



Rowan University

Enhancing Student Success Through AI-Powered Applications

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Rowan University

Presentation Roadmap

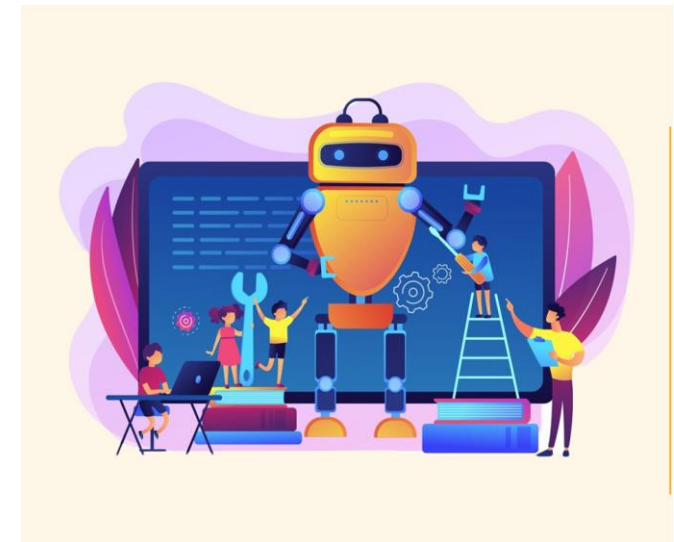
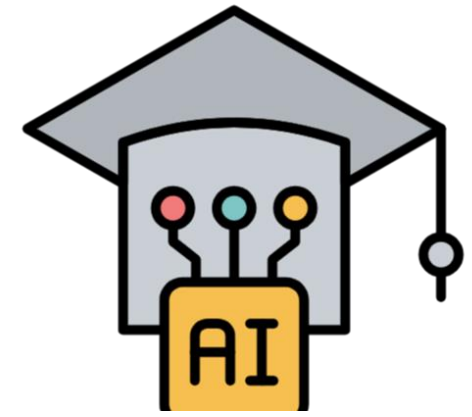
- Introduction
- Problem Statement
- Solution Overview
- Application Workflow
- Data Security and Privacy
- Benefits and Impact
- Conclusion

Overview of AI in Higher Education

AI in Higher Education

- scope of Artificial Intelligence (AI)
 - Simulation of Human Intelligence
 - Enhance learning and administrative processes

- Role of AI in transforming traditional educational models
 - Enable personalized learning experiences
 - Automate administrative tasks
 - Provide valuable insights through data analytics



50000-Foot View

Enhancing Student Success

- Personalized learning experiences
- Intelligent tutoring systems
- Predictive analytics for academic performance



Empowering Faculty

- Automated administrative tasks
- Enhanced data-driven decision making
- Improved resource management



Case Study: ChatGPT Integration

- Query handling for courses, schedules, and seat availability
- Secure data retrieval from databases and the Banner system
- Streamlining access to critical information

Problem Statement: Enhancing Access to Course Information

Current Web Application:

- **Capabilities:**
 - Provides comprehensive information for a term, including:
 - Course details
 - Course schedules
 - Instructor details
 - Section information
 - Building and room details
 - Time and days of the week each course is taught

Problem Statement Contd ..

Challenges:

- **Limited User Engagement**
- **Static Information Presentation:**
 - Information is presented in a static format, making it less interactive.
- **Time-Consuming Searches:**
 - Users spend a significant amount of time searching for specific details.
- **Limited Personalized Assistance:**
 - The web application does not provide personalized responses or guidance.



Introducing the AI-Powered Chatbot

Powered by ChatGPT:


- Leverages advanced natural language processing to understand and respond to user queries accurately and effectively.
- Understand User Queries:
 - a. Accurately interpret and respond to diverse user queries
 - b. Provide precise answers based on context and content of questions asked

Seamless Integration:

- Integrated with the existing web application to enhance its functionality and user experience.

Ask and Answered - Course Information Finder

Course Details
Students and faculty can inquire about specific courses, including course description, credits, and prerequisites.

Section Tally 

Course Information Finder

Enter your question:

can you provide course details for introduction to biology?

Submit

Certainly! Here are the course details for "Introduction to Biology": - Course Code: BIO101 - Course Title: Introduction to Biology - Instructor: John Doe - Department: Biology - College: College of Science and Technology - Location: Main Campus, Building A - Days: Monday to Friday - Time: 18:00 to 19:30 (6:00 PM to 7:30 PM) - Term: Regular - Credit Hours: 3 - Maximum Capacity: 30 students - Enrolled Students: 28 - Available Seats: 2 - Prerequisites: None - Lab Requirement: Yes - Lab Fee: No - Field Trips: Yes - Online Materials: No Please let me know if you need more information or assistance with anything else!

Need Help? Contact Support at support@rowan.edu
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Ask and Answered - Course Information Finder

Schedule Information
Queries about class schedules, including time, days of the week, and instructors, are handled efficiently.

Section Tally

Course Information Finder

Enter your question:

Submit

Based on the data provided, Calculus I is taught on Monday and Wednesday.

Course Information Finder

Enter your question:

Submit

Based on the data provided [(1900, 2030)], it appears that Calculus I starts at 7:00 PM (1900 hours) and ends at 8:30 PM (2030 hours).

Ask and Answered - Course Information Finder

Location Details

Provides information on where classes are located, including building and room numbers.

Section Tally

Course Information Finder

Enter your question:

which building and room number is Advanced Biology taught?

Submit

Advanced Biology is taught in Building B, Room 102.

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Ask and Answered - Course Information Finder

Section Tally

Seat Availability

Real-time updates on how many seats are available in each course.

Course Information Finder

Enter your question:

How many seats are left in Intermediate Biology?

Submit

Based on the given data [(2,)], it appears that there are 2 seats left in Intermediate Biology.

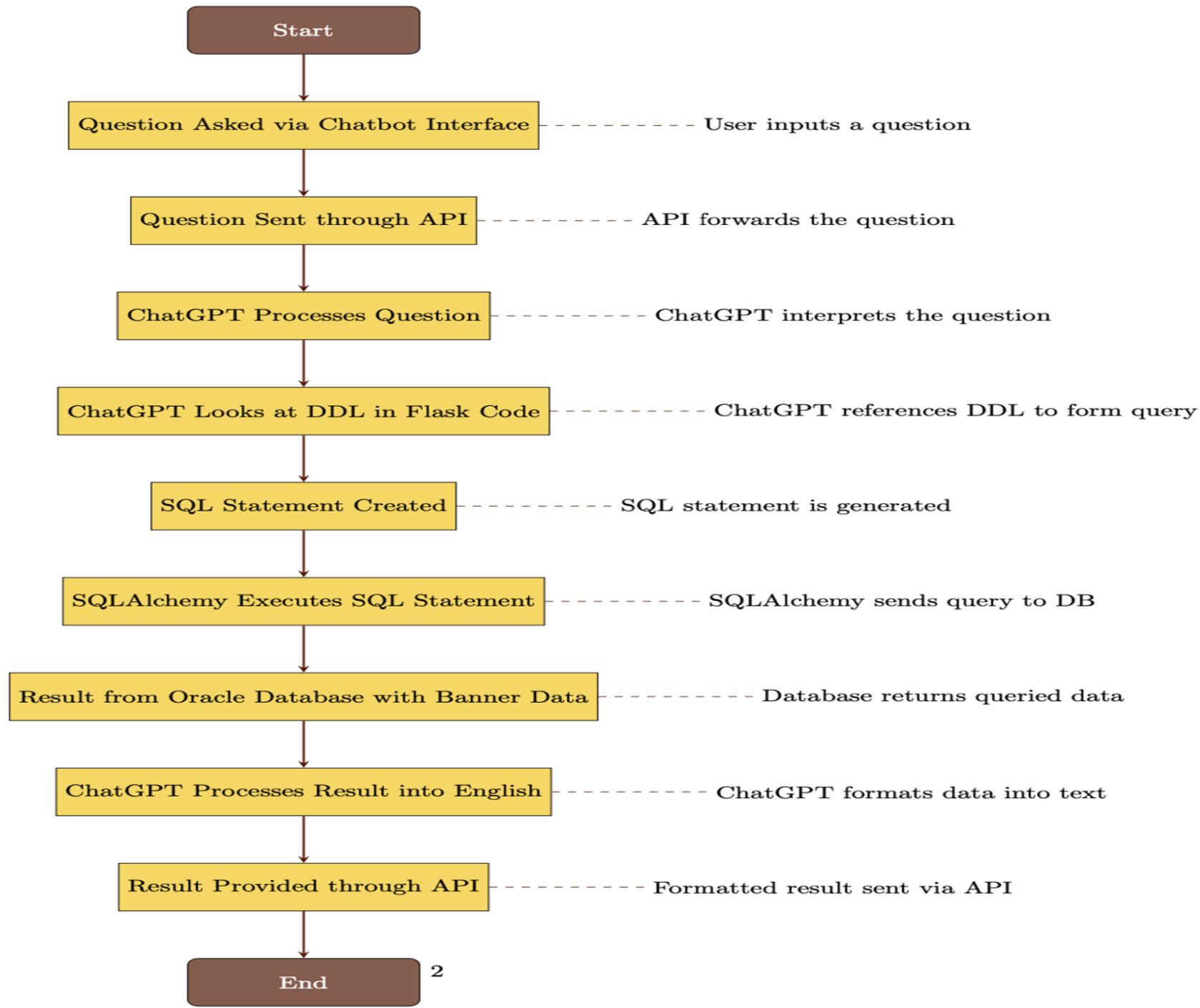
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Solution Overview: AI-Powered Chatbot Integration


- **ChatGPT API Key:**
 - Utilizes the ChatGPT API key to leverage advanced natural language processing capabilities.
- **Python Code and SQLAlchemy:**
 - Python code connects to the Oracle database, accessing Banner tables and views through SQLAlchemy.
- **Database Structure Learning:**
 - Provide Data Definition Language (DDL) to ChatGPT, enabling it to learn the database structure.
- **Dynamic Query Generation:**
 - When a question is asked, ChatGPT uses the DDL to create an appropriate SQL query.
 - The query is sent through SQLAlchemy to fetch the relevant data from the database.
- **Response Generation:**
 - The fetched data is fed into ChatGPT.
 - ChatGPT generates a well-formatted English response.
 - The response is provided as an endpoint, ready for user interaction.

Application Flow



In Depth Application Flow

Question Asked
via Interface

Section Tally 

Course Information Finder

Enter your question:

Submit

Question Sent
Through API

GET
/query?question=Which%20building%20and%20room%20number%20is%20Intro
duntion%20to%20Biology%20taught%20and%20what%20are%20their%20timing
s? HTTP/1.1


```
view_ddl = """
CREATE TABLE rowan.sect_tally_202340 (
  term VARCHAR2(250 CHAR),
  college_cd_and_desc VARCHAR2(250 CHAR),
  department VARCHAR2(250 CHAR),
  course_id VARCHAR2(250 CHAR),
  begin_time_slot NUMBER(10,0),
  end_time_slot NUMBER(10,0),
  term_part VARCHAR2(250 CHAR),
  campus_type VARCHAR2(250 CHAR),
  session_type VARCHAR2(250 CHAR),
  building VARCHAR2(250 CHAR),
  title VARCHAR2(250 CHAR),
  full_name VARCHAR2(250 CHAR),
  campus VARCHAR2(250 CHAR),
  building_code VARCHAR2(250 CHAR),
  room NUMBER(10,0),
  monday_schedule VARCHAR2(250 CHAR),
  tuesday_schedule VARCHAR2(250 CHAR),
  wednesday_schedule VARCHAR2(250 CHAR),
  thursday_schedule VARCHAR2(250 CHAR),
  friday_schedule VARCHAR2(250 CHAR),
  saturday_schedule VARCHAR2(250 CHAR),
  sunday_schedule VARCHAR2(250 CHAR),
  course_ref NUMBER(10,0),
  hrs NUMBER(10,0),
  max_allowed_enrollment NUMBER(10,0),
  enrolled NUMBER(10,0),
  available_enrl NUMBER(10,0),
  max_room_capacity NUMBER(10,0)
)
"""
```

```
def generate_sql_from_english(english_query, table_ddl):
    response = client.chat.completions.create(
        model="gpt-3.5-turbo",
        messages=[
            {"role": "assistant", "content": "You are a helpful assistant."},
            {"role": "user", "content": f"Generate an SQL query from the following \
English query and table DDL:\n\nEnglish query: {english_query}\n\n \
Table DDL: {table_ddl}\n\nGenerated SQL:"}
        ]
    )
```

ChatGPT
Processes
Question



ChatGPT looks
at DDL in
Python Flask



SQL Statement
Created

```
Generated SQL query: ```sql
SELECT building, room, begin_time_slot, end_time_slot
FROM rowan.sect_tally_202340
WHERE title = 'Introduction to Biology';
```
```

SQLAlchemy  
executes SQL  
statement

Results from  
Oracle  
Database

```
SELECT building, room, begin_time_slot, end_time_slot
FROM rowan.sect_tally_202340
WHERE title = 'Introduction to Biology';
```

Script Output x Query Result x

SQL | All Rows Fetched: 1 in 0.023 seconds

|   | BUILDING   | ROOM | BEGIN_TIME_SLOT | END_TIME_SLOT |
|---|------------|------|-----------------|---------------|
| 1 | Building A | 101  | 1800            | 1930          |



ChatGPT  
processes  
results into  
English

```
chatgpt_prompt = f"The user asked: '{question}'. Here is the given data: {result}"
chatgpt_answer = chatgpt_response(chatgpt_prompt)
return jsonify({"answer": chatgpt_answer, "sql_query": sql_query})
```

Section Tally

## Course Information Finder

Enter your question:

Which building and room number is Introduction to Biology taught and what are their timings?

Submit

Introduction to Biology is taught in Building A, Room 101. The class timings are from 6:00 PM to 7:30 PM.

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Return formatted  
result through  
API in JSON  
format

## Technologies Used



Python



ChatGPT



# Data Security and Privacy



## Security Measures in Place:

- **Data Security:**
  - **SQLAlchemy:**
    - Utilized for secure database connections and operations.
    - Provides an abstraction layer, ensuring the integrity and security of data interactions.
  - **Oracle Database:**
    - Robust security features and access controls protect sensitive information.
- **API Security:**
  - **JWT (JSON Web Token):**
    - Used for API authentication and authorization.
    - Ensures that only authorized users and applications can access the data.
- **Privacy Protection:**
  - **Controlled Data Access:**
    - Data access is restricted and controlled through secure API endpoints.
    - Sensitive information is not exposed directly to ChatGPT or external systems.
  - **Data Minimization:**
    - Only necessary data is retrieved and processed, minimizing exposure and potential risks.

## Data Security and Privacy Contd ..



### Benefits of Our Approach:

- **Enhanced Security:**
  - By isolating ChatGPT from direct database interactions, we reduce the risk of unauthorized access.
  - SQLAlchemy and Oracle provide a secure environment for data operations.
- **Efficient and Secure Data Handling:**
  - The Python script efficiently handles data queries and ensures that data is securely retrieved and processed.
  - JWT ensures secure API communication and data protection.
- **User Privacy:**
  - Protects student, course and faculty data by minimizing exposure and ensuring secure handling and processing.
  - Adheres to best practices and standards for data privacy and security.

## Benefits of Section Tally AI-Powered Chatbot Integration

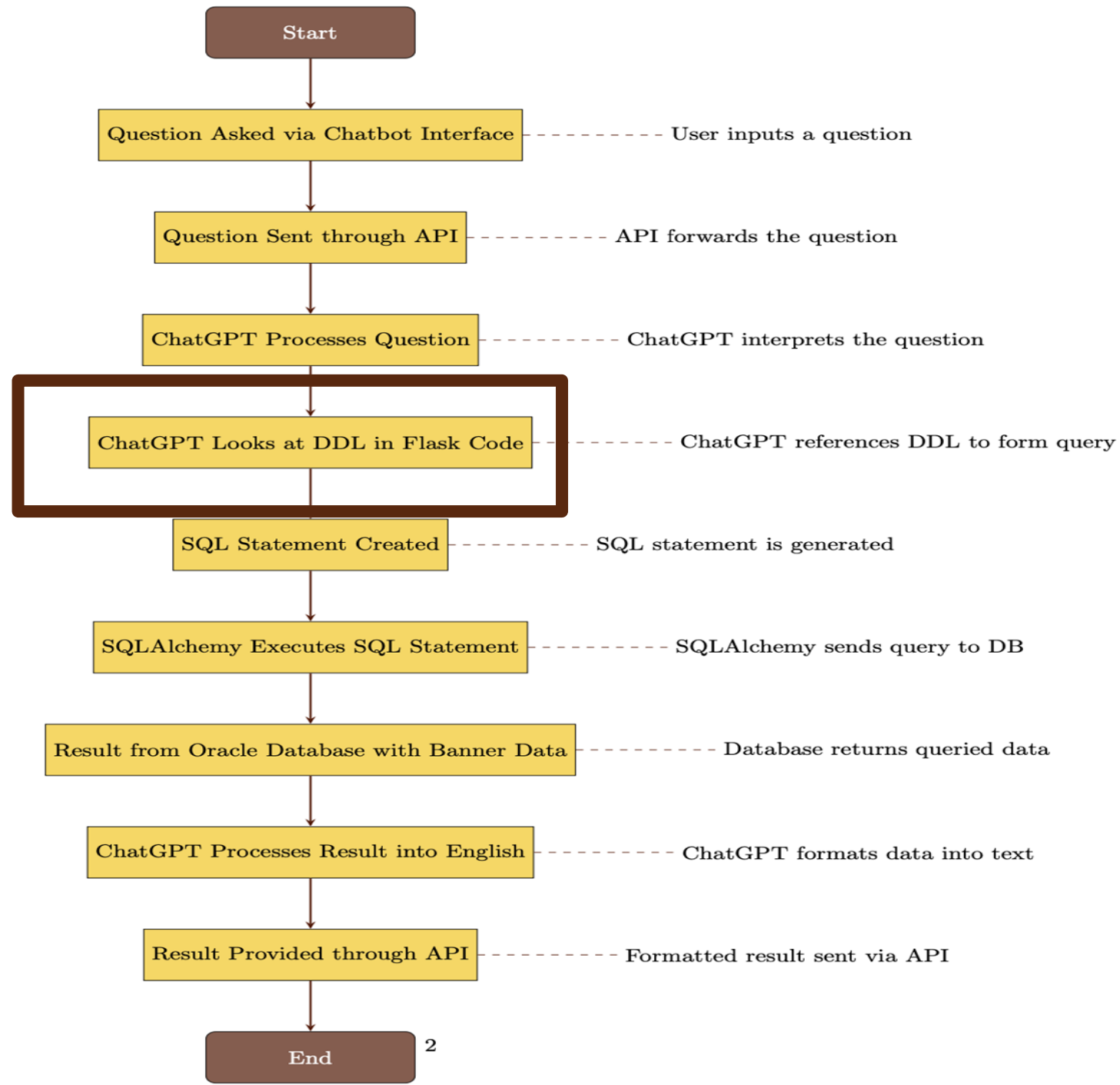
- **Enhanced User Engagement:**
  - Interactive Experience
  - Real-Time Responses
- **Increased Efficiency:**
  - Time Savings
  - Automated Responses
- **Personalized Assistance:**
  - Tailored Responses
  - Adaptive Learning
- **Efficient Data Management:**
  - Dynamic Query Generation
  - Secure Data Handling
- **Easily Scalable**

## Impact of Section Tally AI-Powered Chatbot Integration

- **Improved Student and Faculty Satisfaction:**
  - Enhanced Support
- **Operational Efficiency:**
  - Reduced Workload
  - Streamlined Processes
- **Data-Driven Decision Making:**
  - Insights and Analytics
  - Continuous Improvement
- **Innovation in Higher Education:**
  - Leadership and Innovation
  - Modern Learning Environment

## Other Applications

- Student Review System
  - Attendance Verification
  - Graduation Evaluation
- Identity Management System



## Future Enhancements

### Advancing Data Access:

- **RestAPIs and GraphQL:**
  - Transition from direct database access to using RestAPIs or Banner Ethos Data Access GraphQL endpoints.
  - Enhances security, scalability, and flexibility in accessing and managing data.



### Enhanced Reporting and Visualization:

- **AI-Generated Reports:**
  - Generate detailed reports as part of the AI responses, providing comprehensive insights.
- **Pictorial Graphs:**
  - Include visualizations like pie charts, bar graphs, and line charts to present data in an easily understandable format.





## Future Enhancements Contd..

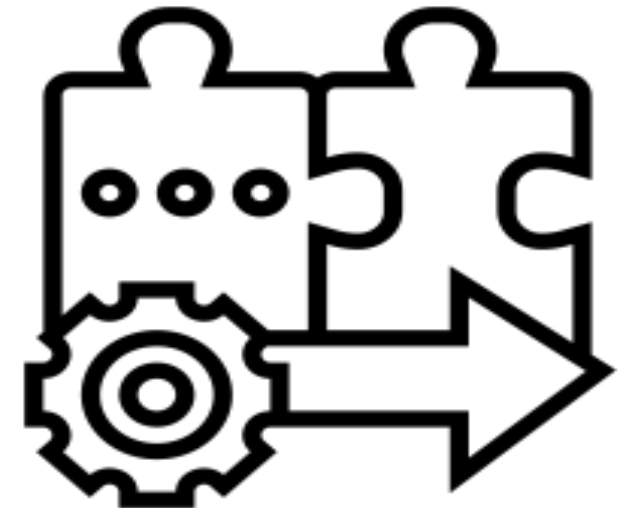
### Cloud Integration:

- **Leveraging Cloud Services:**
  - Shift from provisioned servers to cloud-based infrastructure.
  - Benefits include scalability, cost-efficiency, and improved reliability.
  - Cloud platforms offer advanced tools for AI, data analytics, and integration.



### Enhanced Integration:

- **Seamless Integration Across Applications:**
  - Improve integration capabilities to use the AI process across various web applications.
  - Create a unified system where the chatbot can interact with multiple platforms, enhancing user experience and operational efficiency.



## Conclusion

### Enhanced User Experience

#### Innovative Solutions:

- The integration of ChatGPT/AI into the section tally application showcases the transformative power of AI in higher education.
- AI provides a modern approach to accessing and managing critical course information, enhancing the overall academic experience.

#### Scalable Infrastructure:

- This solution is easily scalable to accommodate growing user needs and expanding functionalities.

#### Future Enhancements:

- Plans to transition to RestAPIs and GraphQL for data access, generate visual reports, utilize cloud services, and collaborate with local communities ensure continued growth and improvement.

#### Operational Efficiency

- Automation of Routine Tasks
- Streamlined Processes

#### Commitment to Excellence



## Glossary

|                 |                                                                                                                                   |                                                                                                                     |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| ChatGPT         | A language model developed by OpenAI that excels in natural language processing tasks.                                            | <a href="https://www.openai.com/">https://www.openai.com/</a>                                                       |
| Python          | A high-level, interpreted programming language known for its simplicity and readability.                                          | <a href="https://www.python.org/">https://www.python.org/</a>                                                       |
| SQLAlchemy      | A SQL toolkit and Object-Relational Mapping (ORM) library for Python.                                                             | <a href="https://www.sqlalchemy.org/">https://www.sqlalchemy.org/</a>                                               |
| Oracle          | A powerful relational database management system (RDBMS) used for enterprise-level database solutions.                            | <a href="https://www.oracle.com/database/">https://www.oracle.com/database/</a>                                     |
| Ellucian Banner | A comprehensive ERP system designed for higher education institutions to manage student information and administrative processes. | <a href="https://www.ellucian.com/solutions/ellucian-banner">https://www.ellucian.com/solutions/ellucian-banner</a> |
| ChatGPT Model   | The underlying architecture of ChatGPT, based on the Generative Pre-trained Transformer (GPT) framework.                          | <a href="https://openai.com/research/gpt-3">https://openai.com/research/gpt-3</a>                                   |

## Glossary Contd..

|                             |                                                                                                                      |                                                                                                                                                       |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Python Flask                | A lightweight web framework for Python used to build web applications and APIs.                                      | <a href="https://flask.palletsprojects.com/en/3.0.x/">https://flask.palletsprojects.com/en/3.0.x/</a>                                                 |
| API                         | Application Programming Interface, a set of protocols for building and interacting with software applications.       | <a href="https://aws.amazon.com/what-is/api/">https://aws.amazon.com/what-is/api/</a>                                                                 |
| RestAPI                     | An architectural style for designing networked applications using HTTP requests to access and use data.              | <a href="https://restfulapi.net/">https://restfulapi.net/</a>                                                                                         |
| GraphQL                     | A query language for APIs and a runtime for executing those queries by using a type system you define for your data. | <a href="https://graphql.org/">https://graphql.org/</a>                                                                                               |
| Ellucian Banner Data Access | Methods provided by Ellucian Banner to access and manage institutional data, including REST and GraphQL APIs.        | <a href="https://www.ellucian.com/assets/en/ellucian-soc3-report-2020-21.pdf">https://www.ellucian.com/assets/en/ellucian-soc3-report-2020-21.pdf</a> |
| SQL                         | Structured Query Language, a standard language for managing and manipulating relational databases.                   | <a href="https://www.oracle.com/database/technologies/appdev/sql.html">https://www.oracle.com/database/technologies/appdev/sql.html</a>               |



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**Thank You**