CAPSTONE PROJECT

AI AGENT FOR CHRONIC DISEASE MONITORING

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OUTLINE

- **Problem Statement** (Should not include solution)

- **Proposed System/Solution**

- **System Development Approach** (Technology Used)

- **Algorithm & Deployment**

- **Result (Output Image)**

- **Conclusion**

- **Future Scope**

- **References**

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PROBLEM STATEMENT

- Chronic diseases like diabetes, hypertension, and heart conditions require continuous monitoring and proactive care. Patients often struggle to interpret health data from wearables or remember medication and lifestyle routines. This project builds an AI-powered assistant that analyzes health charts or sensor data images using IBM Watsonx vision models. It generates personalized medical insights and recommendations in real-time to improve treatment adherence and reduce emergency risks. The system leverages IBM Cloud Lite and Watsonx to deliver intelligent, accessible, and image-based chronic disease support.

PROPOSED SOLUTION

- **Data Collection/Input:**
- Simulate or collect health data (e.g., heart rate, blood sugar, BP).
- Visualize it as charts using matplotlib or upload existing health report images.
- **AI Model Integration:**
- Use IBM Watsonx **vision-enabled foundation models** (like meta-llama/llama-3-2-11b-vision-instruct).
- Pass image(s) with a health-related prompt to the model for interpretation and advice.
- **AI Inference Output:**
- The model generates personalized recommendations based on the visual data (e.g., alert if vitals are abnormal).
- Output includes text-based insights like emergency actions, lifestyle changes, or medication reminders.
- **Visualization & Reporting:**
- Display or print the output in the notebook.
- ptionally generate multiple image types (line, bar, scatter, area) for simulated patients.
- **Deployment:**
- Deploy the notebook as an **IBM Watsonx Job** for scheduled runs, or
- Convert it into a **Flask app or API** for interactive use, or
- Export as PDF/HTML for static report submission.

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SYSTEM APPROACH

The system is designed to analyze health chart images and generate personalized recommendations for chronic disease management using AI.

1.System Requirements:
- IBM Cloud Lite account
- Watsonx.ai project and environment (London region)
- Notebook interface with internet access
- Optional: IBM Cloud Object Storage for image files

2.Libraries Required:
- matplotlib – for generating simulated health charts
- ibm_watsonx_ai – to access foundation models from Watsonx
- PIL or OpenCV – for handling image files (optional for image manipulation)
- requests and json – for API integration and response handling

3.Workflow Overview:
- Generate or upload image-based health data (e.g., heart rate or BP charts).
- Pass image and prompt to Watsonx foundation model using ModelInference.
- Retrieve text-based medical advice tailored to the input visual data.
- Display or save results for reporting, or automate via Watsonx Jobs.
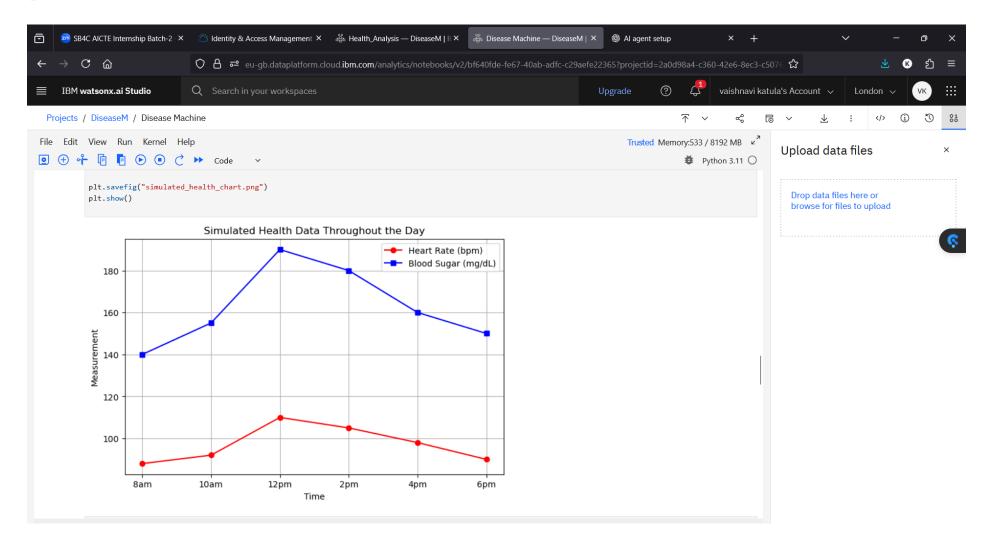
ALGORITHM & DEPLOYMENT

•**Algorithm-:**

•**Input Preparation:**
•Generate or upload health-related images (e.g., heart rate, blood sugar charts).
•Define prompts that instruct the AI model on what insights to generate.
•**Model Interaction:**
•Use IBM Watsonx The model analyzes the image and responds with personalized health advice in natural language.
•**Output Processing:**
•Extract and display the response.
•Optionally log results, display alerts, or integrate into a user-facing interface.

- Deployment

- Notebook Execution:

  - Run interactively within Watsonx Notebooks for development and testing.

- Watsonx Job Deployment:

  - Convert the notebook into a **Job** for scheduled health checks or batch image analysis.

  - Useful for automated chronic care updates.

- Web App or API (Optional):

  - Export Python logic and wrap with Flask or FastAPI.

  - Deploy as a **web app** or **API endpoint** using IBM Cloud Foundry or Code Engine.

- Report Export:

  - Export results to **PDF or HTML** for clinical reports or academic submission.

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RESULT

CONCLUSION

- This project presents an AI-powered assistant capable of analyzing health data visualizations to support chronic disease management. By leveraging IBM Watsonx foundation models, the system interprets image-based inputs and delivers real-time, personalized medical insights. It bridges the gap between complex sensor data and actionable recommendations, enhancing patient adherence and proactive care. The flexible deployment options—via notebooks, jobs, or web apps—make the solution adaptable for both clinical and personal use. Overall, the system demonstrates how AI and cloud technologies can improve healthcare outcomes through intelligent automation.

FUTURE SCOPE

- **Multi-modal Inputs:**
Expand the system to accept both images and real-time sensor data (e.g., from smartwatches or IoT devices) for continuous monitoring.
- **Mobile Integration:**
Develop a mobile app interface to make the solution accessible for patients and caregivers on the go.
- **EHR Integration:**
Connect with Electronic Health Records (EHR) systems to pull historical data for deeper personalization and tracking

REFERENCES

- IBM Watsonx.ai Documentation
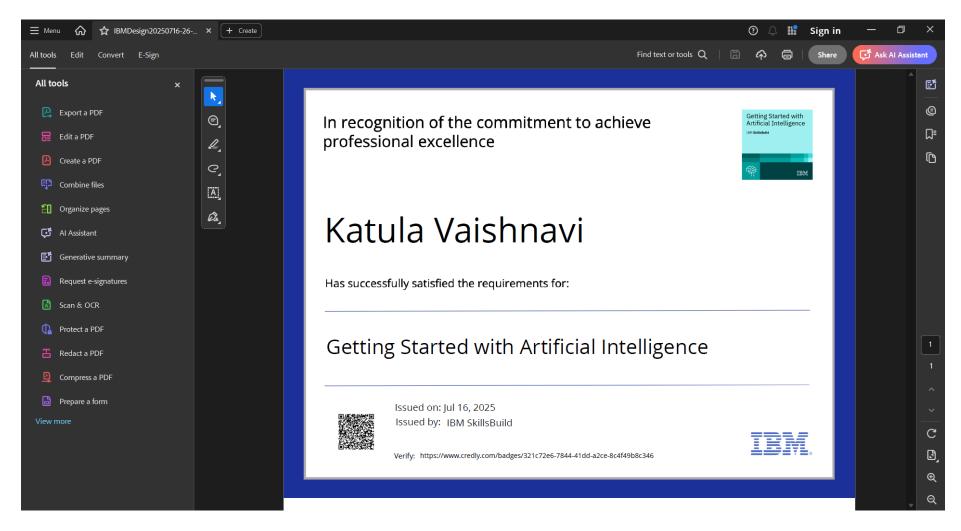https://www.ibm.com/cloud/watsonx-ai
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- IBM Cloud Docs – Watson Machine Learning
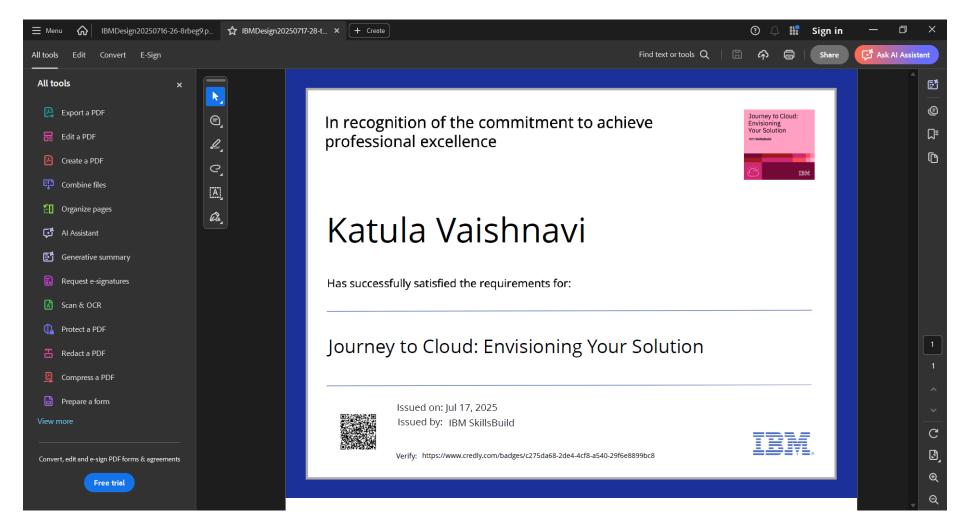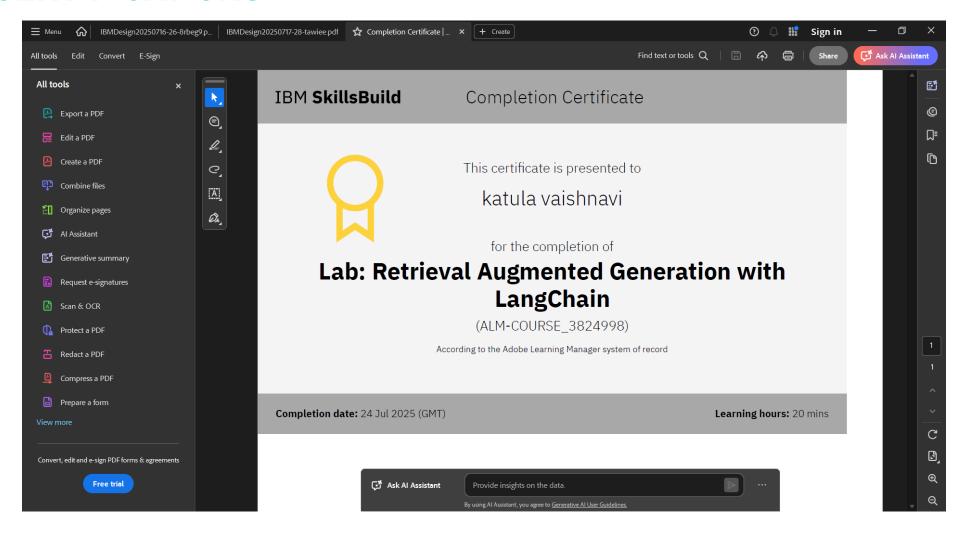https://cloud.ibm.com/docs/watson-machine-learning

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