

Stage 2 – Completing Implementation & Research

After successfully completing Stage 1, which focused on core chatbot development, frontend integration, and basic RAG-based response generation, we moved to Stage 2. The objective of this stage was to enhance security, expand domain knowledge, improve contextual understanding, conduct a detailed research survey, and prepare comprehensive academic documentation. This stage balanced practical implementation with research validation to ensure real-world applicability in the financial services domain.

Week 1 – Secure Authentication Setup and Access Control

Overview:

This week focused on implementing a secure authentication mechanism to ensure that only authorized users could access chatbot services, especially for sensitive financial queries. Security and user trust were the primary goals.

Progress:

Integrated Firebase Authentication into the chatbot application.

Enabled Email and Password authentication in the Firebase Console.

Implemented user registration with validation for email format and password strength.

Developed secure login functionality with proper error handling for invalid credentials.

Implemented password reset functionality using email-based verification.

Linked authenticated users with secure session management.

Tested authentication workflows including signup, login, logout, and password recovery.

Summary:

By the end of Week 1, a secure and reliable authentication system was fully operational. User access to chatbot features was restricted to authenticated sessions, significantly improving data security and system reliability.

Next Week and Beyond:

The next phase focuses on expanding the chatbot's financial knowledge base and improving response accuracy using domain-specific datasets.

Week 2 – Financial Domain Knowledge Expansion and RAG Enhancement

Overview:

This week aimed to strengthen the chatbot's understanding of financial concepts by expanding its knowledge base and improving the retrieval-augmented generation pipeline.

Progress:

Added structured banking datasets covering accounts, loans, cards, insurance, and investments.

Improved document chunking strategies for better semantic retrieval.

Generated high-quality embeddings using the selected embedding model.

Optimized vector search performance in the vector database.

Validated response accuracy for policy-based and procedural queries.

Summary:

The chatbot demonstrated improved response relevance and domain accuracy. Knowledge expansion significantly reduced incorrect or generic answers.

Next Week and Beyond:

The upcoming week focuses on research and comparative analysis of chatbot approaches used in financial services.

Week 3 – Research Survey on Financial Chatbot Technologies

Overview:

This week was dedicated to conducting an extensive literature survey on chatbot technologies used in the financial sector to justify the chosen approach scientifically.

Progress:

Studied rule-based, intent-based, and AI-driven chatbot architectures.

Analyzed limitations of traditional rule-based chatbots in handling complex queries.

Reviewed more than 15 research papers on LLMs, RAG frameworks, and conversational AI.

Compared AI chatbots based on accuracy, scalability, cost, and maintenance.

Documented findings with comparative tables and evaluation metrics.

Summary:

The survey confirmed that LLM-based RAG chatbots outperform traditional systems in flexibility, accuracy, and scalability, supporting the proposed system design.

Next Week and Beyond:

The next phase focuses on improving conversational context handling and memory management.

Week 4 – Context Management and Conversation Memory

Overview:

This week focused on enhancing the chatbot's ability to handle multi-turn conversations and maintain context across user interactions.

Progress:

Implemented conversation memory to retain previous user interactions.

Enabled follow-up query handling without requiring repeated information.

Improved intent continuity across multiple dialogue turns.

Tested contextual conversations for loan inquiries, account queries, and service requests.

Summary:

By the end of Week 4, the chatbot supported natural and coherent multi-turn conversations, significantly improving user experience.

Next Week and Beyond:

The following week focuses on performance evaluation, load testing, and security validation.

Week 5 – Performance Evaluation and Security Testing

Overview:

This phase aimed to validate system robustness, response time, and data protection mechanisms under realistic usage conditions.

Progress:

Conducted load testing with multiple concurrent users.

Measured average response time and system throughput.

Implemented masking of sensitive financial information.

Verified secure data transmission using encryption protocols.

Tested system stability under high query volume.

Summary:

The chatbot maintained stable performance and strong security compliance, confirming readiness for real-world deployment.

Next Week and Beyond:

The next stage involves full application integration and demo preparation.

Week 6 – Application Integration and Demo Preparation

Overview:

This week focused on integrating all modules into a unified application and preparing demonstration materials.

Progress:

Integrated authentication, chatbot engine, and UI into a complete workflow.

Improved chat interface usability and response display.

Conducted cross-device and cross-browser testing.

Recorded demonstration videos showcasing chatbot functionality.

Collected usage logs for evaluation.

Summary:

The application was fully functional, stable, and ready for presentation and evaluation.

Next Week and Beyond:

The final week focuses on documentation, report writing, and academic submission.

Week 7 – Research Paper Writing, PPT Creation, and Final Submission

Overview:

The final week emphasized documentation, result consolidation, and academic dissemination of the project.

Progress:

Prepared a detailed research paper on AI-powered chatbots for financial services.

Documented problem definition, system architecture, and implementation details.

Presented experimental results and performance evaluation.

Created a professional PPT including architecture diagrams and workflow explanations.

Completed final project submission for evaluation.

Summary:

Week 7 successfully concluded Stage 2 with comprehensive documentation and validation. The project resulted in a secure, scalable, and intelligent AI-powered financial chatbot, ready for real-world deployment and academic presentation.