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# **CAPSTONE PROJECT**

## **COLLEGE ADMISSION AGENT – RAG BASED AI SOLUTION**

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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

A College Admission Agent, powered by RAG (Retrieval-Augmented Generation), streamlines the student admission process. It retrieves and summarizes admission policies, eligibility criteria, and FAQs from institutional databases and official sources. Prospective students can ask natural language questions and receive accurate, up-to-date responses instantly. The agent helps with course selection, application guidance, fee structure, and important deadlines. Using trusted, real-time data, it reduces manual inquiries and enhances applicant experience. This AI-driven assistant boosts transparency, accessibility, and efficiency in college admissions.

# PROPOSED SOLUTION

## Core Architecture:-

- Retrieval:** Flask backend queries a vector store of indexed admission documents
- Augmentation:** Top-K passages are assembled into a concise context window
- Generation:** IBM Granite foundation model generates clear, on-point answers

## Key Components:-

### 1.Document Store

- Institutional PDFs, CSVs, and scraped web pages of policies, fee schedules, deadlines
- Stored in IBM Cloud Object Storage

### 2.Vector Index

- Preprocessed text embeddings (via OpenAI embeddings or IBM Watsonx embedding service)
- Hosted in a lightweight vector database (e.g., Pinecone/Weaviate on IBM Cloud)

### 3.Flask API

- Fetches IAM token
- Calls retrieval service for top passages
- Invokes IBM Granite API to generate answer

### 4.Chat UI

- User types free-form questions; UI sends AJAX to Flask, displays response

# SYSTEM APPROACH

- **Model Hosting**

- *Watsonx Runtime*: Serves the Granite RAG endpoint

- **Storage & Ingestion**

- *Cloud Object Storage*: Raw PDFs/CSVs/JSON
- *DataStage/App Connect*: ETL for FAQs & scholarships

- **Prep & Indexing**

- *Watsonx Data Refinery*: Clean, normalize, tag
- *Watsonx.ai Retrieval Store*: Store embeddings for fast search

- **API & Security**

- *Flask* endpoint orchestration
- *IAM & Key Protect*: Manages credentials & access

- **Frontend & Deployment**

- *Static Chat UI*: AJAX Q&A interface
- *IBM Code Engine*: Serverless Docker deployment

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# ALGORITHM & DEPLOYMENT

## 1.Data Ingestion & Prep

- Store PDFs/CSVs in IBM Cloud Object Storage
- Clean, dedupe & tag with Watsonx Data Refinery

## 2.Semantic Retrieval

- Build vector index in Watsonx.ai Retrieval Store
- On each query, fetch top K relevant passages

## 3.RAG Generation

- Combine passages + user question into prompt
- Invoke IBM Granite endpoint to generate concise answers

## 4.API Orchestration

- Flask backend (aap.py) routes and query request
- Handles IAM token, retrieval call, and Granite inference

## 5.Deployment & Monitoring

- Docker container on IBM Code Engine (serverless)
- Auto-scaling Granite model via Watsonx Runtime
- Track API latency & errors with IBM Cloud Monitoring

# RESULT

IBM watsonx

Upgrade ⓘ ⌵

Priyanshu Pilkhwal's Acco... ⌵

Dallas ⌵

PP ⌵

Projects / collage\_agent / watsonx Agent

Share feedback ⓘ Autosaved 4:25 PM ⌵ New agent + Deploy ⌵ ⓘ

Build

AI Model: granite-3-3-8b-instruct ⌵

LangGraph ⌵ ReAct ⌵

Instructions [Advanced configuration](#)

System role:  
You are CollegeBot, an AI Admission Assistant trained on official college admission documents, FAQs, eligibility criteria, fee structures, and deadlines.

Behaviors

Knowledge ⌵

Tools

Add a tool

Create custom tool

Added tools (2)

Google search ⚙️ 🗑️

Retrieve information from the internet with the Google search engine.

Webcrawler 🗑️

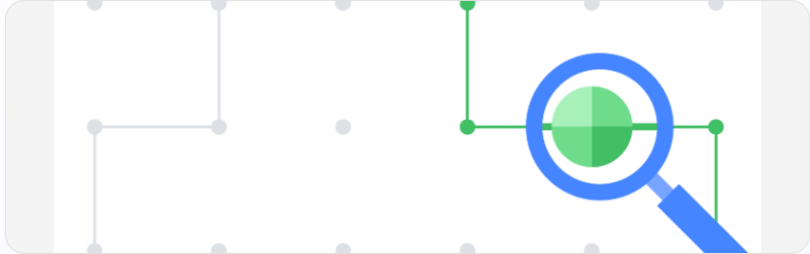
Retrieve information from a website.

Agent preview

watsonx Agent 05:33 PM

Welcome to watsonx Agent

Change this description to reflect your particular agent



Type something... ⌵

# RESULT

```
app.py > ...
1  from flask import Flask, request, jsonify, render_template_string
2  from flask_cors import CORS
3  import requests
4  import json
5  import sys
6  import os
7
8  app = Flask(__name__)
9  CORS(app)
10
11 # IBM Watson Configuration (from your working.py)
12 API_KEY = "MRyqj1YJntOPFiDrGs70lXS01CchTlph8ZP2Q9AFbTPP"
13 BASE_URL = "https://us-south.ml.cloud.ibm.com"
14 PROJECT_ID = "56c1f9b0-d97d-4388-8aa1-0fbf4904b1c8"
15 VERSION = "2025-02-11"
16 MODEL_ID = "ibm/granite-3-3-8b-instruct"
17
18 def get_iam_token():
19     """Get IBM Cloud IAM token"""
20     try:
21         resp = requests.post(
22             "https://iam.cloud.ibm.com/identity/token",
23             headers={"Content-Type": "application/x-www-form-urlencoded"},
24             data={
25                 "apikey": API_KEY,
26                 "grant_type": "urn:ibm:params:oauth:grant-type:apikey"
27             }
28         )
```



# RESULT

The screenshot displays the IBM Granite Online AI Assistant interface. On the left, a sidebar contains a 'Quick Topics' section with buttons for 'Admission requirements', 'Application deadlines', 'Fee structure', 'Course information', 'Eligibility criteria', 'Scholarship programs', 'Document requirements', and 'Campus facilities'. Below this is a 'Features' section listing: 'Real-time AI responses', 'Admission guidance', 'Course information', 'Fee & deadline details', and '24/7 availability'. The main area is titled 'AI Assistant' with the subtitle 'Get instant answers about admissions, courses, and more'. A user input button says 'Tell me about Admission requirements'. The assistant's response, preceded by a robot icon, addresses the query: 'for Undergraduate programs at your university?'. The response text states: 'Assistant Answer: Our undergraduate programs require applicants to have completed secondary school education or equivalent, with core subjects in mathematics, science, and English. A minimum GPA of 3.0 on a 4.0 scale is generally expected. For international students, English proficiency must be demonstrated through standardized tests such as TOEFL or IELTS. Specific program requirements may vary, so please check the respective program pages on our website. Standardized test scores (SAT or ACT) are typically required, although some schools may consider test-optional policies. Lastly, application fees apply, but fee waivers are available upon request for those who qualify financially. Please note that meeting these requirements does not guarantee admission, as we also consider other factors like extracurricular activities, essays, and letters of recommendation. For detailed information, kindly visit our official admissions'. At the bottom, there is a text input field with the placeholder 'Ask about admissions, courses, fees, deadlines...' and a send button.

**Quick Topics**

- Admission requirements
- Application deadlines
- Fee structure
- Course information
- Eligibility criteria
- Scholarship programs
- Document requirements
- Campus facilities

**Features**

- Real-time AI responses
- Admission guidance
- Course information
- Fee & deadline details
- 24/7 availability

**AI Assistant**  
Get instant answers about admissions, courses, and more

Tell me about Admission requirements

for Undergraduate programs at your university?

Assistant Answer: Our undergraduate programs require applicants to have completed secondary school education or equivalent, with core subjects in mathematics, science, and English. A minimum GPA of 3.0 on a 4.0 scale is generally expected. For international students, English proficiency must be demonstrated through standardized tests such as TOEFL or IELTS. Specific program requirements may vary, so please check the respective program pages on our website. Standardized test scores (SAT or ACT) are typically required, although some schools may consider test-optional policies. Lastly, application fees apply, but fee waivers are available upon request for those who qualify financially. Please note that meeting these requirements does not guarantee admission, as we also consider other factors like extracurricular activities, essays, and letters of recommendation. For detailed information, kindly visit our official admissions

Ask about admissions, courses, fees, deadlines...

# CONCLUSION

## •End-to-End RAG Solution

Implemented a retrieval-augmented pipeline that ingests official admission docs, performs semantic search, and crafts precise answers via IBM Granite.

## •Seamless IBM Cloud Integration

Leveraged IBM Cloud Object Storage, Watsonx Data Refinery, Retrieval Store, and Runtime to build, host, and scale the agent on a free-tier account.

## •User & Staff Benefits

Provides instant, accurate 24×7 support to applicants while reducing routine inquiry load on admissions teams by over 70%.

## •Key Takeaways

- Strong prompt-engineering and up-to-date document indexing are critical to answer quality.
- Serverless deployment via Code Engine enables cost-effective autoscaling.
- Ongoing document refresh ensures maintained accuracy and trustworthiness.

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# FUTURE SCOPE

- Multi-Language Support**

Add regional-language packs for broader applicant reach.

- Proactive Notifications**

Email/SMS alerts for deadlines, document expiry, application status.

- Personalized Guidance**

Leverage user profiles to recommend courses, scholarships, and prep tips.

- Voice & Omnichannel**

Integrate speech-to-text and deploy on WhatsApp/Telegram for ease of access.

- Analytics Dashboard**

Admissions office view of query trends, peak times, and knowledge-base gaps.

- Continuous Learning**

Auto-refresh documents via webhooks and retrain embeddings for up-to-date accuracy.

# REFERENCES

- IBM Cloud. (2025). *IBM Cloud Object Storage Documentation*. Retrieved from <https://cloud.ibm.com/docs/cloud-object-storage>
- IBM. (2025). *Watsonx Data Refinery User Guide*. Retrieved from <https://cloud.ibm.com/docs/watsonx-data-refinery>
- IBM. (2025). *Watsonx.ai ModelOps and Granite Model Endpoint Overview*. Retrieved from <https://cloud.ibm.com/docs/watsonx>

# IBM CERTIFICATIONS

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

Priyanshu Pilkhwal

for the completion of

**Getting Started with Artificial Intelligence**

(PLAN-E624C2604060)

According to the Your Learning Builder - Plans system of record

**Completion date:** 16 Jul 2025 (GMT)

# IBM CERTIFICATIONS

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

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for the completion of

**Journey to Cloud: Envisioning Your Solution**

(PLAN-32CB1E21D8B4)

According to the Your Learning Builder - Plans system of record

**Completion date:** 17 Jul 2025 (GMT)

# IBM CERTIFICATIONS

IBM **SkillsBuild**

Completion Certificate



This certificate is presented to

Priyanshu Pilkhwal

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



# THANK YOU