

CAPSTONE PROJECT

AI-POWERED SMART STUDY ASSISTANT

Presented By:

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OUTLINE

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result**
- **Conclusion**
- **Future Scope**
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Problem Statement

Nowadays, students are often overwhelmed by huge workloads and forced to navigate multiple disparate platforms to manage tasks which may be varied academic research or comprehension of multiple different and unrelated topics, losing precious time in the process. This lack of a unified workspace leads to significant cognitive load and inefficiency, as the specialized tools required for diverse topics—ranging from complex document/image-based analysis to structured schedule planning—are rarely integrated into a single, cohesive environment.

Proposed Solution

AI-powered Smart Study Assistant is a simple interface that provides students with all the various tools in one place to centralize and simplify the academic workflow. By leveraging the multimodal capabilities of **Gemini 1.5 Flash**, the platform serves as a versatile companion that bridges the gap between unorganized thoughts and actionable knowledge.

The project provides the following features as tabs:

- **Chat:** A real-time chat interface for instant academic support and conceptual clarity.
- **Summarizer:** Summary generator for contents in the uploaded document.
- **Explainer:** Explanation provider for a document's contents at three different levels- Beginner, Intermediate, and Advanced.
- **Key word finder:** To find and explain important/relevant words in a document.
- **Similar content provider:** The AI provides links to contents on the web containing information similar to the contents of the uploaded document.
- **Web link provider:** The AI provides links to online sites containing closely-related information to the contents of the document (this feature is useful for research purpose).
- **Q&A:** To provide answers to the questions in a document.
- **Image search:** The AI searches the web and provides links to images bearing close similarity/relation to the document uploaded.
- **Timetable generator:** The AI generates a suitable timetable based on the user input for task names, optional task details, and total estimated time required to complete all the tasks.

System Approach

- **Core model:** Gemini 1.5 Flash (via Google Generative AI SDK) was selected for its high efficiency and native multimodal support (handling text and images simultaneously).
- **Backend and framework:** Developed using Python and Streamlit.
- **Development environments:** Google Colaboratory and Visual Studio Code.
- **Key libraries:** google-generativeai (model interaction), Streamlit, PyPDF2, Pillow, Tesseract OCR, Poppler Utils, Python Pptx, Python Docx, Openpyxl, Pytesseract, Pdf2Image, Pandas, Reportlab, and Xlsxwriter.
- **Version control:** Git.
- **Code storage:** GitHub.

Algorithm & Deployment

The underlying algorithm utilizes a Retrieval-Augmented Generation (RAG) inspired flow, where document context is extracted and fed into the Gemini 1.5 Flash model alongside specific "system instructions" to ensure accuracy in summarization and Q&A. For the timetable generation, the system uses a structured prompting technique to map user tasks against time variables, ensuring a logical chronological flow.

Deployment Architecture:-

- **Version control:** The source code is maintained and versioned on GitHub.
- **Hosting and deployment:** The application is deployed via Streamlit Community Cloud, which provides a direct CI/CD pipeline from the GitHub repository to a live web URL, ensuring the assistant is accessible to students across any device.

Result

stdast-pdas.streamlit.app

Share

AI-powered Smart Study Assistant

Chat Summarize Explain Key Words Similar Content Web Links Q&A Image Search Timetable How To Use

Chat with AI

Tell the AI your doubts to resolve them.

Ask me anything...

Define photosynthesis. Give a simple example.

Photosynthesis: The Plant's Powerhouse

Photosynthesis is the fundamental process by which green plants, algae, and some bacteria convert light energy into chemical energy in the form of glucose (a sugar). This glucose serves as their food source, providing the energy they need to grow, reproduce, and carry out all their life functions.

Think of it as a plant's way of making its own food using sunlight!

Here's a breakdown of what happens:

- Inputs:
 - Sunlight (Light Energy): The primary energy source.
 - Carbon Dioxide (CO_2): Absorbed from the atmosphere through tiny pores in the leaves called stomata.
 - Water (H_2O): Absorbed from the soil by the roots and transported to the leaves.
- The "Machinery":

Show desktop

- **Inputs:**
 - **Sunlight (Light Energy):** The primary energy source.
 - **Carbon Dioxide (CO_2):** Absorbed from the atmosphere through tiny pores in the leaves called stomata.
 - **Water (H_2O):** Absorbed from the soil by the roots and transported to the leaves.

- **The "Machinery":**

- **Chlorophyll:** The green pigment found in chloroplasts (specialized organelles within plant cells). Chlorophyll is crucial for capturing light energy.

- **The Process:** Inside the chloroplasts, chlorophyll uses the captured light energy to split water molecules. This releases oxygen (O_2) and provides the energy and building blocks to combine carbon dioxide with the hydrogen from water, ultimately forming glucose.

- **Outputs:**

- **Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$):** The sugar that acts as food for the plant. It can be used immediately for energy or stored for later use.
 - **Oxygen (O_2):** Released into the atmosphere as a byproduct, which is essential for most living organisms, including us!

In simpler terms: Plants take sunlight, water, and air (carbon dioxide) and transform them into sugar for food and release oxygen.

Simple Example of Photosynthesis: A Leaf on a Sunny Day

Imagine a single green leaf on a sunny day.

1. **Sunlight:** The sun beams down, and the green chlorophyll in the leaf captures this light energy.
2. **Water:** The plant's roots have been soaking up water from the soil, which travels up to the leaf.
3. **Carbon Dioxide:** The leaf "breathes in" carbon dioxide from the air through tiny openings.

Now, inside the leaf's cells, a magical transformation occurs:

- The light energy powers a reaction.
- The water is broken down.
- The carbon dioxide is combined with components from the water.

Explain Document Content

Understand a concept at different levels of complexity.

Upload Document



Drag and drop file here

Limit 200MB per file • TXT, PDF, DOCX, DOC, PPTX, JPG, JPEG, PNG, XLSX

Topic Name (Optional)

Enter the topic name

Browse files

photosynthesis-in-plants-jpg.jpg 107.2KB X

Select Difficulty Level:

Explain for beginner level

Explain for intermediate level

Explain for advanced level

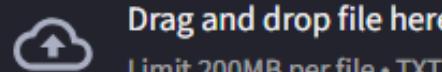
Explanation

- * **The Plant:** You can see a green plant with leaves. This is our "factory."
- * **Sun (represented by the "7 ey"):** This is the **energy** source for the plant. Plants need sunlight to do their work. The wavy lines from the sun show that it's sending out light and heat.
- * **Oxygen (represented by "Oxygen"):** This is a gas that plants **release** into the air. It's like the "waste product" or something they don't need anymore from making food. It's important for us because we breathe oxygen!
- * **Sugar (represented by "Sugar"):** This is the **food** that the plant makes for itself. It's like the plant's energy drink or fuel. Plants use sugar to grow and live.
- * **Water (represented by "Mas Water"):** This is something the plant **takes in** from the ground through its roots. Water is a very important ingredient for

Generate Answers to Questions

Get instant answers to your written questions.

Upload Document



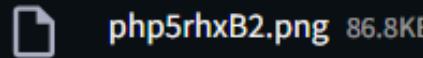
Drag and drop file here

Limit 200MB per file • TXT, PDF, DOCX, DOC, PPTX, JPG, JPEG, PNG, XLSX

Topic Name (Optional)

Enter the topic name

Browse files



php5rhxB2.png 86.8KB

X

Generate answers

Questions & Answers

Here are the questions from the document and their detailed answers:

Question a)

Question: What are the two main colors of light that drive photosynthesis by exciting chlorophyll?

Answer: The two main colors of light that drive photosynthesis by exciting chlorophyll are **blue light** and **red light**. Chlorophyll pigments absorb light most strongly in these regions of the visible spectrum. While chlorophyll absorbs some green light, it reflects it, which is why plants appear green.

Question b)

Question: When a plant is transitioned from the dark to the light, explain if the pH of the stroma would: increase, decrease, or stay the same? Completely explain your reasoning, using definitions and compartments.

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Internet access

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AI-powered Smart Study Assistant

Chat Summarize Explain Key Words Similar Content Web Links Q&A Image Search Timetable How To Use

Create Your Timetable

Use the AI to generate a timetable that best suits your requirements.

Task Name

Task 2

From (Optional)

YYYY-MM-DD HH:MM

To (Optional)

YYYY-MM-DD HH:MM

Estimated Time (Optional)

2 hours

+ Add Task

Added task: Task 2

Current Tasks

1. Task 1 | From: 10:00 | To: 11:00 | Est:

2. Task 2 | From: | To: | Est: 2 hours

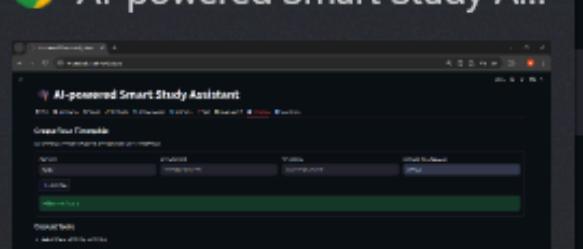
Clear All Tasks

Estimated Total Time

e.g., 8 hours

Generate Timetable

AI-powered Smart Study A...



1. Task 1 | From: 10:00 | To: 11:00 | Est:

2. Task 2 | From: | To: | Est: 2 hours

3. **Task 3** | From: 1:00 | To: 2:30 | Est: 1.5 hours

4. Task 4 | From: | To: | Est:

Estimated Total Time

6 hours

[Generate Timetable](#)

Generated Timetable

4. Task 4 | From: | To: | Est:

[Clear All Tasks](#)

Estimated Total Time

6 hours

Generate Timetable

Generated Timetable

[Download Timetable](#)

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Conclusion

The AI-powered Smart Study Assistant successfully consolidates essential academic tools into a single, intuitive interface, significantly reducing the time students spend on administrative and preparatory tasks. By harnessing advanced generative AI, the project transforms the study experience from a process of information gathering into one of deep, personalized understanding and proper time management.

Future scope

- **Multi-user sync:** Implementing user authentication to allow students to save their study history and generated timetables across different sessions.
- **Integrations:** Connecting the timetable generator directly with Google Calendar or Notion APIs for real-time schedule syncing.
- **Gamification:** Adding a "Progress Tracker" that uses AI to analyze study habits and award badges or streaks to boost student motivation.
- **Voice Interface:** Expanding the chat feature to include voice-to-text and text-to-speech for hands-free study sessions.

References

- [Google AI for Developers: Gemini 1.5 Flash](#)
- [Streamlit Documentation: Building Generative AI Apps](#)
- [Google Generative AI Python SDK \(GitHub\)](#)
- [Research on AI in Education \(UNESCO\)](#)
- [PEP 8 – Style Guide for Python Code](#)
- [Streamlit Community Cloud Deployment Guide](#)

Github link

- Github link : [SMART STUDY ASSISTANT](#)
- Streamlit app link: [AI-powered Smart Study Assistant](#)



THANK YOU