



Harvest.io

Recommendation System for Farmers

Azure GenAI Hackathon

Names:

Faisal, Siva, Syrin, Umar

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Problem Statement

1. Difficulty making quality decisions for optimal farming practices.
2. Limited tools to diagnose plant diseases effectively.
3. Lack of accessible, real-time advice for improving crop health and yield.
4. High Level of Required Tribal Knowledge in Farming Practices
5. Research backed farming advice is not readily available

Impact:

1. Reduced productivity
 2. Increased losses due to delayed or incorrect decisions.
 3. High barrier of entry for new farmers
- 
- 



02 Features & Architecture

Vision Based Disease Detection

Goal :

- Help Farmers identify different diseases that affect their Crop in order to find solutions

Approach :

- Utilize Azure AI Custom Vision
- Finetune the image detection capabilities of AI vision to be focused on identifying diseases within crops
- Finetune the model to detect Healthy Crops

Resources :

- Kaggle Dataset CCMT:
<https://www.kaggle.com/datasets/armaanoajay/ccmt-crop-pest-and-disease-detection>

RAG Tuned ChatBot

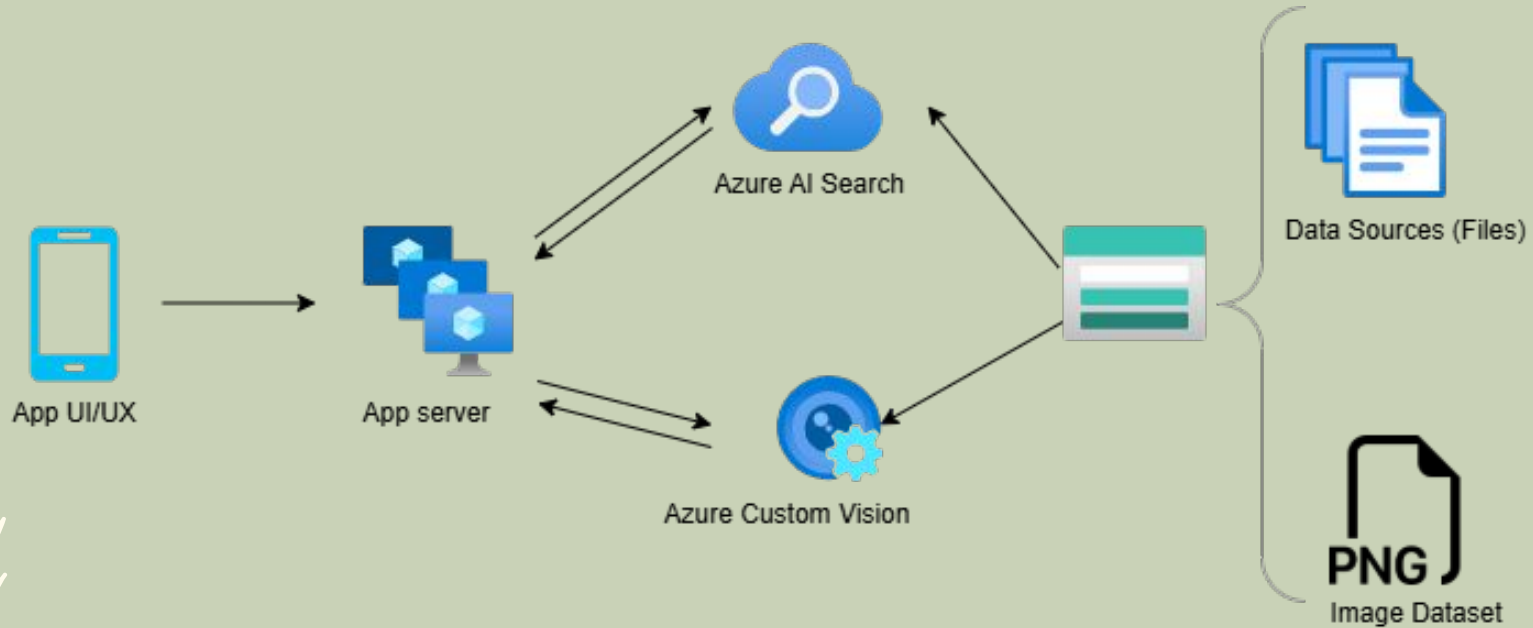
Goal :

- Provide farmers with quality information that would assist them in improving the overall crop yield based on their scenario

Approach :

- Extract relevant research papers that could provide valuable insights
- Convert the Research Papers into a simplified JSON format using a script
- Utilise Azure AI Search to Index the documents to be a readable format
- Utilise Azure AI Search to Augment the results of your chatbot

Technology Architecture





Our MVP

03

Minimal Viable Product

Data Conversion

▼ articles	●
📄 Article-2.pdf	U
📄 Crop_Yield_Forecasting_Methods_and...	U
📄 Improved-low-water-solubility-of-fise...	U
📄 Investigation-of-the-effects-of-cultur...	U
📄 On-optimization-of-enzymatic-proces...	U
📄 Seasonal-Forecast.pdf	U
📄 stallings1961.pdf	U
▼ output	●
{ } Article-2.json	U
{ } Crop_Yield_Forecasting_Methods_and...	U
{ } Improved-low-water-solubility-of-fise...	U
{ } Investigation-of-the-effects-of-cultur...	U
{ } On-optimization-of-enzymatic-proces...	U
{ } Seasonal-Forecast.json	U
{ } stallings1961.json	U
🔗 .gitignore	
🔗 custom_vision.py	U
🔗 pdf_to_ai.py	U
🔗 search.py	U

```
1 import os
2 import json
3 from PyPDF2 import PdfReader
4
5
6 def extract_text_from_pdf(pdf_path):
7     """
8     Extract text from a PDF file.
9
10    :param pdf_path: Path to the PDF file
11    :return: Extracted text as a string
12    """
13    reader = PdfReader(pdf_path)
14    text = ""
15    for page in reader.pages:
16        text += page.extract_text()
17    return text
```

Debug Console (Ctrl+Shift+Y)

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

○ @StarvedHawk → /workspaces/GenAI_Hackathon_Farm_Bot

azureblob-index ...

Save Discard Refresh Create demo app Edit JSON Delete Encryption

Documents 7 Total storage 1.65 MB Vector index size 0 Bytes Max storage 15 GB

Search explorer Fields CORS Scoring profiles Semantic configurations Vector profiles

+ Add semantic configuration Delete

Name	Title field	Content fields	Keyword fields
Temperature	Add title field	content, keyphrases, sentiment	keyphrases

azureblob-index ...

Documents 7 Total storage 1.65 MB Vector index size 0 Bytes Max storage 15 GB

Search explorer Fields CORS Scoring profiles Semantic configurations Vector profiles

+ Add field + Add subfield Delete Autocomplete settings

Search field names

Field name	Type	Retrievable	Filterable	Sortable	Facetable	Searchable	Analyzer	Dimensions
content	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Stands...	
metadata_storage_cc	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
metadata_storage_is	Int64	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
metadata_storage_is	DateTimeOffset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
metadata_storage_cc	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
metadata_storage_nu	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
metadata_storage_pi	String	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
metadata_storage_fi	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
metadata_content_er	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
metadata_content_ty	String	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

reference-articles ...

Container

Search Upload Change access level Refresh Delete Change tier Acquire lease Break lease View snapshots Create snapshot

Overview

Diagnose and solve problems

Access Control (IAM)

Settings

Shared access tokens

Access policy

Properties

Metadata

Authentication method: Access key (Switch to Microsoft Entra user account)

Location: reference-articles

Search blobs by prefix (case-sensitive) Show deleted blobs

+ Add filter

Name	Modified	Access tier	Archive status	Blob type	Size	Lease state
Article-2.json	12/21/2024, 1:05:57 ...	Hot (Inferred)		Block blob	81.45 KiB	Available ...
Crop_Yield_Forecast...	12/21/2024, 1:05:57 ...	Hot (Inferred)		Block blob	150.72 KiB	Available ...
Improved-low-wate...	12/21/2024, 1:05:57 ...	Hot (Inferred)		Block blob	38.28 KiB	Available ...
Investigation-of-the...	12/21/2024, 1:05:57 ...	Hot (Inferred)		Block blob	36.06 KiB	Available ...
On-optimization-of...	12/21/2024, 1:05:57 ...	Hot (Inferred)		Block blob	71.35 KiB	Available ...
Seasonal-Forecast.js...	12/21/2024, 1:05:57 ...	Hot (Inferred)		Block blob	151.49 KiB	Available ...
stallings1961.json	12/21/2024, 1:05:57 ...	Hot (Inferred)		Block blob	20.72 KiB	Available ...

The Chatbot

Chat playground

[View code](#) [Deploy](#) [Import](#) [Export](#) [Prompt samples](#) [Send feedback](#)

Setup

Deployment *

+ Create new deployment

gpt-4o (version:2024-11-20)

Give the model instructions and context

recommending their current inventory and what they need to stock up on based on metrics like PH Levels, Temperature and Fertilizer in the soil. Please refer to the documents provided to improve your results

Apply changes

Generate prompt

+ Add section

Few shot examples are not used when source data has been added. Any previous examples have been cleared. Once data is removed, then examples can be added.

✓ Add your data

Gain insights into your own data source. Your data is stored securely in your Azure subscription. [Learn more about how your data is protected.](#)

Data source: Azure AI Search

Search Resource: faisaal-azure-ai-search-test

Chat history

Response format

Text

My farm is in a region which has loamy soil with a PH of 8 and an average temperature of 10 degrees in the morning. give me recommendations in order to improve my crop yield

Based on the retrieved document and your farm's metrics (loamy soil, pH of 8, and an average morning temperature of 10°C), here are some recommendations to improve your crop yield:

1. Adjust Soil pH

- Observation:** A pH of 8 indicates alkaline soil, which may limit nutrient availability for crops.
- Recommendation:** Apply sulfur-containing amendments (e.g., elemental sulfur or ammonium sulfate) to lower the pH gradually. Incorporating organic matter, such as compost or manure, can also help buffer soil pH over time.

2. Nutrient Management

- Observation:** High pH soils often lead to deficiencies in micronutrients like iron, zinc, and manganese.
- Recommendation:** Use chelated micronutrient fertilizers (e.g., chelated iron) to ensure nutrient availability. Conduct a soil test to determine if macronutrients like nitrogen, phosphorus, and potassium are at adequate levels and supplement as necessary.

3. Temperature Considerations

- Observation:** A morning temperature of 10°C is relatively low and can slow down certain crop growth processes.
- Recommendation:** Choose crops or cultivars that are tolerant to cooler climates, such as wheat, barley, or cool-season vegetables (e.g., spinach, lettuce, broccoli). Additionally, consider using row covers or low tunnels to retain heat and protect crops during cooler mornings.

4. Irrigation Management

- Observation:** Loamy soil has good water retention and drainage properties but still requires careful irrigation to avoid stress.
- Recommendation:** Monitor soil moisture levels and irrigate as needed to avoid water stress, especially during critical growth stages like flowering and fruiting. Employ drip irrigation for efficient water use.


Disease Vision

Detected attributes JSON




maize_leaf_blight (99.96%)
maize_leaf_spot (0.04%)
maize_healthy (0.00%)

Detected attributes JSON



maize_leaf_spot (99.98%)
maize_leaf_blight (0.02%)
maize_healthy (0.01%)

MAIZE IMAGE ANALYSIS



Health Status: Healthy
Confidence: 99.0%
Analysis: Leaf appears to be healthy
Detected Features: green, outdoor, terrestrial plant, grass, plant stem, vascular plant, leaf, plant

The Dashboard





Conclusion 04

Impact

1. Enhanced Decision-Making
 - a. Automatic and Early Plant Disease Detection
2. Time Efficiency
 - a. Instant Results
 - b. Reduced Dependency on Experts
3. Cost Reduction
 - a. Reduction in Input costs (fertilizers, pesticides)
 - b. Better Resource Allocation
4. Improved Crop Yield and Quality
 - a. Better Crop Management
 - b. Improved Quality of Produce
5. Data-driven and Research-based insights
 - a. Collection of Plant Health Data

Future Work

Including more crop types to analyze and detect.



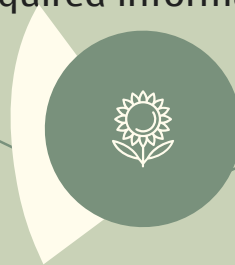
**More
Crops**

Enhance different aspects such as accuracy, compactability, specificity, and dynamics.



**Better
Features**

Improve the Database of knowledge that is utilised to deliver the required information



Inclusion



Thanks!

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