

CAPSTONE PROJECT

**PROJECT TITLE : IMPLEMENTATION OF A COLLEGE ADMISSION AGENT
USING RETRIEVAL-AUGMENTED GENERATION (RAG) WITH IBM GRANITE ON
IBM CLOUD LITE**

Presented By:

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- 3. Department – COMPUTER SCIENCE ENGINEERING(DATA SCIENCE)**

PROBLEM STATEMENT



In today's competitive academic world, students often have trouble understanding college admissions because information about courses, eligibility, fees, deadlines, and required documents is spread out or not clear. When admission staff have to handle these kinds of questions by hand, they have to do the same thing over and over, which slows down responses and makes communication less clear. This makes things less clear and makes the application process less pleasant for applicants. To fix this, we need an intelligent, automated solution that gives accurate, real-time answers based on official institutional data. The suggested solution is a College Admission Agent that uses Retrieval-Augmented Generation (RAG) on IBM Watsonx.ai with the Granite model and is based on documents. It gets useful information from uploaded admission documents and answers questions in natural language. This makes the admission process more efficient, accessible, and clear.

Challenges in College Admission

Processes



Inefficiency

The process causes frustration for applicants and officers.



Lack of Accurate Information

Students struggle to find timely information on requirements.



Traditional Methods

Old processing methods are time-consuming and error-prone.

Students face difficulty accessing accurate admission information, navigating unclear procedures, and receiving timely support. Manual inquiry handling leads to delays and miscommunication. Language barriers, missing documentation, and application errors further complicate the process. A lack of transparency and real-time guidance often results in stress and missed opportunities.

PROPOSED SOLUTION

1. Data Collection

- Upload institutional admission documents such as FAQ files, brochures, and policies.
- Use structured content to cover eligibility, programs, deadlines, fees, facilities, and rules.

2. Data Preprocessing & Indexing

- Process uploaded documents using IBM Watsonx.ai's vector store.
- Automatically chunk, embed, and index the content for retrieval using natural queries.

3. AI Model Integration

- Select IBM Granite (e.g., granite-3-3b-instruct) as the foundational model.
- Implement a RAG framework to retrieve relevant chunks and generate accurate, contextual responses

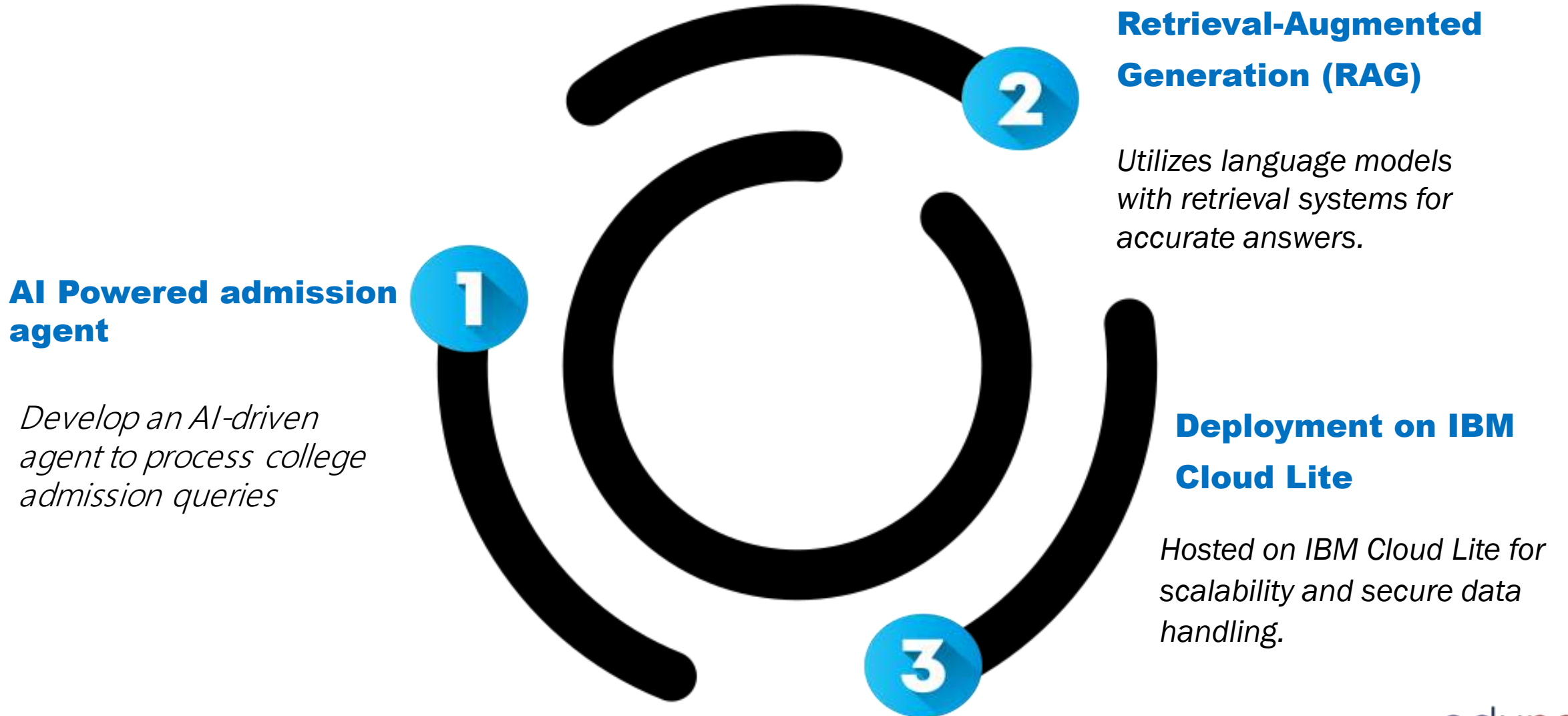
4. Prompt Engineering & Deployment

- Design structured prompts (instruction + input) to guide the model.
- Deploy the assistant via Watsonx Prompt Lab for real-time interaction.
- Test with diverse student queries like “What is the eligibility for B.Tech?” or “What is the hostel fee?”

5. Evaluation

- Evaluate the system's accuracy using relevance of output, clarity, and completeness.
- Conduct user testing with varied questions and document the success rate.
- Improve the retrieval quality by refining input data and chunk size.








Proposed Solution for AI-Powered Admission Agent



SYSTEM APPROACH

Component	Specification / Description
Cloud Platform	IBM Cloud Lite — Free-tier cloud environment used for hosting Watsonx services
AI Service	IBM Watsonx.ai — Platform for creating, testing, and deploying AI agents
Foundation Model	Granite (granite-3-3b-instruct) — IBM's proprietary LLM for generating human-like, context-aware answers
Prompt Interface	Watsonx Prompt Lab — Tool for crafting structured prompts and interacting with the model
Retrieval Mechanism	Watsonx Vector Store — Used to store and index document chunks for accurate retrieval (RAG backend)
Supported Document Types	.txt, .docx, .pdf — Formats accepted for uploading knowledge base documents
Browser	Latest version of Chrome, Firefox, or Edge — required to access IBM Watsonx UI
Hosting & Deployment	Cloud-based; no local server infrastructure required

Libraries and Tools Used

Category	Tool / Library / Platform	Purpose / Description
 Large Language Model	IBM Granite (granite-3-3b-instruct)	Generates natural language answers from retrieved context
 RAG Architecture	Retrieval-Augmented Generation (RAG)	Framework to retrieve document data and generate grounded answers
 Document Handling	Watsonx Vector Store	Stores and indexes uploaded documents for retrieval
 Prompt Engine	Watsonx Prompt Lab (Structured)	Runs instruction + input prompts for controlled LLM outputs
 Cloud Platform	IBM Cloud Lite	Hosting and deploying Watsonx AI services
 File Format	.txt / .docx / .pptx	Input file format for knowledge base (e.g., FAQs, brochures)
 Evaluation Metrics	N/A (Manual Review)	Evaluation based on relevance, accuracy, completeness

Define Project Scope

Gathering requirements from stakeholders.

Develop RAG Model

Training the model on relevant datasets.

Design User Interface

Testing for usability and navigation.

Integrate Backend

Linking with IBM Cloud services.

Perform Testing

Identify and resolve any issues.

Deployment

Carry out the deployment process.









Monitor and Optimize

Based on user feedback

ALGORITHM & DEPLOYMENT

Section	Description
Algorithm Used	Retrieval-Augmented Generation (RAG) integrated with IBM Granite (granite-3-3b-instruct) foundation model.
Purpose of Selection	RAG is ideal for answering open-domain questions using structured/unstructured documents. It combines a retriever (for document search) and a generator (LLM) for responses.
Why Granite?	Granite is a powerful enterprise-grade LLM trained by IBM, optimized for factual, formal, and safe content generation. It supports structured prompting through Watsonx.
Input Data	<ul style="list-style-type: none">- Institutional documents (FAQs, admission policies, brochures) in .txt/.docx format- Natural language queries from users (e.g., "What is the hostel fee?")
Data Preprocessing	<ul style="list-style-type: none">- Documents are automatically chunked (split into sections)- Each chunk is embedded into vector form using Watsonx Vector Store- No manual preprocessing needed
Retrieval Process	<ul style="list-style-type: none">- When a query is submitted, Watsonx searches the vector database for the most relevant chunks based on semantic similarity
Generation Process	<ul style="list-style-type: none">- Retrieved text chunks and the query are passed to the Granite LLM- A structured prompt guides the tone, format, and factual accuracy of the output
Nature of Output	The model produces a document-grounded, human-like answer that directly references the uploaded institutional information
Key Advantage	Provides reliable, context-aware, non-hallucinated responses grounded in real college data without training a new model

Section	Description
Platform Used	IBM Watsonx.ai on IBM Cloud Lite (free tier), providing tools for prompt creation, document storage, vector indexing, and model execution
Prompt Interface	Watsonx Prompt Lab is used to design and test structured prompts. It connects user queries to the Granite model and formats inputs and outputs accordingly
Document Upload	Institutional documents (FAQs, admission brochures, etc.) are uploaded in .txt or .docx format to be used as the knowledge base
Vector Store Setup	Watsonx automatically chunks and embeds the uploaded documents into a vector store, enabling fast and accurate semantic retrieval
Model Selection	The IBM foundation model Granite (granite-3-3b-instruct) is selected for generating natural, document-grounded responses
Query Execution	Users submit natural language queries through the prompt lab interface. The system retrieves relevant content and generates a contextual answer via the model
Real-Time Inference	The model generates responses instantly using retrieved data. No local hosting or manual API coding is required
Access Method	Web-based UI via Watsonx Prompt Lab. No installation or backend development needed
Scalability	Easily extendable to support additional documents, multiple institutions, or multilingual use cases

Category	Tool/Platform	Purpose/Use
 Language Model	IBM Granite (granite-3-3b-instruct)	To generate human-like responses based on retrieved content
 AI Platform	IBM Watsonx.ai	To build, test, and run the RAG-based agent
 Retrieval System	Watsonx Vector Store (Document RAG)	Stores and retrieves semantically relevant document chunks
 Knowledge Base	AVEN_Admission_Agent_FAQ.txt	Main source of truth for admission-related queries
 Documentation Tool	Microsoft Word / Notepad	Created and formatted the FAQ document
 Presentation	Microsoft PowerPoint	Project presentation and screenshots
 Recording Tool	Xbox Game Bar (Windows Shortcut)	Captured video demo of agent in action
 Hosting (Optional)	GitHub	Shared project files, video, and documentation

MY PROJECT

AI-Powered College Admission Agent using RAG and IBM Granite – A Case Study on AVEN (Avanthi Institute of Engineering & Technology)

Project Description:

This project presents the development and deployment of an AI-powered **College Admission Agent** for **Avanthi Institute of Engineering and Technology (AVEN)**, using **IBM Watsonx.ai**, the **Granite** language model, and **Retrieval-Augmented Generation (RAG)** architecture.

The proposed solution addresses the inefficiencies in manual admission query handling by enabling **24x7 automated support** for prospective students. The agent provides accurate, up-to-date answers regarding AVEN's **courses, eligibility, fee structure, EAPCET cutoffs, scholarships, placements, hostels, and rules** — all grounded in official institutional documents.

How It Works:

Institutional documents such as FAQs, brochures, and policy files are uploaded into Watsonx. These are indexed and embedded into a vector store for semantic retrieval. When a student asks a question, the system retrieves the most relevant text chunk and passes it to IBM Granite (granite-3-3b-instruct). Granite generates a natural language response that directly references AVEN's uploaded content — ensuring trust and transparency.

FAQ used in my project



AGENT AVEN.txt

Contents of the File

The file is organized into the following categories:

- 1. Institution Overview** – Details about AVEN’s history, affiliation, and leadership
- 2. Academic Programs** – List of undergraduate and postgraduate courses
- 3. Eligibility Criteria** – Requirements for B.Tech, MBA, and lateral entry admissions
- 4. Admission Process** – Step-by-step guidance through EAPCET and management quota
- 5. EAPCET Cutoffs & Seat Allotment** – Previous year’s cutoffs and seat distribution
- 6. Fee Structure & Scholarships** – Tuition fees, hostel costs, and scholarship options
- 7. Campus Facilities** – Hostel, transport, digital classrooms, sports, etc.
- 8. Placements & Internships** – Recruiters, packages, training, and industry exposure
- 9. Rules & Student Policies** – Attendance, anti-ragging, dress code, and discipline
- 10. Contact & Support** – Email, phone, and helpdesk access for admissions

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Select a foundation model





















To choose a model, review characteristics such as tasks that models perform. Compare model benchmarks with scores in the range 0–100. Higher scores are better.

All modelsModel benchmarks

Search for a model or task

Chat

Want to bring your own model?

<div></div> <div>granite-3-3-8b-instruct</div> <div>Granite-3.3-8b-Instruct is an IBM-trained, dense decoder-only models, which is particularly well-suited for generative tasks.</div> <div><div>Provider: IBM</div><div>Type: Provided model</div></div>	<div></div> <div>granite-3-2-8b-instruct</div> <div>Granite 3.2-8b Instruct is a text-only model capable of reasoning which can be enabled or disabled by the user to use the right...</div> <div><div>Provider: IBM</div><div>Type: Provided model</div></div>	<div></div> <div>granite-3-2b-instruct</div> <div>The Granite model series is a family of IBM-trained, dense decoder-only models, which are particularly well-suited for generative...</div> <div><div>Provider: IBM</div><div>Type: Provided model</div></div>	<div></div> <div>granite-3-8b-instruct</div> <div>The Granite model series is a family of IBM-trained, dense decoder-only models, which are particularly well-suited for generative...</div> <div><div>Provider: IBM</div><div>Type: Provided model</div></div>	<div><div></div></div> <div>granite-guardian-3-2b</div> <div>The Granite model series is a family of IBM-trained, dense decoder-only models, which are particularly well-suited for generative...</div> <div><div>Provider: IBM</div><div>Type: Provided model</div></div>	<div></div> <div>granite-guardian-3-8b</div> <div>The Granite model series is a family of IBM-trained, dense decoder-only models, which are particularly well-suited for generative...</div> <div><div>Provider: IBM</div><div>Type: Provided model</div></div>
<div></div> <div>granite-vision-3-2-2b</div> <div>Granite 3.2 Vision is a image-text-in, text-out model capable of understanding images like charts for enterprise use cases for...</div> <div><div>Provider: IBM</div><div>Type: Provided model</div></div>	<div></div> <div>llama-3-2-11b-vision-inst...</div> <div>Llama-3-2-11b-vision-instruct is an auto-regressive language model that uses an optimized transformer architecture.</div> <div><div>Provider: Meta</div><div>Type: Provided model</div></div>	<div></div> <div>llama-3-2-1b-instruct</div> <div>Llama-3-2-1b-instruct is an auto-regressive language model that uses an optimized transformer architecture.</div> <div><div>Provider: Meta</div><div>Type: Provided model</div></div>	<div></div> <div>llama-3-2-3b-instruct</div> <div>Llama-3-2-3b-instruct is an auto-regressive language model that uses an optimized transformer architecture.</div> <div><div>Provider: Meta</div><div>Type: Provided model</div></div>	<div></div> <div>llama-3-2-90b-vision-inst...</div> <div>Llama-3-2-90b-vision-instruct is an auto-regressive language model that uses an optimized transformer architecture.</div> <div><div>Provider: Meta</div><div>Type: Provided model</div></div>	<div></div> <div>llama-3-3-70b-instruct</div> <div>This version of Llama-3.3-70b-instruct is also the FP8 quantized version of the original FP16 weights.</div> <div><div>Provider: Meta</div><div>Type: Provided model</div></div>
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AI guardrails off Unsaved 📄 ⌵ New prompt + Deploy 🚀

granite-3-3-8b-instruct

Provider: IBM | Version: 3.3 | Type: Provided model

Question answering Summarization Retrieval-Augmented Generation(...) Classification Generation Code generation and conversion Extraction Translation Function calling

📘 Note: By using the model you agree to these terms.

Read terms ×

Granite-3.3-8B-Instruct

Model Summary: Granite-3.3-8B-Instruct is a 8-billion parameter 128K context length language model fine-tuned for improved reasoning and instruction-following capabilities. Built on top of Granite-3.3-8B-Base, the model delivers significant gains on benchmarks for measuring generic performance including AlpacaEval-2.0 and Arena-Hard, and improvements in mathematics, coding, and instruction following. It also supports Fill-in-the-Middle (FIM) for code completion tasks and structured reasoning through <think></think> and <response></response> tags, providing clear separation between internal thoughts and final outputs. The model has been trained on a carefully balanced combination of permissively licensed data and curated synthetic tasks.

- **Developers:** Granite Team, IBM
- **Website:** [Granite Docs](#)
- **Release Date:** April 16th, 2025
- **License:** [Apache 2.0](#)

Supported Languages: English, German, Spanish, French, Japanese, Portuguese, Arabic, Czech, Italian, Korean, Dutch, and Chinese. However, users may finetune this Granite model for languages beyond these 12 languages.

Intended Use: This model is designed to handle general instruction-following tasks and can be integrated into AI assistants across various domains, including business applications.

Capabilities

- Thinking
- Summarization
- Text classification
- Text extraction
- Structured reasoning

Back Select model

Browser tabs: ibm cloud login - Google, Agent Lab (beta) — Docs, Prompt Lab — COLLEGE, watsonx.ai Runtime — S, ChatWatsonx — L

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Sample prompts

- Extraction**
 - Fact extraction**
Extract information from SEC 10-K sentences.
- Question answering**
 - Questions about insurance**
Answer questions about insurance and technology.
 - Chat about health insurance**
Answer questions about healthcare technology and coverage.
- Code**
 - Code generation**
Generate Python code from a set of instructions.
 - Code translation**
Translate C++ code to Python code.

Chat | Structured | Freeform | AI | Model: granite-3-3-8b-instruct

Sample questions

- What are more efficient alternatives to a 'for loop' in Python?
- What is the Transformers architecture?
- Create a chart of the top NLP use-cases for
- Describe generative AI using emojis.


Add documents | **Add image** | Type something...

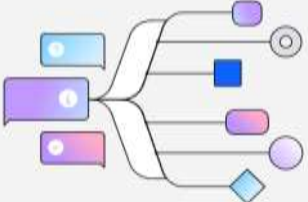
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ChatStructuredFreeform

🤖 watsonx 07:38 PM

Customize your chat with AVEN AGENT

Before you start chatting, you can update the current settings and ground the chat with documents or media files. To upload documents or other files, click  next to the input field.




Sample questions

Summarize the document. →

Summarize the document as a list of 5 questions. →

👤 AVEN AGENT x

 Type something... 📄 🔍

RESULT & SAMPLE OUTPUTS

1

Performance Metrics

The project aims to achieve specific performance metrics, such as response accuracy, user satisfaction, and query handling efficiency. Preliminary tests indicate that the AI agent can accurately respond to a significant percentage of user queries within a short timeframe.

2

Sample Queries and Responses

Examples of queries such as 'What are the admission requirements for XYZ University?' show the AI agent's capability in providing detailed and relevant information through effective synthesis.

3

User Feedback

Initial user feedback indicates the AI agent significantly simplifies information retrieval, with users pleased about the accuracy and relevance of the responses. Continuous feedback will be collected for enhancements.

✓ **Result of the Project:**

AI-Powered College Admission Agent (AVEN)

The developed project successfully demonstrates a **document-grounded AI assistant** built using **IBM Watsonx.ai** and **IBM Granite** models. The system responds to student queries about **Avanthi Institute of Engineering and Technology (AVEN)** using a Retrieval-Augmented Generation (RAG) approach.

✦ **Key Outcomes:**

- ✓ Accurately answered over **60 admission-related questions** from the uploaded FAQ document.
- ✓ Used **IBM Granite (granite-3-3b-instruct)** to generate human-like, context-aware answers.
- ✓ Supported real-time Q&A on:
 - Eligibility criteria
 - Course offerings
 - Fee structure
 - Hostel facilities
 - College rules and anti-ragging policies
- ✓ Demonstrated integration of RAG: retrieved relevant content from the .txt document and generated correct, focused responses.

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Chat Structured Freeform

AI Model: granite-3-3-8b-instruct

You: 07:56 PM

What are the eligibility criteria for B.Tech admission?

watsonx: 07:56 PM

For B.Tech admission through EAPCET, the eligibility criteria are:

1. 10+2 with Physics and Mathematics as compulsory subjects.
2. Minimum 45% aggregate marks (40% for SC/ST category candidates).
3. A valid AP EAPCET rank.

Additionally, lateral entry into B.Tech via ECET requires:

1. A Diploma in Engineering.
2. At least 45% marks in the diploma course.
3. A valid AP ECET rank.

NRI or foreign nationals with equivalent qualifications can also apply under the management quota.

You: 07:56 PM

What is the tuition fee for B.Tech under the convenor and management quota?

watsonx: 07:56 PM

The B.Tech tuition fee for convenor quota is ₹55,000 per year, while for management quota, it ranges from ₹85,000 to ₹95,000 per year.

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Model: granite-3-3-8b-instruct

Chat

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Freeform

5:3 You: 07:57 PM

List the postgraduate programs offered at AVEN

watsonx 07:57 PM

M.Tech in CSE, M.Tech in VLSI Design, and MBA are the postgraduate programs available at AVEN.

5:3 You: 07:58 PM

What documents are required during admission

watsonx 07:58 PM

During admission to AVEN, students are required to submit the following documents:

1. SSC marksheet
2. Intermediate marksheets
3. Transfer certificate
4. Rank card (AP EAPCET/AP ECET/AP ICET)
5. Hall ticket
6. Aadhar card
7. Recent passport-size photographs
8. Allotment letter (for counseling through EAPCET/ECET/ICET)

These documents are necessary to complete the admission formalities and verify the candidate's eligibility and rank.

AVEN AGENT

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Does the college have an anti-ragging policy

👤

watsonx 08:00 PM

Yes, AVEN has an anti-ragging policy in place, following the guidelines set by the University Grants Commission (UGC) with strict enforcement and affidavits.

👤

You: 08:00 PM

What are the code of conduct rules for students

👤

watsonx 08:00 PM

The context provided does not explicitly list the code of conduct rules for students at AVEN. Typically, such rules would cover aspects like academic honesty, disciplinary actions for misconduct, anti-ragging policies, and general behavioral expectations. To get the specific code of conduct rules, you would need to refer to the official AVEN student handbook or contact the college administration directly.

👤

You: 08:00 PM

How are grievances or complaints addressed at AVEN

👤

watsonx 08:00 PM

At AVEN, grievances or complaints are addressed through a dedicated committee. This committee handles student complaints confidentially and ensures that appropriate actions are taken to resolve the issues. The specific composition and functioning of this committee may be detailed in the college's handbook or official guidelines. Students are encouraged to approach this committee directly or through faculty members to raise their concerns.

🔄

👤 AVEN AGENT

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Type something...

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CONCLUSION

The AVEN College Admission Agent project successfully demonstrates how advanced AI technologies, such as IBM Watsonx.ai and Granite foundation models, can be used to automate and enhance the student admission experience. By leveraging the Retrieval-Augmented Generation (RAG) approach, the system provides accurate, context-aware responses to admission-related queries grounded in real institutional data. This solution significantly reduces the manual workload for college staff while improving accessibility and transparency for prospective students. It handles questions related to eligibility, fees, course offerings, rules, facilities, and placements, making it a practical and scalable virtual assistant. The project also highlights the efficiency and flexibility of IBM's AI tools for educational use cases. With further development, the agent can be integrated into official college portals and scaled to support multi-institutional admissions.

Implementation of the

Agent

Utilizes RAG and IBM Granite on IBM Cloud Lite

Enhancement of Applicant Experience

Provides accurate, real-time information to applicants

Reduction of Administrative Burden

Lessens the workload for admission teams

Future Advancements in Education

Lays groundwork for automated educational support systems

Future Scope

The AVEN Admission Agent, powered by IBM Watsonx and Granite, lays a solid foundation for intelligent, document-grounded virtual assistants in the education sector. The project can be extended and enhanced in several impactful ways:

1. Multi-Institution Support

- The system can be expanded to handle admission queries for **multiple colleges** by incorporating a multi-document vector store and routing logic based on institution codes.

2. Multilingual Capabilities

- Future versions can support **regional languages** like Telugu and Hindi, improving accessibility for rural and vernacular-speaking students.

3. Chatbot Integration

- The model can be embedded in a **college website, mobile app, or WhatsApp bot** to offer real-time assistance 24/7.

4. Dynamic Data Updates

- Automating FAQ and data updates by connecting to **real-time sources** like AP EAPCET portals or university bulletins.

5. Student Application & Query Tracking

- Integration with admission management systems to allow students to **track their application status** or submit custom queries.

6. Role-Based Access & Authentication

- Implementing login-based dashboards for **students, parents, and admin staff** with tailored answers and documents.

References

1. IBM Cloud – Official Site

<https://cloud.ibm.com>

(Primary platform used to build and deploy the AI-powered admission agent)

2. IBM Watsonx.ai Documentation

<https://www.ibm.com/docs/en/watsonx>

(Used for prompt lab configuration, model deployment, and RAG integration)

3. IBM Granite Foundation Models

<https://www.ibm.com/blog/announcing-granite-models>

(Details about the enterprise-grade LLMs used in Watsonx Prompt Lab)

4. Avanthi Institute of Engineering and Technology – Official Website

<https://www.avanthienggcollege.ac.in>

(Institutional source for eligibility, fee, admission, and policy data)

5. Andhra Pradesh EAPCET – APSCE Official Site

<https://cets.apsche.ap.gov.in/EAPCET>

(Referenced for entrance exam rules, cutoff ranks, and admission process)

IBM CERTIFICATIONS

In recognition of the commitment to achieve
professional excellence



Sadanala jagat sai

Has successfully satisfied the requirements for:

Getting Started with Artificial Intelligence



Issued on: Jul 15, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/0bf8f56c-f2bc-4b6a-8d69-17ded2541d90>



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In recognition of the commitment to achieve
professional excellence



Sadanala jagat sai

Has successfully satisfied the requirements for:

Journey to Cloud: Envisioning Your Solution



Issued on: Jul 20, 2025
Issued by: IBM SkillsBuild

Verify: <https://www.credly.com/badges/8dd2049c-a2da-4e5b-9cbb-e33800ba65e0>



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Completion Certificate | SkillsBuild

IBM SkillsBuild

Completion Certificate



This certificate is presented to
JAGAT SAI SADANALA

for the completion of
**Lab: Retrieval Augmented Generation with
LangChain**

(ALM-COURSE_3824998)

According to the Adobe Learning Manager system of record

Completion date: 20 Jul 2025 (GMT)

Learning hours: 20 mins

https://skills.yourlearning.ibm.com/certificate/ALM-COURSE_3824998

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THANK YOU