AI - BASED GOLD LOAN MANAGEMENT SYSTEM: A MOBILE APPLICATION FOR STORE-BASED LOAN MANAGEMENT

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Abstract :

This paper introduces the design and creation of an AI-Driven Gold Loan Management System (AI-GLMS), a mobile-focused, smart financial tool built to improve the whole process of jewellery stores and small loan companies. The system combines standard loan procedures with smart AI features, allowing for automatic fraud spotting, fake user detection, and smart chatbots to help customers with their questions. In addition to handling customer sign-ups, tracking asset values, approving loans, setting up repayment plans, and calculating monthly payments, the system uses a machine learning tool to evaluate past borrower actions, repayment habits, and unusual patterns to find any suspicious activities instantly. An AI-based way to check identities helps find fake documents or incorrect KYC information, which lowers the risks during the onboarding process. There's also a smart chatbot that helps both customers and workers by answering questions, explaining steps, and making customer support easier. By using automation, AI predictions, and safe communication, the AI-GLMS makes everything more clear, faster, less error-prone, and helps follow rules better for small lenders. This project shows how AI can help small businesses make better choices with data, prevent fraud before it happens, and offer a flexible experience for customers.

Keywords : Artificial Intelligence, Gold Loan Management System, Fraud Detection, Machine Learning, Know Your Customer (KYC) Verification, Mobile FinTech Application, EMI Automation, Risk Assessment, AI Chatbot, Digital Lending Systems

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Introduction :

Gold-backed lending remains an important financial support in India and other developing countries. Gold is not only a valued cultural treasure but also a reliable financial resource when people need it most. Small jewellery shops and local financial outlets often act as quick lenders, but their methods are mostly done by hand and are not well organized.

Old ways of working, like using paper records, hand-written math, and unofficial

ways to value gold, lead to mistakes, repeated data, wrong repayment plans, and trouble with following rules. These issues make businesses more open to risks like fake borrowers, fake documents, and people changing how they pay back loans on purpose.Using mobile technology and artificial intelligence can change these weak manual systems into something smarter and more data-based.

AI-powered gold lending systems not only make the old processes digital but also add smart fraud checks, real-time monitoring for unusual activities, and automatic help for customers. These improvements allow small businesses to have the same level of trust, openness, and quick response that big financial companies usually offer.

Literature Review :

Existing studies show that automation, using AI for predictions, and analyzing risks are very important in financial systems. Research on AI-based loan platforms shows how machine learning can help find fraud, predict chances of loan default, and improve trust in operations.

Studies on digital microfinance show that small businesses need simple, mobile-friendly, and secure platforms, unlike the complex systems used by big banks.

New developments in tools like Flutter, TensorFlow Lite, and Spring Boot now make it possible to create mobile apps with strong security features and AI capabilities.

Most current systems for jewellery or retail finance do not use AI features that are specific to their areas, such as scoring fraud risk, checking identity through behavior, or offering chat-based support.

This lack shows a need that AI-GLMS tries to fill by adding AI directly into the main parts of lending, making it a new and promising approach.

Existing system :

Traditional gold loan processes depend a lot on handwritten notes, manual records of gold value, simple calculators, and checking physical documents. These methods create several problems like:

1. mistakes in calculations made by people
2. lost or broken records
3. fake information provided by borrowers
4. different ways of valuing gold each time
5. no alerts when borrowers need to repay loans
6. no way to track how borrowers behave

There's no way to find out who is trying to cheat, spot repeated bad behavior, or check how risky a borrower is. Help for customers is slow and only happens when staff are available. These issues make manual systems slow, unsafe, and lead to problems with operations.

Objectives :

The Gold Loan Management System (GLMS) project was made to change the way gold loans are handled from old, manual methods to a digital, automated process. The system is designed to make things more accurate, clear, and easy for both people who give loans and those who take them by combining financial tools with technology. Here are the main goals of the project:

- Make EMI calculations and repayment plans automatic and very accurate.
- Use AI to find fraud by checking for strange patterns, unusual repayments, and risky users.
- Detect fake users using document checks, image validation, and behaviour analysis with AI.
- Offer an AI-powered chatbot to help customers with loan questions, EMI details, and product info.
- Keep things secure with user roles and encrypted communication for authentication.
- Keep all digital records in one place for easy checking and to follow rules.
- Give users dashboards with useful insights and predictions to help make better decisions.

Proposed System :

The proposed Gold Loan Management System (GLMS) is a fully digital, end-to-end solution that automates and simplifies the process of managing gold loans. It uses modern and scalable technologies to replace old paper-based methods with a structured, data-focused platform. This helps improve how efficiently operations are done, ensures accurate financial records, and increases transparency in all loan-related activities. The system is built using three main tech parts: a Flutter-based mobile app, a Spring Boot-powered backend, and a MySQL database, now enhanced with machine learning and AI-based tools.

1. Flutter Mobile Application (Frontend Layer) :

The system's user interface is built with Flutter, which allows for a cross-platform mobile app that works well on both Android and iOS.

This app is used by jewellery store staff to do important tasks like adding new customers, capturing their KYC documents, entering gold values, creating loans, updating repayments, and approving disbursements. Flutter's design makes the app easy to use and navigate, and it performs consistently across all devices. The mobile-first design ensures that even users who aren't tech-savvy can use it easily, making it ideal for small and medium-sized jewellery shops.

2. Spring Boot Backend Server (Business Logic Layer) :

The system's backend is built using Spring Boot, which acts as the main engine that handles all the important functions. It has several key roles:

- Calculates interest and EMI using standard financial formulas
- Manages loan schedules and sends automatic repayment reminders
- Checks the Loan-to-Value (LTV) ratio to ensure compliance
- Provides secure access with role-based permissions using Spring Security
- Ensures safe communication between the app and the server
- Offers RESTful APIs for communication with the Flutter app Spring Boot's setup makes the system fast, scalable, and reliable, especially for handling financial tasks.

It also works well with JPA/Hibernate to keep the database interactions safe and efficient.

3. Python Backend Server (ML Model) :

I. AI Fraud Detection System: This machine learning model uses past repayment data to spot :

- Sudden changes in payment patterns
- Too many loan requests in a short time
- Mismatches between the gold value and past records
- Unusual user behavior

It gives each borrower a fraud risk score and flags high-risk cases for administrators to check.

II. AI Fake User & Document Verification: The system uses image recognition and data checks to find :

- Fake documents
- Altered photos
- Inconsistent KYC information
- Duplicate user identities

Any suspicious activities during onboarding are highlighted for manual review.

I. AI Chatbot for Customer Queries: The chatbot helps customers with :

- Calculating EMI
- Checking loan eligibility
- Getting repayment instructions
- Checking the status of their gold valuation

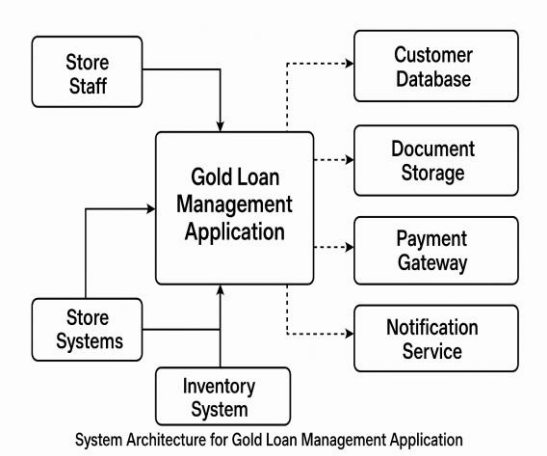
4. MySQL Relational Database (Data Storage Layer) :

The system uses MySQL as the main database to safely store all organized information, like customer details, gold item info, loan records, repayment history, valuation notes, and system messages. MySQL offers:

- Strong data integrity through rules that keep data accurate

- High consistency and accuracy for financial records
- Backup and recovery tools to protect data
- Quick search and indexing for fast access to customer and loan information

The database structure keeps all connections clear, such as linking customers to loans, loans to repayments, and gold items to their valuations, in a well-organized and easy-to-trace way.



System Architecture for Gold Loan Management Application

System Architecture :

The Gold Loan Management System (GLMS) is built using a three-tier architecture that includes the frontend, middleware (application server), and database. This design makes the system easy to scale, maintain, and keep running reliably. It helps users connect with the system smoothly while making sure data stays secure and accurate. The frontend is a mobile app that lets store staff and managers use the system easily. Through this app, users can add customer information, enter details about gold value, approve loans, and monitor repayment plans. The app connects to the back end using RESTful API endpoints, which make data sharing quick and efficient. The middleware, or API server, takes care of all the business rules and automated tasks. It checks user inputs, calculates loan installments, sets up repayment schedules, and sends reminders for due payments. This part also uses JSON Web Tokens (JWT) to check who is logged in and what they are allowed to do, making sure only approved users can access certain parts of the system based on their roles.

Workflow :

The Gold Loan Management System (GLMS) starts with customers signing up and getting their gold valued. Staff note down details like the weight, purity, and current market price of the gold. Using this information, the system automatically figures out the highest loan amount allowed, based on government rules about loan-to-value (LTV). Once the manager checks and approves the valuation, the loan is approved. The system then creates a repayment plan that shows how much to pay each month, the interest, and when payments are due. Borrowers get messages via SMS and email to remind them about their payments. The system keeps track of all repayments in real time, updates the loan status automatically, and alerts managers if there are any missed payments or overdue accounts. This whole process

makes everything run smoothly, follows all rules, and keeps everything clear and open for everyone involved.

WORKFLOW FOR GOLD LOAN

Advantages :

The AI-Driven Gold Loan Management System makes a big difference in how operations run by changing slow and error-filled manual tasks into a smart and dependable digital system. It uses automation for calculating monthly installments, sends real-time alerts, and manages all data in one place, which cuts down on the need for human involvement and keeps financial processes accurate. By adding AI, the system adds more security and understanding, helping to spot fraud by looking at past behavior to find strange repayment habits or risky borrower actions. The AI tool that checks for fake users helps find counterfeit documents and duplicate identities, making it harder for fraud during the onboarding process. Also, the AI chatbot improves customer service by providing quick and 24/7 help with loan questions and repayment advice. All these features work together to create a clear, safe, and efficient loan environment that helps make better decisions and builds trust between lenders and borrowers.

Limitations :

Even though AI-GLMS has many benefits, there are some real-world problems that can happen when it's used in practice. Because the system works through cloud-based APIs and needs an internet connection, it can stop working if there's a weak or unstable internet signal, especially in faraway or areas with poor internet. The way well the AI tools work, like detecting fraud or checking identity, depends a lot on the data they're trained on. If the data isn't good or is biased, the AI might not work as well. People who aren't very tech-savvy might have a hard time understanding the risk scores the AI generates or adjusting to the automated processes, so they might need training and support. The system also deals with private customer information, so if it's not kept secure with regular updates and strong protection, it could be at risk for cyberattacks. Also, moving old paper or partly digital records to this new system can take a lot of time and needs careful checking to make sure the data stays accurate. These issues show the importance of having good digital skills, strong infrastructure, and regular maintenance of the system.

Future scope :

The AI-GLMS has a lot of potential for future improvements, making it possible for the platform to grow into a full intelligent fintech solution. The fraud detection feature can be made better by using advanced deep learning models that can spot complicated behavior patterns and predict possible loan defaults more accurately. Adding real-time gold price data from APIs will help set loan values based on current market conditions. In the future, the system might include biometric security features like facial recognition or fingerprint checks to make customer sign-up faster and safer. The chatbot can also be improved with better understanding of natural language and the ability to interact through voice, offering more human-like support. Cloud-based dashboards and systems to monitor multiple branches will let jewelry chains manage lending activities from a central location. Also, adding support for other types of collateral and digital payment methods like UPI auto-debit can make the platform more useful and convenient. These improvements can turn the AI-GLMS into a strong, flexible, and predictive lending system that fits well with today's financial world.

Conclusion :

The AI-Driven Gold Loan Management System makes gold-backed lending easier for small businesses by using automation, smart AI tools for managing risks, and easy mobile access. It uses machine learning to catch fraud, checks identities, and includes chatbots to help users. This system gives small jewellery shops the same smart tools that big companies use. It makes lending safer, less reliant on people, and ensures loans are handled correctly, following rules and working quickly, especially in places where development is still growing.

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