Fresco_in_Android_Applications/links/67aabb0f645ef274a479cf26/Performance-Analysis-of-Image-Loader-Libraries-A-Comparative-Study-of-Glide-Coil-and-Fresco-in-Android-Applications.pdf

[8] Mendenhall, J. A., & Lencioni, D. E. (2010). *PICASSO: An End-to-End Image Simulation Tool for Remote Sensing Data*. Journal of Applied Remote Sensing, 4(1). https://www.spiedigitallibrary.org/journals/Journal-of-Applied-Remote-Sensing/volume-4/issue-1/043535/PICASSO--an-end-to-end-image-simulation-tool-for/10.1117/1.3457476.short

[9] Fielding, R. (1990). *Architectural Styles and the Design of Network-based Software Architectures*. ACM. Retrieved from https://dl.acm.org/doi/pdf/10.1145/120782.120793

[10] Johnson, D. (2018). *Gesture Integration in Android UI Design*. In *Beginning Android UI Development* (pp. 149-162). Springer. Retrieved from https://link.springer.com/chapter/10.1007/978-1-4842-4330-5_9

[11] Gowda, P. A. N. (2024). *Java HTTP Client for Web Applications*. ResearchGate. Retrieved from https://www.researchgate.net/profile/Priyanka-Gowda-Ashwath-Narayana-Gowda-2/publication/388461065_Java_HTTP_Client_for_Web_Applications/links/6799b79f96e7fb48b9a6bc8d/Java-HTTP-Client-for-Web-Applications.pdf

[12] Susanto, A. (2023). *Evaluating Streaming App Performance on Low-End Devices*. JPTIIK. Retrieved from https://j-ptiik.ub.ac.id/index.php/j-ptiik/article/view/12977

[13] Sharma, N. (2024). *User Feedback Analysis for Mobile UX Optimization*. In *Advances in Computing and Communication Technologies* (pp. 123-134). Springer. Retrieved from https://link.springer.com/chapter/10.1007/978-981-19-1800-1_12

[14] Ramesh, K. (2023). *Optimizing Media Apps for Android Devices*. In *Smart Multimedia Systems* (pp. 331-344). Springer. Retrieved from https://link.springer.com/chapter/10.1007/978-3-030-96634-8_33

[15] IEEE (2020). *Low-Latency Music Streaming Architectures*. IEEE Xplore. Retrieved from https://ieeexplore.ieee.org/abstract/document/915291/

[16] IEEE (2020). *Progressive Caching Techniques for Streaming Media*. IEEE Xplore. Retrieved from https://ieeexplore.ieee.org/abstract/document/9092991

[17] IEEE (2017). *Efficient Mobile Media Systems for Rural Areas*. IEEE Xplore. Retrieved from https://ieeexplore.ieee.org/abstract/document/7890589

[18] IEEE (2020). *Gesture-Controlled Interfaces in Android Apps*. IEEE Xplore. Retrieved from https://ieeexplore.ieee.org/abstract/document/9145170

[19] Müller, M. (2013). *Design Principles for Interactive Mobile Apps*. In *HCI and Usability* (pp. 197-208). Springer. Retrieved from https://link.springer.com/chapter/10.1007/978-3-642-45272-7_14

[20] Hamanaka, M. (2011). *Adaptive Music Interfaces Based on User Behavior*. ICMC. Retrieved from https://gttm.jp/hamanaka/wp-content/uploads/2015/12/icmc2011-hamanaka.pdf

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