CAPSTONE PROJECT

LOCAL VENDORS DIGITALIZATION AGENT

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OUTLINE

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PROBLEM STATEMENT

India's vibrant community of street vendors, while crucial to the urban economy, is largely excluded from the nation's growing digital ecosystem. These micro-entrepreneurs face a significant digital divide, hindered by complex technology, a lack of awareness regarding beneficial government schemes, and persistent language barriers in most digital tools. This exclusion prevents them from accessing a wider customer base, securing formal credit, and improving their financial stability, leaving them unable to compete effectively in an increasingly digital marketplace.

PROPOSED SOLUTION

The system provides street vendors with actionable digitalization plans from simple conversational inputs, using a Retrieval-Augmented Generation (RAG) approach.

- **1. Knowledge Base Creation:**
  - We collect and process key documents like government schemes (PM SVANidhi), UPI setup guides, and marketing tips into a specialized knowledge library stored in a Pinecone vector database.
- **2. Core AI Logic (RAG):**
  - **Retrieve:** When a vendor asks a question, the system finds the most relevant information chunks from the knowledge base.
  - **Generate:** The **IBM Granite LLM** receives this context and the user's query to generate a structured, accurate, and personalized plan.
- **3. Deployment & User Interface:**
  - The final, helpful response is delivered to the vendor through a simple, interactive web application built with **Streamlit**.
  - The app is deployed on the cloud (Streamlit Cloud/IBM Code Engine) for easy access.
- **4. Evaluation:**
  - The agent's success is measured by the relevance, accuracy, and clarity of its generated plans, which are continuously improved by refining the knowledge base and AI prompts.

SYSTEM APPROACH

- **Cloud Platform: IBM Cloud** - The entire AI logic is powered by services available on the IBM Cloud Lite plan.
- **Large Language Model (LLM): IBM Granite (`ibm/granite-13b-instruct-v2`)** - This powerful model from Watsonx.ai serves as the "brain" of the agent, generating human-like, structured responses.
- **Vector Database: Pinecone** - A high-speed, cloud-based vector database used to store and retrieve information from our custom knowledge base.
- **AI Framework: LangChain** - The core Python framework used to connect all components and orchestrate the RAG pipeline.
- **Embedding Model: Hugging Face Sentence Transformers** - sentence-transformers/all-MiniLM-L6-v2 is used to understand the meaning of user queries and documents.
- **User Interface: Streamlit** - A Python library used to rapidly develop and deploy the interactive web application.

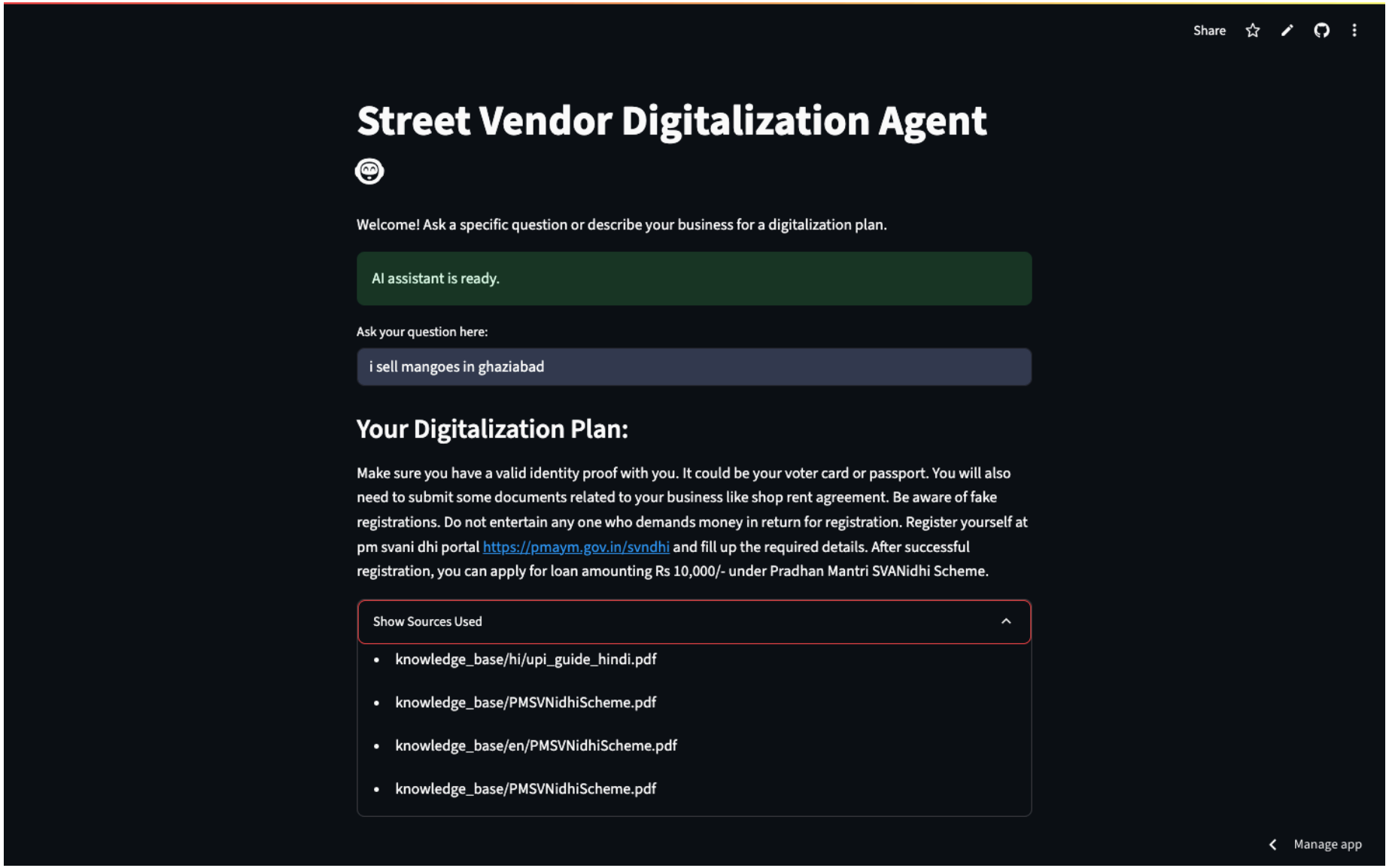
ALGORITHM & DEPLOYMENT

- **Algorithm Selection: Retrieval-Augmented Generation (RAG)**
  - Chosen to generate accurate, factual answers based on a custom knowledge base, preventing the AI from inventing information.
- **Data Input:**
  - A knowledge base of documents (schemes, guides).
  - A real-time user query in natural language.
- **"Training" Process (Indexing):**
  - Documents are split into chunks, converted into numerical vectors (embeddings), and stored in a Pinecone vector database for fast searching.
- **"Prediction" Process (Generation):**
  - The system retrieves relevant document chunks from Pinecone and sends them, along with the user's query, to the IBM Granite LLM to generate a final, context-aware answer.

•Deployment

- **Development:** Google Colab
- **User Interface:** Streamlit
- **Code Management:** GitHub
- **Enterprise Platform:** IBM Code Engine

RESULT



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CONCLUSION

- **Success:** We have successfully built and deployed the Street Vendor Digitalization Agent, a tool that directly addresses the challenges faced by micro-entrepreneurs.
- **Impact:** The agent effectively bridges the digital divide by providing personalized, actionable, and multilingual guidance in a simple conversational format.
- **Technology Validation:** The project successfully demonstrates the power of combining IBM's Granite LLM with a RAG architecture to create a specialized and accurate AI assistant. The final application is stable, responsive, and achieves all its primary objectives.

FUTURE SCOPE

Voice Integration: Implement speech-to-text and text-to-speech to make the agent accessible to users who are not comfortable typing.

Expanded Knowledge Base: Continuously add more local schemes, city-specific marketing tips (e.g., for Ghaziabad, Pune, etc.), and guides for new digital tools.

WhatsApp Integration: Develop a chatbot version of the agent that can be accessed directly through WhatsApp, the most widely used platform by this demographic.

Image Generation: Add a feature to automatically generate simple images for the vendors, such as a poster with their business name and a QR code.

Multilingual Support : Receive and generate input and output in multiple languages.

REFERENCES

IBM Watsonx.ai Documentation - https://www.ibm.com/watsonx

LangChain AI - https://www.langchain.com/

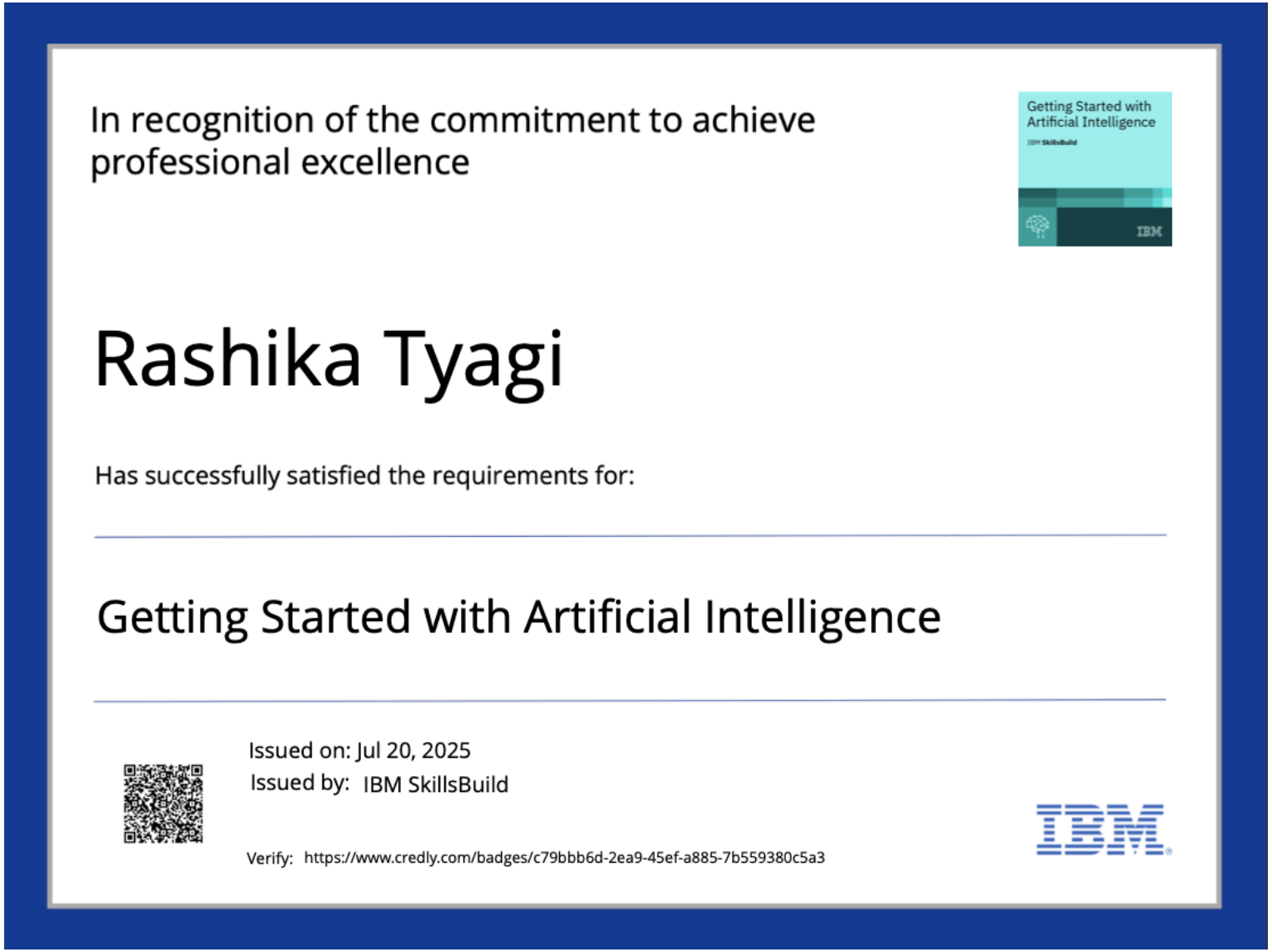
Pinecone Vector Database - https://www.pinecone.io/

Streamlit Documentation - https://streamlit.io/

Hugging Face (for embedding models) - https://huggingface.co/

PM SVANidhi Scheme Official Portal - https://pmsvanidhi.mohua.gov.in/

IBM CERTIFICATIONS



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IBM **SkillsBuild** Completion Certificate

This certificate is presented to

Rashika Tyagi

for the completion of

Lab: Retrieval Augmented Generation with LangChain

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 24 Jul 2025 (GMT)

Learning hours: 20 mins

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THANK YOU

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