

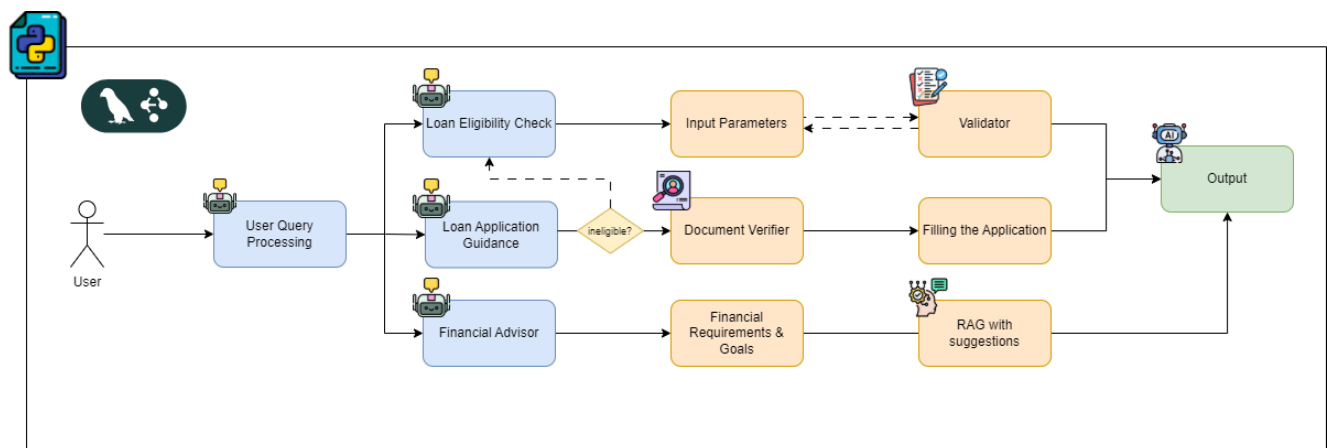
# Multilingual Conversational Loan Advisor

## Track 2

### Introduction:

Our hackathon project introduces an innovative multi-agent framework to simplify the loan application process and provide financial advisory services. By leveraging AI, we've created an application using specialized agents that work together to guide users through every stage of their financial journey. The system accepts both text and voice inputs, responding in the user's preferred format for maximum accessibility. At its core, our solution features three specialized agents: an Eligibility Check Agent powered by machine learning to assess loan qualification using comprehensive financial parameters; a Loan Guidance Agent that streamlines document verification and application completion; and a Financial Advisor Agent equipped with a knowledge base built on financial literature, web resources, and curated video content. This approach not only simplifies complex financial processes but also empowers users with personalized insights to make informed decisions about their financial future.

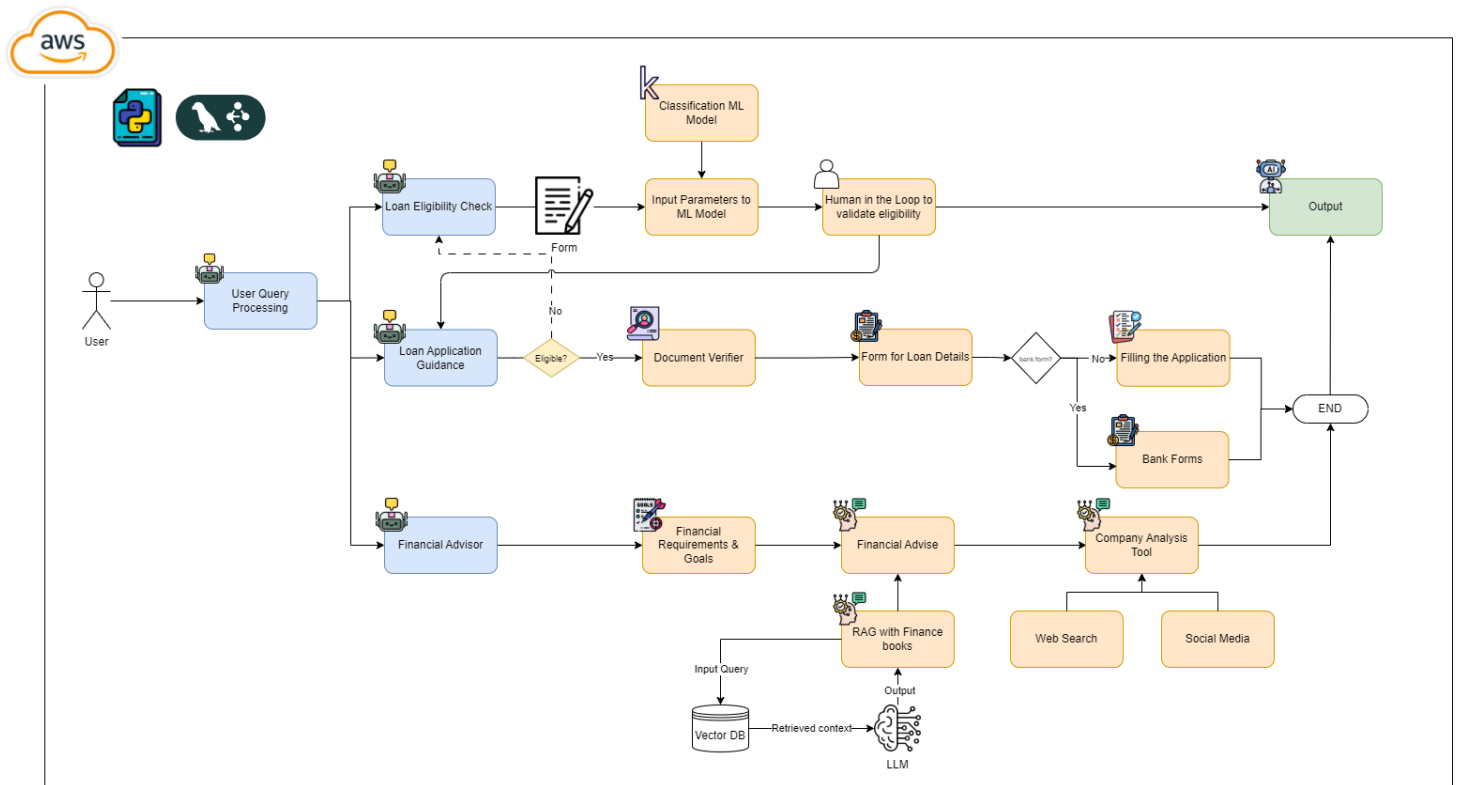
### High-Level Design:



The High-Level diagram illustrates the architecture of the multi-agent financial assistant system with three main workflow paths:

1. **User Query Processing:** At the start, a user interacts with the system, and their query is analyzed to determine which specialized path to follow. Here, we determine the intent of the query whether he/she wants to check the eligibility of Loan, requires guidance for Loan Application or is looking for Financial Advise.
2. **Three Agent Pathways:**
  - **Loan Eligibility Check:** This pathway begins with an eligibility assessment, followed by input parameter collection and validation.
  - **Loan Application Guidance:** This flow checks if the user is eligible, then proceeds to document verification and application form completion.
  - **Financial Advisor:** This path identifies financial requirements and goals, then provides suggestions using a RAG (Retrieval-Augmented Generation) system.
3. **Components and Flow:**
  - The system includes specialized components like document verifiers, validators, and application form fillers.

## Low-Level Design:



This low-level design architecture diagram provides a detailed implementation view of the multi-agent financial assistant deployed on AWS infrastructure. The diagram expands on the high-level design with specific technical components:

### 1. Loan Eligibility Path:

- Form components capture necessary user information
- A classification ML model trained on an open-source dataset from “Kaggle” receives input parameters and returns if the user is eligible/ineligible.

- Human-in-the-loop validation ensures the accuracy of eligibility decisions
- 2. Loan Application Guidance Path:**
  - Initial eligibility check before Loan Application Guidance.
  - Document verification process for eligible users.
  - Post Document Verification, we ask the user for more details on the loan.
  - The system either populates a standard template with the user's loan details or transfers the collected information directly into the user's uploaded bank-specific application form
- 3. Financial Advisor Path:**
  - The Agent asks for Financial requirements/goals from the user.
  - RAG (Retrieval-Augmented Generation) system with finance books
  - Vector database storing financial knowledge
  - Company Analysis Tool incorporating web search and social media inputs
  - Financial advice generation incorporating multiple data sources

The diagram presents a detailed AWS-based implementation architecture featuring interconnected microservices with explicit control flows, decision nodes, data persistence layers, and AI components. The system integrates classification ML models with human-in-the-loop validation, vector databases for knowledge retrieval, and LLM processing capabilities—all orchestrated to deliver a comprehensive financial assistance platform that handles loan eligibility assessment, document processing, and personalized financial guidance through a technically sophisticated yet modular design.

## Proposed Solution:

### Architecture Overview

Our solution implements a multi-agent framework deployed on AWS infrastructure, with specialized AI agents handling different aspects of the loan process. The system processes both text and voice inputs, providing personalized financial guidance.

### Core Components

1. **User Query Processing:** The entry point of your system processes natural language inputs (text/voice) and intelligently routes them to the appropriate specialized agent without hardcoding.
2. **Loan Eligibility Check:** This component leverages a classification ML model trained on both Kaggle datasets and AI-generated synthetic data. The model evaluates 15+ parameters, including age, income, credit score, employment type, and debt-to-income ratio to provide accurate eligibility assessments. A human validation loop ensures the reliability of predictions.
3. **Loan Application Guidance:** When users pass the eligibility check (or request direct guidance), this agent provides document verification through a robust KYC process. The agent then intelligently guides users through either standardized forms for loan details or assists with bank-specific application forms, offering help at each step.
4. **Financial Advisor**
5. This component combines multiple technologies:
  - a. RAG system with vectorized financial literature stored in a Vector DB
  - b. Web search capabilities for current financial information

- c. Social media analysis (mainly YouTube recommendations) for trending financial topics
- d. Company analysis tools for investment guidance

### **Technical Implementation**

The system architecture shows a thoughtful AWS-based implementation with:

- Python:
  - FastAPI for Application backend
  - Langchain and LangGraph for Agents
- AWS for deployments
- User friendly Interface developed using React.js
- Vector databases for efficient RAG implementation
- Human-in-the-loop validation for critical eligibility decisions
- Multiple decision points to create personalized user journeys

### **User Flow**

1. User initiates query through voice or text
2. System processes and routes to appropriate specialized agent
3. For eligibility checks: collects parameters, runs ML model, validates with human oversight
4. For loan guidance: verifies documents, assists with form completion (standard or bank-specific)
5. For financial advice: leverages RAG, web search, and company analysis tools to provide personalized recommendations.
6. All paths ultimately converge to a final output delivered to the user through voice or text.

### **Distinctive Features**

- a. Truly multilingual support at all stages
- b. Hybrid approach combining classical ML with modern LLMs
- c. Human validation for critical financial decisions
- d. Flexibility to handle both standardized and bank-specific forms
- e. Multi-modal input/output (text and voice and vision)
- f. Comprehensive financial education through integrated knowledge sources
- g. End-to-end solution from initial query to application completion

This comprehensive architecture demonstrates a thoughtful approach to financial assistance that combines technical sophistication with practical usability, particularly benefiting users who may find traditional financial processes intimidating or inaccessible.

## **Key Features of the Solution:**

1. Multi-Agent Framework: Specialized agents for eligibility checking, loan guidance, and financial advising, ensuring expert-level assistance for each domain.
2. Multimodal Interaction: Support for both text and voice inputs/outputs, making the system accessible to users with different preferences and needs.
3. ML-Powered Eligibility Assessment: A classification model trained on diverse datasets that evaluates 15+ parameters to accurately determine loan eligibility.
4. Human-in-the-Loop Validation: Critical eligibility decisions are validated by human experts, ensuring reliability while maintaining automation.

5. Document Verification System: Robust KYC process that verifies user-uploaded documents like Aadhar cards, PAN cards, and bank statements.
6. Dual Form Processing: Flexibility to guide users through both standardized forms and bank-specific application documents. Vision capabilities of LLMs for extracting information from bank specific documents.
7. RAG-Based Financial Advisory: Retrieval-Augmented Generation system leveraging financial literature to provide informed financial advice.
8. Web Integration: Real-time web search capabilities to supplement advice with current financial information and trends.
9. Multimedia Recommendations: Suggestions for educational YouTube videos and other resources tailored to users' financial questions.
10. Company Analysis Tools: Advanced capabilities for analyzing investment opportunities and different company performance.
11. Social Media Insights: Integration with social platforms to identify relevant discussions, sentiments and relevant information about different stocks, companies etc.
12. Multilingual Support: Comprehensive language capabilities throughout all system components, making financial services accessible across language barriers.
13. AWS-Based Infrastructure: Deployment reliable AWS.
14. End-to-End Solution: Complete user journey from initial query to final loan application or financial advice implementation.
15. Vector Database Integration: Efficient storage and retrieval of financial knowledge for contextually relevant responses.