“Study Smart”

A Project Report
submitted in partial fulfilment
for the award of the
Degree of Bachelor of Technology in Department of
Computer Science & Engineering

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Candidate's Declaration

I hereby declare that the work, which is being presented in the Project, entitled "**Study Smart**" in partial fulfilment for the award of Degree of "Bachelor of Technology" in Department of **Cyber Security**, Engineering College Ajmer, Bikaner Technical University is a record of my own investigations carried under the Guidance of **Ms. Sammah Rasheed,** Department of Computer Science & Engineering, Engineering College Ajmer. I have not submitted the matter presented in this report anywhere for the award of any other Degree.

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Student Name’s
B.Tech VI Year
(Branch)

ABSTRACT

In today's digital learning era, students often struggle with overwhelming content on platforms like YouTube. **Study Smart** solves this by offering a free, web-based tool built with HTML, CSS, and JavaScript that simplifies the learning process.
Using the Gemini's API, it curates relevant educational videos based on student queries. Users can paste any YouTube link to instantly get:

- A concise summary of the video.
- Auto-generated notes.
- Practice questions (MCQs).
- Ask any question but related to topic like Chatgpt.

With login required and a clean, responsive UI, Study Smart saves time, boosts comprehension, and supports active recall—making it the perfect study companion for modern learners.

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Chapter 1: Introduction

1.1 Background and Motivation

In today's academic environment, students heavily rely on online video content for supplemental learning. Platforms such as YouTube host a vast library of educational materials covering a wide range of subjects. However, sifting through hours of content to find relevant, accurate study material is both time-consuming and inefficient. Often, students spend more time searching for content than actually learning from it.

The motivation behind "Study Smart" stems from the increasing need for tools that can efficiently filter and process information, ensuring students have access to quality educational resources quickly and easily. This project addresses the common problem of information overload by curating quality videos, summarizing them, and enhancing the learning process through active recall via automatically generated practice questions. By creating a platform that automates these processes, "Study Smart" aims to make online learning more effective and less time-consuming.

1.2 Overview of Study Smart Platform

"Study Smart" is designed as a user-friendly web application that allows students to search for subject-specific study videos from YouTube. It also enables users to paste a video link directly into the platform, after which it generates a concise summary and questions based on the video content. The platform is developed using standard web technologies, including HTML, CSS, and JavaScript, ensuring broad accessibility and compatibility across various devices.

The core functionality of "Study Smart" includes:

- **Video Search:** Integration with the YouTube Data API to find educational videos based on keywords.
- **Automated Summarization:** Extraction of key points from video transcripts to create concise summaries.
- **Question Generation:** Creation of practice questions based on the content of the video summaries.

1.3 Need for an Efficient Ed-Tech Tool

With abundant information but limited time, students need tools that make learning smarter, not harder. Traditional study methods often involve manually searching for relevant resources and taking notes, which can be both tedious and time-consuming. In the current educational landscape, where online learning is increasingly prevalent, there is a growing need for tools that can streamline these processes.

Study Smart addresses this need by providing features that save time and enhance understanding, thereby supporting modern study habits. The automated summarization and question generation features reduce the time spent on manual tasks and promote active learning through practice. This helps students focus on understanding and retaining information rather than getting bogged down in the logistics of finding and processing study materials.helps students focus on understanding and retaining information rather than getting bogged down in the logistics of finding and processing study materials.

1.4 Goals and Challenges

Goals:

- **Filter Educational Video Content:** Develop a system that can efficiently search and filter educational videos from YouTube based on relevance and quality.

- **Generate Easy-to-Read Summaries:** Create a summarization tool that can extract key points from video transcripts and generate concise, easy-to-read summaries.

- **Create Practice Questions Automatically:** Implement a question generation system that can create practice questions based on the content of video summaries, promoting active recall and comprehension.

Challenges:

- **Ensuring Summarization Accuracy:** Developing a summarization tool that accurately captures the key points of a video transcript, while avoiding irrelevant or misleading information, poses a significant challenge.

- **Extracting Meaningful Questions from Transcripts:** Generating practice questions that are relevant and meaningful requires a sophisticated understanding of the video content and the ability to formulate questions that test students' comprehension effectively.

- **Keeping the Platform Lightweight and Responsive:** Ensuring the platform remains lightweight and responsive, despite the complex processing required for summarization and question generation, requires careful optimization and efficient coding practices.

Chapter 2: Literature Survey

2.1 Existing Platforms

Numerous educational platforms offer video content. These include Khan Academy, edX, Coursera, and YouTube Edu. Each platform has its strengths and weaknesses in terms of content quality, personalization, and interactivity. While some platforms provide excellent educational material, they

often lack features such as automated summarization and practice question generation, which can enhance the learning experience.

- **Khan Academy:** Offers a wide range of free educational videos and exercises but lacks automated summarization and question generation.

- **edX:** Provides access to university-level courses and videos but typically requires paid enrollment for full access to course materials.

- **Coursera:** Similar to edX, Coursera offers a variety of courses and videos but also lacks integrated summarization and question generation features.

- **YouTube Edu:** While YouTube hosts a vast library of educational videos, the lack of curation and quality control can make it difficult for students to find reliable resources.

2.2 Comparison of Features

Platform	Video Content	Summarization	Question Generation	Personalization
Khan Academy	Yes	No	No	Yes
Coursera	Yes	Limited	Yes (manual)	Yes
edX	Yes	Limited	Yes (manual)	Yes
YouTube Edu	Yes	No	No	No
Study Smart (our project)	Yes	Yes (auto)	Yes (auto)	Basic

2.3 Gaps and User Problems

Based on user feedback and analysis of existing platforms, several key gaps and user problems have been identified:

- **No Summarization Tools Integrated:** Many students struggle to efficiently extract key points from lengthy videos. The absence of integrated summarization tools forces students to manually take notes, which can be time-consuming and prone to error.

- **Lack of Targeted Practice from Video Material:** While some platforms provide practice questions, they are often not directly linked to specific video content. This lack of targeted practice can make it difficult for students to reinforce their understanding of the material presented in the videos.

- **Time Wasted Browsing Irrelevant Videos:** Students often spend a significant amount of time searching for relevant and reliable educational videos. The lack of curation and filtering tools makes it difficult to quickly identify high-quality resources.

2.4 Role of AI/Automation in Ed-Tech

AI and automation technologies are increasingly used in ed-tech to personalize learning experiences, automate administrative tasks, and provide intelligent tutoring. In the context of Study Smart, AI is integrated into the summarization and question generation features to enhance user convenience and improve the efficiency of the learning process. The use of AI can help:

- ☐ **Automate Summarization:** AI algorithms can analyze video transcripts to identify key points and generate concise summaries automatically.
- ☒ **Personalize Learning:** AI can be used to tailor the content and practice questions to each student's individual learning needs and preferences.
- ☐ **Provide Intelligent Tutoring:** AI-powered tutors can provide personalized feedback and guidance to students, helping them to improve their understanding of the material.

Chapter 3: Project Objective & Scope

3.1 Main Objective

The main objective of this project is to develop a platform that allows students to efficiently discover, summarize, and practice content from educational videos, thereby improving the effectiveness and efficiency of online learning.

3.2 Specific Objectives

- ☒ **Search and List Relevant YouTube Educational Videos:** Implement a search functionality that allows users to find relevant educational videos from YouTube based on keywords and filters.
- ☐ **Summarize Video Content for Quick Revision:** Develop an automated summarization tool that can extract key points from video transcripts and generate concise summaries for quick revision.
- ☐ **Generate Practice Questions Based on Summaries:** Create a question generation system that can generate practice questions based on the content of video summaries, promoting active recall and comprehension.
- ☒ **Provide a User-Friendly Interface:** Design a simple, intuitive, and user-friendly interface that makes it easy for students to search, summarize, and practice with educational videos.

3.3 Scope

The system is designed for students in high school or college who use online video lectures. Initially, it focuses on science and mathematics content but is designed to be expandable to other subjects. The platform will primarily target YouTube videos due to their extensive availability and variety.

Specific areas within scope include:

- **Video Search and Retrieval:** Integration with the YouTube Data API to search and retrieve relevant educational videos.
- **Automated Summarization:** Development of algorithms to extract key points from video transcripts and generate concise summaries.
- **Question Generation:** Creation of practice questions based on the content of video summaries.
- **User Interface Design:** Development of a user-friendly interface that allows students to easily search, summarize, and practice with educational videos

.

3.4 Limitations

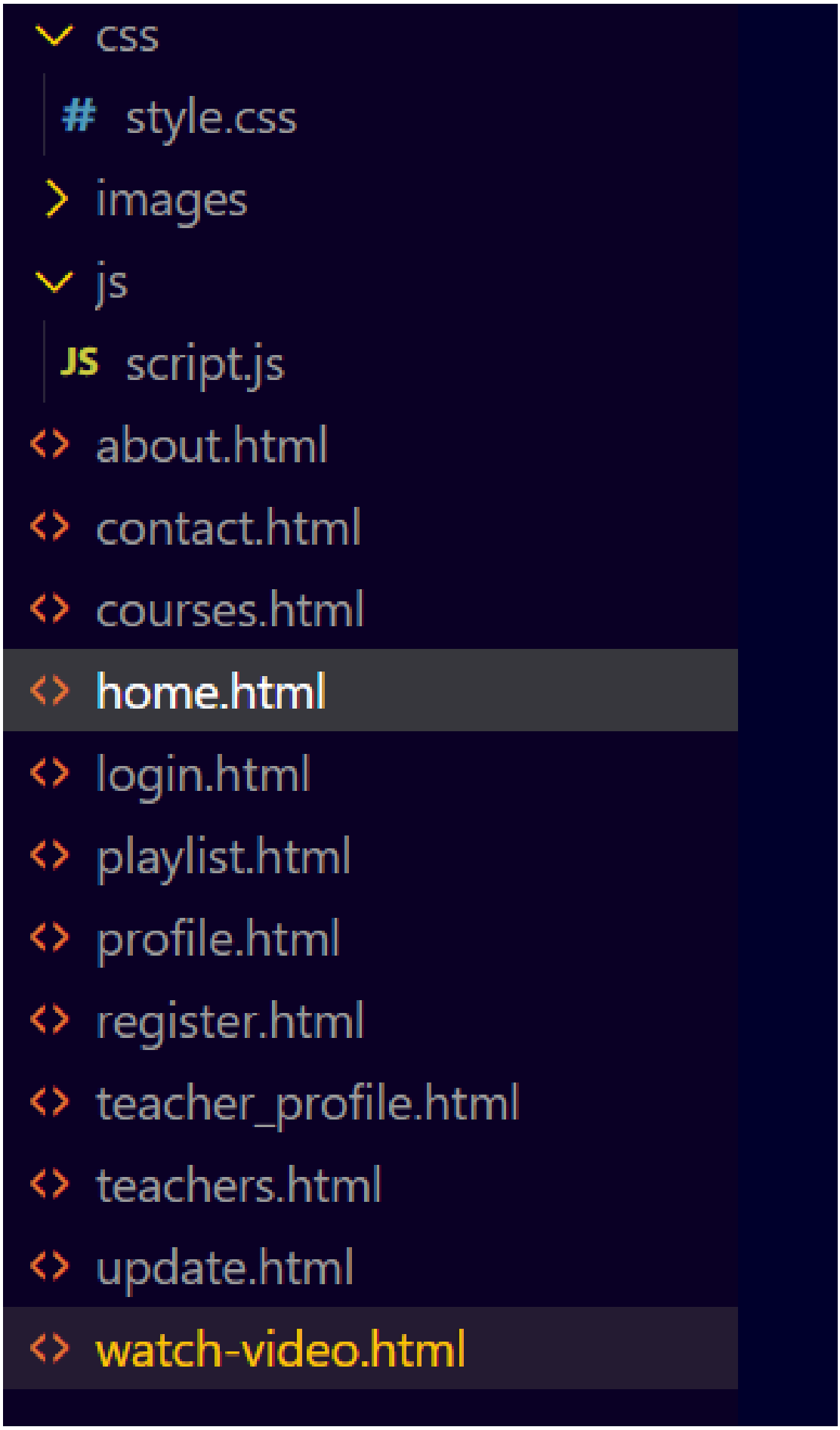
The system has certain limitations that must be considered:

- **Internet-Dependent:** The platform requires a stable internet connection to access YouTube videos and process content.
- **Summary Quality Depends on Transcript Accuracy:** The accuracy of the generated summaries depends on the quality and accuracy of the video transcripts. Errors or omissions in the transcripts can affect the quality of the summaries.
- **Questions May Be Generic Without NLP Refinement:** The practice questions generated by the system may be generic without further refinement using Natural Language Processing (NLP) techniques.

Chapter 4: System Analysis

4.1 Problem Statement

Students spend excessive time searching for relevant and reliable educational videos and then manually take notes. This process is inefficient, affects productivity, and can be a source of frustration. This project addresses the need for a more streamlined and effective approach to online learning.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Saransh

Student

View Profile

- Home
- About
- Courses
- Teachers
- Contact us

Study Smart

search courses...

Quick Options

Likes And Comments

Total likes : 120

View Likes

Total comments : 12

View Comments

Saved playlists : 4

View Playlists

Top Categories

- Development
- Business
- Design
- Marketing
- Music
- Photography
- Software
- Science

Popular Topics

- HTML
- CSS
- Javascript
- React
- PHP
- Bootstrap

Become A Tutor

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Get Started

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Aaradhya

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Hemant

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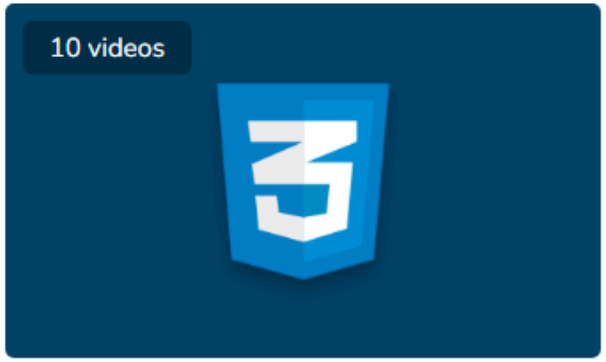

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Harsh Janghir
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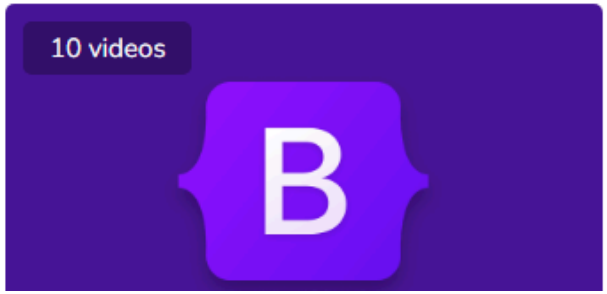
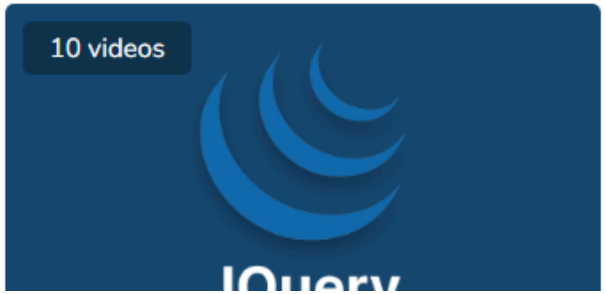
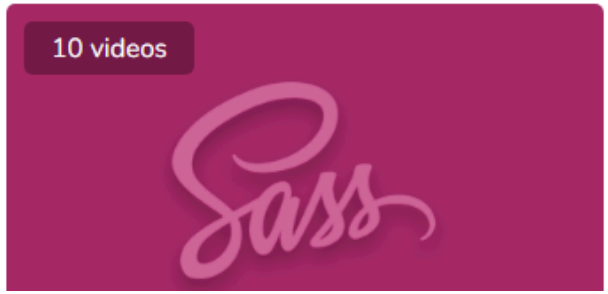


Deepak Rao
15-06-2025



Ajay Devgun
21-01-2025



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Get Started

Ashish Sharma

Python Teacher

total playlists : 4

total videos : 18

total likes : 1208

View Profile

Neetu Verma

Java Teacher

total playlists : 4

total videos : 18

total likes : 1208

View Profile

Atul Kumar

Developer

total playlists : 4

total videos : 18

total likes : 1208

View Profile

Chitransh

Coder

total playlists : 4

total videos : 18

total likes : 1208

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Sonam

Developer

total playlists : 4

total videos : 18

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Sunny

Developer

Saurabh

Coder

Get In Touch

enter your name

enter your email

enter your number

enter your message

Send Message

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111-222-3333

Email address

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Saranshkachhawa@gmail.com

Office address

Naya Bazar, Ajmer

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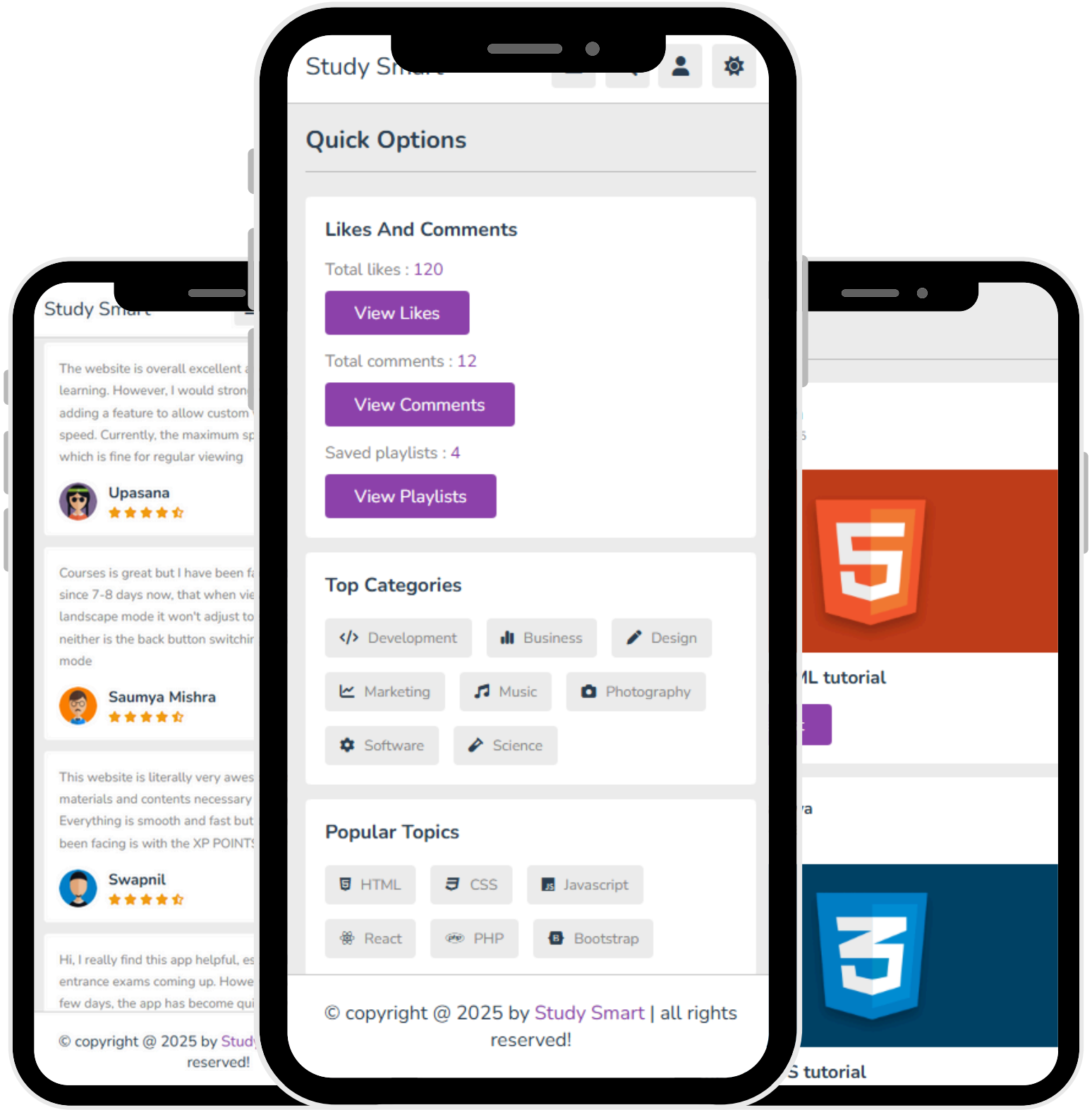

4.2 Functional Requirements

The functional requirements of the system include:

- **Search Video Database (YouTube API):** The system must be able to search the YouTube database using the YouTube Data API to find relevant educational videos based on keywords and filters.

- **Accept and Process Pasted Video Links:** The system must be able to accept and process pasted video links from YouTube to extract and summarize the content.

- **Extract and Summarize Transcripts:** The system must be able to extract transcripts from YouTube videos and generate concise summaries of the content.

- **Generate Related Questions:** The system must be able to generate practice questions based on the content of the video summaries to promote active recall and comprehension.

- **User Authentication and Authorization:** The system must have a way to register new users and login to access personalized features.

4.3 Non-Functional Requirements

The non-functional requirements of the system include:

- **Fast Load Time:** The platform must load quickly to provide a seamless user experience.

- **Responsive Design for Mobile Use:** The platform must be responsive and accessible on various devices, including desktops, tablets, and smartphones.

- **User-Friendly Interface:** The platform must have a simple, intuitive, and user-friendly interface that is easy to navigate and use.
- **Scalability:** The system should be designed to handle an increasing number of users and video content without performance degradation.

- **Security:** The platform must ensure the security and privacy of user data.

- **Reliability:** The platform should be reliable and available with minimal downtime.

4.4 Feasibility Study

The system is technically and economically feasible. It can be developed using basic web technologies and available free APIs. The required skills, resources, and infrastructure are readily accessible.

- **Technical Feasibility:** The system can be developed using standard web technologies such as HTML, CSS, and JavaScript. The YouTube Data API provides access to YouTube videos, and various NLP libraries can be used for summarization and question generation.

- **Economic Feasibility:** The system can be developed with minimal cost, as the required technologies and APIs are either free or have affordable pricing options. The development can be carried out by a small team of developers.

- **Operational Feasibility:** The system is operationally feasible, as it addresses a clear need for students and provides a valuable tool for online learning. The platform can be easily maintained and updated.

Whisper takes the Youtube link and transcribe that so that we can use that to upload on **gemini** so that it provide the short notes of that video.

Chapter 5: System Design

5.1 Use Case Diagram

The Use Case Diagram for "Study Smart" visually maps out how users interact with the system and what functionalities are available to them. The primary actor is the Student, who can perform actions such as searching for educational videos, pasting a YouTube link for analysis, viewing summarized notes, and practicing with generated questions. The system itself acts as a secondary entity, handling tasks like fetching video data via the YouTube API, extracting transcripts, summarizing content, and generating practice questions.

In a typical flow, the student logs in (if authentication is implemented), searches for videos or submits a video link, and receives a curated list of videos or a summary and questions. The system ensures that each action is mapped to a clear use case, such as "Search Videos," "Summarize Video," "Generate Questions," and "Display Results." The diagram helps clarify system boundaries, user expectations, and the relationships between different modules. This structured approach is essential for planning development and ensuring all requirements are addressed[1][2][3][4].

5.2 Data Flow Diagram (DFD)

The Data Flow Diagram (DFD) illustrates how data moves through the "Study Smart" platform. At Level 0, the main process starts with the student providing input (search keywords or a YouTube video link). This input is sent to the system, which interacts with the YouTube Data API to fetch video metadata and transcripts. The transcript is then processed by the summarization module to generate concise notes, and by the question generator to produce practice questions.

The DFD shows the flow from user input to system processing and finally to output, which is displayed as search results, summaries, and questions. Each process (search, summarize, generate questions) is represented as a distinct block, with arrows indicating the movement of data between modules and data stores. This diagram is crucial for understanding dependencies, identifying potential bottlenecks, and ensuring efficient data handling throughout the application.

5.3 Wireframes / Prototype

Wireframes are schematic representations of the user interface, providing a visual guide for the layout and structure of each page. For "Study Smart," wireframes include:

```js
let toggleBtn = document.getElementById('toggle-btn');
let body = document.body;
let darkMode = localStorage.getItem('dark-mode');

const enableDarkMode = () =>{
   toggleBtn.classList.replace('fa-sun', 'fa-moon');
   body.classList.add('dark');
   localStorage.setItem('dark-mode', 'enabled');
}

const disableDarkMode = () =>{
   toggleBtn.classList.replace('fa-moon', 'fa-sun');
   body.classList.remove('dark');
   localStorage.setItem('dark-mode', 'disabled');
}

if(darkMode === 'enabled'){
   enableDarkMode();
}

toggleBtn.onclick = (e) =>{
   darkMode = localStorage.getItem('dark-mode');
   if(darkMode === 'disabled'){
      enableDarkMode();
   }else{
      disableDarkMode();
   }
}

let profile = document.querySelector('.header .flex .profile');

document.querySelector('#user-btn').onclick = () =>{
   profile.classList.toggle('active');
   search.classList.remove('active');
}

let search = document.querySelector('.header .flex .search-form');

document.querySelector('#search-btn').onclick = () =>{
   search.classList.toggle('active');
   profile.classList.remove('active');
}

let sideBar = document.querySelector('.side-bar');

document.querySelector('#menu-btn').onclick = () =>{
   sideBar.classList.toggle('active');
   body.classList.toggle('active');
}
```

- Homepage: Features a search bar for entering keywords and an input box for pasting a YouTube link.
- Search Results Page: Displays a grid or list of video thumbnails, titles, durations, and brief descriptions, allowing users to select a video for further analysis.
- Summary and Questions Page: Shows the video summary at the top, followed by a list of generated practice questions. Buttons for copying notes or attempting questions are included.
- Navigation Elements: Consistent headers, footers, and navigation bars for seamless movement between pages.

Wireframes help ensure the platform is intuitive, user-friendly, and visually appealing before full-scale development begins.

5.4 UI/UX Design Considerations

The UI/UX design of "Study Smart" is guided by principles of simplicity, accessibility, and responsiveness. Key considerations include:

- Minimalist Layout: Reduces distractions and helps users focus on learning tasks.
- Mobile Responsiveness: Ensures the platform works smoothly on smartphones, tablets, and desktops.
- Accessible Fonts and Colors: Uses high-contrast color schemes and readable fonts to accommodate users with visual impairments.
- Intuitive Navigation: Clear menus, buttons, and feedback messages guide users through each step.
- Feedback and Error Handling: Provides immediate feedback for actions (e.g., invalid link, no results found) to improve user confidence and satisfaction.

Chapter 6: Technology Stack

6.1 HTML

HTML (HyperText Markup Language) forms the structural backbone of the "Study Smart" web application. It defines the layout of content, including headings, paragraphs, forms, input fields, buttons, and containers for dynamic content such as video thumbnails and summaries. Semantic HTML elements are used to improve accessibility and SEO, ensuring that the platform is both user- and machine-friendly.

Gemini API
Quickstart

6.2 CSS

CSS (Cascading Style Sheets) is responsible for the visual styling of the platform. It controls the appearance of elements, including color schemes, fonts, spacing, and layout. Media queries are used to ensure the site is responsive, adapting gracefully to different screen sizes. CSS frameworks like Bootstrap or custom stylesheets may be used to maintain consistency and accelerate development.

6.3 JavaScript

JavaScript adds interactivity and dynamic functionality to the platform. It handles user input, form submissions, API requests, and DOM manipulation. For example, when a user submits a search query or video link, JavaScript processes the input, communicates with the YouTube API, and updates the page with results or summaries without requiring a full page reload. JavaScript also manages error handling, loading indicators, and real-time updates to enhance user experience.

6.4 APIs and Tools Used

- YouTube Data API: Fetches video metadata, search results, and transcripts for processing.
- Transcript Extractor: Converts video audio to text, enabling summarization and question generation.
- Summarization Script: Processes transcripts using rule-based or AI-driven algorithms to generate concise notes.
- Question Generator: Analyzes summaries to create practice questions (e.g., multiple-choice, fill-in-the-blank).
- Additional Tools: May include libraries for UI components (e.g., Bootstrap), text processing (e.g., NLTK for future enhancements), and deployment tools.

Chapter 7: Implementation

7.1 Website Layout and Navigation

The website is structured for clarity and ease of use. The typical navigation flow is:

- Home Page: Entry point with a search bar and link input field.
- Search Results: Displays a list/grid of relevant videos based on user input.

- Summary Page: Shows the summary and questions for a selected video.
- Navigation Bar: Provides quick access to Home, About, Contact, and other key sections.
- Footer: Contains links to privacy policy, terms of service, and credits.

Navigation is designed to minimize clicks and keep users oriented, with clear breadcrumbs and back buttons.

7.2 Summarization Feature

When a user pastes a YouTube link or selects a video, the system retrieves the video transcript. The summarization module processes this transcript using a combination of keyword extraction, sentence ranking, and rule-based selection to produce a concise summary. The summary highlights the main points and concepts discussed in the video, making it easier for students to review and revise content quickly.

7.3 Question Generator

The question generator module analyzes the summary to identify key concepts, definitions, and facts. It uses templates and logic to create practice questions, such as:

- Multiple-Choice Questions: "What is the main concept discussed in the video?"
- Fill-in-the-Blank: "_____ is the process described in the video."
- Short Answer: "Explain the significance of [concept]."

The generated questions are displayed below the summary, allowing students to test their understanding immediately.

7.4 Frontend-Backend Integration

Currently, "Study Smart" operates primarily as a frontend application, making direct calls to external APIs (e.g., YouTube Data API) for data retrieval. In future iterations, a backend (Node.js or Python/Flask) can be implemented to:

- Store User Data: Save user preferences, history, and progress.
- Enhance Processing: Offload heavy summarization and question generation tasks to the server.
- Improve Security: Manage API keys, authentication, and data privacy more securely.

Frontend-backend integration will enable more advanced features and scalability as the platform grows.

Chapter 8: Features & Modules

8.1 Video Finder

This module allows users to search for educational videos using keywords. The system queries the YouTube Data API, retrieves a list of relevant videos, and displays them with thumbnails, titles, durations, and brief descriptions. Users can filter results by relevance, upload date, or duration to find the most suitable content.

8.2 Link-Based Summarizer

Users can paste a YouTube video link into the platform. The system extracts the transcript, processes it, and generates a concise summary. This feature is particularly useful for students who already have a specific video in mind and want quick notes without watching the entire content.

8.3 Practice Question Generator

Based on the generated summary, the system creates 3–5 practice questions to reinforce learning. These questions are typically multiple-choice or fill-in-the-blank, designed to test comprehension of the main points. The questions are displayed below the summary, and users can attempt them for self-assessment.

8.4 User Interface

The user interface is designed for clarity, simplicity, and accessibility. Key features include:

- Clean Layout: Minimalist design with clear separation of sections.
- Responsive Design: Adapts to various screen sizes and devices.
- Accessible Elements: High-contrast colors, readable fonts, and keyboard navigation support.
- Intuitive Controls: Clearly labeled buttons, input fields, and feedback messages.

Chapter 9: Testing

9.1 Testing Plan

The testing plan outlines the strategies used to ensure the platform's reliability and usability. It includes:

- Unit Testing: Verifying individual modules (search, summarization, question generation) function correctly

- Integration Testing: Ensuring modules work together seamlessly.
- System Testing: Validating the complete workflow from input to output.
- Usability Testing: Gathering feedback from real users to assess ease of use and satisfaction.

Testing is conducted on multiple browsers (Chrome, Firefox, Edge) and devices (desktop, tablet, mobile).

9.2 Unit Testing

Each core module is tested independently:

- Search Module: Tested with various keywords to ensure accurate and relevant results.
- Summarization Module: Tested with transcripts of different lengths and complexity to verify summary quality.
- Question Generator: Tested with various summaries to ensure questions are relevant and correctly formatted.

Test cases are documented, and any failures are addressed promptly.

9.3 Usability Testing

Usability testing involves real students using the platform to complete typical tasks. Feedback is collected on:

- Ease of Use: How intuitive and user-friendly the platform is.
- Clarity of Output: Whether summaries and questions are easy to understand.
- Overall Satisfaction: Users' willingness to use the platform regularly.

Feedback is used to refine the interface and improve features.

9.4 Bug Fix Summary

A summary table lists all identified bugs, their descriptions, and the actions taken to resolve them. For example:

Bug ID	Description	Status
#001	Video not loading in Firefox	Fixed
#002	Summary cuts abruptly	Fixed
#003	Misaligned layout on mobile	Fixed

This ensures transparency and demonstrates a commitment to quality.

Chapter 10: Results & Screenshots

10.1 Sample Search Page

This section presents a screenshot and description of the search results page. It shows how users see a list of video results, each with a thumbnail, title, duration, and short description. The layout is designed for easy scanning and selection.

10.2 Summary Page Output

An example screenshot of the summary page is provided, showing the generated summary for a selected video. The summary is concise, highlighting the main points, and is formatted for quick reading and note-taking.

10.3 Question Generator Output

This section displays the output of the question generator. Sample questions (multiple-choice, fill-in-the-blank) are shown, illustrating how the platform helps users practice and reinforce their understanding of the video content.

10.4 User Review

Feedback or testimonials from users who tested the platform are included here. These reviews highlight the platform’s impact on study habits, time savings, and overall satisfaction, providing qualitative evidence of its effectiveness.