SECURE RESEARCH DATA MANAGEMENT APP

Mini Project Report

Submitted in partial fulfillment of the requirements for the award of the Degree

of

Bachelor of Technology (B.Tech)

in

INFORMATION TECHNOLOGY

By

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CERTIFICATE

This is to certify that the Mini project work entitled **"Secure Research Data Management App"** is being submitted by **Lokesh Choudhary (21AG1A1232), G.Yuva Prakash Sai(21AG1A1220), K.Vamshi Tejan(21AG1A1231)** in partial fulfillment for the award of Degree of **BACHELOR OF TECHNOLOGY** in **INFORMATION TECHNOLOGY** to the Jawaharlal Nehru Technological University, Hyderabad during the academic year 2024-25 is a record of bonafide work carried out by him/her under our guidance and supervision.

The results embodied in this report have not been submitted by the student to any other University or Institution for the award of any degree or diploma.

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DECLARATION

This is to certify that the work reported in the present project titled "**Secure Research Data Management App**" is a record work done by us in the Department of IT, ACE Engineering College.

No part of the thesis is copied from books/journals/internet and whenever the portion is taken, the same has been duly referred in the text; the reported are based on the project work done entirely by us not copied from any other source.

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ABSTRACT

To develop a secure application for the Research and Academia sector, enabling efficient data management with configurable public and private access app name “**RESEARCHNEST**”. Researchers, educators, and students can store, organize, and share their work, ensuring collaboration while protecting sensitive information. Key features include research data management, publication sharing, and project collaboration. The app aims to enhance academic workflows and promote open knowledge sharing. This innovative solution addresses the critical need for secure and efficient data handling in academia.

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CHAPTER 1

INTRODUCTION

This project aims to develop an innovative, secure, and user-friendly digital platform designed to address the complex and multifaceted challenges researchers face in managing their data. Research data comes in diverse forms and often involves intricate workflows, from data collection and processing to analysis and dissemination.

The platform will streamline these processes by offering robust tools for organizing, tagging, and discovering data, ensuring that researchers can manage their resources more efficiently. Recognizing the critical importance of regulatory compliance, the platform will include features to support data anonymization, consent management, and adherence to retention policies, helping researchers meet ethical and legal standards seamlessly.

To maintain the accuracy and reliability of research findings, the system will incorporate mechanisms for data validation, quality control, and automated backup and recovery, safeguarding data integrity across its lifecycle. Built with security at its core, the platform will provide advanced encryption, role-based access controls, and audit trails to protect sensitive information and foster trust among users. Moreover, the project will facilitate collaboration and knowledge sharing by enabling researchers to prepare, publish, and share their data with ease, integrating with leading data repositories and offering customizable sharing options. By addressing these critical aspects, the project aspires to empower researchers with a comprehensive solution that not only simplifies data management but also enhances the quality, security, and impact of their work in an increasingly data-driven research landscape.

This project is rooted in the understanding that research data management is a cornerstone of modern scientific inquiry, yet it remains one of the most significant pain points for researchers across disciplines. With the growing volume and complexity of data, researchers often struggle to maintain organization, ensure compliance with regulations, and uphold data integrity. This platform is designed to address these challenges by offering a centralized hub that simplifies data workflows while adhering to the highest standards of security and usability. Whether dealing with structured datasets, multimedia files, or complex metadata, the platform will provide researchers with the tools they need to organize, access, and utilize their data effectively.

Beyond addressing operational efficiency, the platform recognizes the broader responsibilities of researchers, such as safeguarding sensitive information and ensuring ethical practices. By integrating features like consent management, data anonymization, and retention policy automation, the platform will act as a guardian of ethical compliance, reducing the burden on researchers and institutions alike. Its intuitive interface and automated workflows aim to bridge the gap between technical and non-technical users, making advanced data management capabilities accessible to all members of the research community.

Furthermore, this project emphasizes the importance of collaboration and knowledge dissemination. In today’s interconnected research ecosystem, the ability to share and publish data is critical for driving innovation, reproducibility, and impact. The platform will provide seamless integration with leading data repositories and journals, streamlining the preparation and submission processes while ensuring researchers retain control over how their data is accessed and used.

At its core, this project is a response to the evolving demands of the research landscape. It aspires to not only meet current needs but also anticipate future challenges by incorporating scalable infrastructure and adaptability. By creating a robust, secure, and user-centric platform, this initiative seeks to empower researchers with the confidence and tools they need to focus on their core mission: advancing knowledge and driving meaningful discoveries.

1.1 MOTIVATION

The motivation for this project stems from the pressing need to address the challenges faced by researchers in managing the ever-growing complexity of research data in a digital age. As the volume, variety, and velocity of data continue to increase, researchers are often overwhelmed by the demands of organizing, securing, and sharing their data while ensuring compliance with regulatory and ethical standards.

The absence of streamlined tools not only hinders efficiency but also jeopardizes the integrity and reproducibility of research, which are fundamental to scientific progress. Additionally, the growing emphasis on open science and data sharing has highlighted the need for platforms that facilitate collaboration and make data discoverable, reusable, and citable.

This project is driven by the vision to empower researchers with a comprehensive solution that simplifies these processes, enabling them to focus on innovation and discovery rather than the administrative burdens of data management. By addressing critical pain points such as data integrity, security, and compliance, this platform aspires to bridge gaps in current systems and support a future where research data is managed responsibly, shared widely, and utilized to its fullest potential.

1.2 PROBLEM STATEMENT

The objective of this project is to create a comprehensive, secure, and user-centric digital platform that empowers researchers to manage, organize, and share their data efficiently while ensuring compliance with ethical and regulatory standards.

By integrating tools for data integrity, security, collaboration, and discoverability, the platform seeks to advance scientific research by addressing key challenges in the modern research landscape.

FIG 1.2.1 Research Data Management Ecosystem

1.3 OBJECTIVES OF THE PROJECT

Research often involves working with diverse data formats, ranging from spreadsheets and databases to specialized file types like images, genomic sequences, or video recordings. Researchers also handle complex workflows that may involve data collection, processing, analysis, and reporting.

1.3.1 DEVELOP A SECURE PLATFORM

Given the sensitive nature of research data, creating a secure environment is paramount. The platform should be designed to provide:

Encryption: Ensure all data is encrypted both in transit and at rest, using industry-standard encryption protocols.
Access Controls: Enable role-based access controls (RBAC) to ensure only authorized personnel can view or modify data. Multi-factor authentication (MFA) should add an additional layer of security.

Audit Trails: Maintain detailed logs of all activities performed on the platform, such as data uploads, modifications, or sharing events. These logs can be used for accountability and troubleshooting.

1.3.2 FACILITATE COLLABORATION

Research data management is subject to numerous regulatory and ethical considerations. Non-compliance can result in legal risks, reputational damage, and funding losses. The app should provide features that proactively support researchers in adhering to these requirements:
Data Anonymization: Implement tools to anonymize sensitive data, ensuring personal or identifiable information is removed or masked as per legal and ethical standards.

Consent Management: Include modules to store and manage participant consent forms, track consent types, and ensure the scope of data usage aligns with permissions granted.

Data Retention Policies: Automate adherence to retention policies by allowing researchers to set rules for archiving, deleting, or retaining datasets based on project timelines or regulatory guidelines.

1.3.3 STREAMLINE DATA MANAGEMENT

Research often involves working with diverse data formats, ranging from spreadsheets and databases to specialized file types like images, genomic sequences, or video recordings. Researchers also handle complex workflows that may involve data collection, processing, analysis, and reporting. To address these challenges, the app should:
Simplify Data Organization: Provide tools to categorize and structure data intuitively. This could include hierarchical folder systems, tagging capabilities, and customizable templates tailored to specific research disciplines.

Metadata Tagging: Enable the addition of rich metadata to datasets for better context and easier searchability. This might include fields for author details, research objectives, keywords, and temporal or spatial information.

Data Discovery: Incorporate advanced search and filtering capabilities to help researchers locate relevant data quickly. Features like keyword-based searches, saved queries, and automatic recommendations based on prior usage would enhance usability**.**

1.3.4 ENHANCE DATA INTEGRITY

Maintaining the quality and reliability of research data is critical to the validity of findings. The app should incorporate mechanisms to safeguard data accuracy and reliability:

Data Validation: Provide tools to check for errors, inconsistencies, or anomalies during data entry or import. Automated validation rules can help ensure data adheres to expected formats and ranges.

Quality Control: Include audit trails, version control, and approval workflows to track changes and ensure datasets remain unaltered during collaboration or over time.

Backup and Recovery: Offer automatic backup solutions with customizable schedules and robust recovery mechanisms to protect against accidental data loss.

1.3.5 FACILIATE DATA PUBLISHING AND SHARING

Sharing research data is critical for collaboration, reproducibility, and advancing knowledge. The app should simplify the process of preparing and sharing datasets:

Data Preparation for Publication: Provide tools to clean, format, and organize data in accordance with publishing standards or repository guidelines.

Integration with Repositories: Enable direct integration with popular research data repositories (e.g., Dryad, Figshare, Zenodo) or journal platforms to streamline data submission.

Customizable Sharing Options: Allow researchers to control access to shared data, specifying permissions such as "view-only," "download," or "edit." Incorporating DOI (Digital Object Identifier) generation for datasets would further enhance citation and traceability.

1.4 SIGNIFICANCE OF THE PROJECT

1.4.1 ENSURING DATA SECURITY AND CONFIDENTIALITY

Ability to protect sensitive research data from unauthorized access, breaches, and misuse. In an era where research often involves personal, proprietary, or ethically sensitive information, maintaining robust security measures is not just a technical necessity but also a moral and legal obligation. This platform is designed with advanced encryption protocols to safeguard data both in transit and at rest, ensuring that it remains secure throughout its lifecycle. Role-based access controls and multi-factor authentication further enhance protection by restricting access to authorized personnel only. Additionally, audit trails provide transparency and accountability, enabling researchers to track all activities related to their data. By addressing these critical aspects, the project not only helps build trust among collaborators and stakeholders but also ensures compliance with stringent data protection regulations and ethical standards, fostering a secure environment where researchers can focus on innovation without compromising confidentiality. The importance of ensuring data security and confidentiality in this project extends beyond compliance and legal requirements—it is a cornerstone of ethical research and trust-building within the scientific community. Research data often includes sensitive information such as personal health records, demographic details, or proprietary experimental results, which, if compromised, could lead to significant ethical breaches, reputational harm, and potential financial loss. By embedding state-of-the-art security measures into the platform, this project aims to proactively address vulnerabilities and safeguard the privacy of individuals and organizations involved. Features like end-to-end encryption, secure data sharing, and automated compliance checks provide researchers with the confidence to handle sensitive data responsibly. Moreover, the platform's ability to implement anonymization tools and consent management ensures that ethical boundaries are upheld, even in collaborative and multi-institutional research scenarios. These efforts not only protect the data itself but also preserve the integrity and credibility of the research process, contributing to a secure foundation for advancing knowledge in an increasingly data-driven world.

1.4.2 PROMOTING COLLABORATION AND KNOWLEDGE SHARING

The significance of this project in promoting collaboration and knowledge sharing lies in its ability to break down barriers that often hinder effective teamwork and data dissemination in research. Collaboration is at the heart of scientific progress, but researchers frequently face challenges in sharing data securely, managing permissions, and ensuring interoperability across diverse systems. This platform addresses these challenges by providing seamless tools for data sharing, customizable access controls, and integration with widely used data repositories and journals. By enabling researchers to securely share datasets, methodologies, and findings, the platform fosters a culture of openness and transparency while protecting

Additionally, features such as version control, real-time collaboration, and DOI (Digital Object Identifier) generation ensure that shared data is traceable, citable, and easily accessible for future use. This not only enhances reproducibility and trust in research but also encourages multidisciplinary collaborations by making data discoverable and usable across fields. By bridging gaps between isolated research efforts and enabling knowledge exchange, this project has the potential to accelerate innovation, build global research networks, and contribute to a more inclusive and connected scientific community.

1.4.3 IMPROVING RESEARCH EFFICIENCY AND PRODUCTIVITY

The significance of this project in improving research efficiency and productivity lies in its ability to streamline complex data management workflows, allowing researchers to focus more on innovation and discovery rather than administrative tasks. In many research environments, inefficiencies arise from fragmented data storage, disorganized metadata, and cumbersome processes for data retrieval and sharing. This platform addresses these issues by offering intuitive tools for organizing and tagging data, advanced search functionalities for rapid discovery, and automation features to reduce repetitive tasks.

By minimizing the time and effort spent on managing data, researchers can allocate more resources to analysis, experimentation, and interpretation. Moreover, the platform’s built-in mechanisms for compliance, data validation, and quality control further enhance efficiency by reducing errors and ensuring that data is ready for use without extensive manual intervention. Collaboration tools, such as real-time editing and seamless integration with external repositories, make team workflows more cohesive and less prone to delays.

1.4.4 SUPPORTING REPRODUCTIVITY AND VALIDATION

The significance of this project in supporting reproducibility and validation lies in its ability to address two critical pillars of credible scientific research: ensuring that results can be independently verified and that methods are transparent. Reproducibility is fundamental to advancing knowledge, as it allows other researchers to replicate findings and build upon them with confidence. This platform plays a key role by providing structured tools for organizing data, maintaining comprehensive metadata, and preserving the integrity of datasets through version control and audit trails. Researchers can document their processes in detail, ensuring that their work is not only reproducible but also transparent and accessible to the scientific community.

Furthermore, the platform's data validation features help identify and mitigate errors or inconsistencies, ensuring that the datasets being shared or analyzed are of the highest quality. By facilitating seamless data sharing and integrating with established repositories, the platform ensures that other researchers can access the necessary resources to verify results, compare methodologies, and apply findings to new contexts. This capability strengthens trust in scientific outputs and encourages a culture of rigorous validation, ultimately contributing to more reliable and impactful research across disciplines.

CHAPTER 2

LITERATURE SURVEY

The development of secure research data management applications has gained significant attention in recent years, driven by the exponential growth of data generation and the increasing emphasis on data-driven research. Existing literature highlights the critical challenges researchers face, including data organization, compliance with regulatory standards, and secure collaboration.

The literature survey delves into the challenges and opportunities surrounding research data sharing, virtual research environments, open access, and data management in libraries. Christine L. Borgman (2012), in her paper titled *"The conundrum of sharing research data"*, published in the *Journal of the American Society for Information Science and Technology* (63(6), 1059-1078), explores the barriers researchers encounter when sharing data. These barriers are rooted in technical, social, and institutional challenges, which hinder the seamless dissemination and collaboration of research findings. This work underscores the complexity of promoting a culture of open data sharing among researchers.

Expanding on the infrastructure for collaboration, Leonardo Candela and Pasquale Pagano (2013) focus on Virtual Research Environments (VREs) in their paper titled *"Virtual research environments: An overview and a research agenda"*, published in the *Data Science Journal* (12, GRDI75-GRDI81). The authors outline the essential features of VREs, such as version control and access management, which are critical for fostering collaborative and efficient research workflows. Their work provides a foundation for developing tools and frameworks that can address the growing need for collaborative research practices in the digital age.

The survey also highlights advancements in Open Access and research data management. Jonathan P. Tennant (2016), in his paper *"The academic, economic and societal impacts of Open Access"*, published in *F1000Research* (5), discusses how Open Access accelerates scientific discovery and innovation by removing paywalls and increasing accessibility to research outputs. Complementing this, Andrew M. Cox and Stephen Pinfield (2014), in their study titled *"Research data management and libraries: Current activities and future priorities"*, published in the *Journal of Librarianship and Information Science* (46(4), 299-316), identify the key challenges in research data management. These challenges include addressing skills gaps, adapting to cultural changes, and ensuring adequate resource allocation, emphasizing the critical role of libraries in supporting effective data management strategies.

CHAPTER 3

SOFTWARE SPECIFICATIONS & REQUIREMENTS

3.1 HARDWARE REQUIREMENTS

- More users mean more concurrent access and processing needs.
- Larger datasets require more storage space and faster I/O.

A. Server-Side (for a web-based app)

- Web Server
  - Multi-core processors (e.g., Intel Xeon or AMD EPYC) with sufficient cores and clock speed. Start with at least 4 cores for small deployments, scaling up as needed.
  - At least 8GB of RAM, but 16GB or more is recommended for moderate to large deployments.
  - Fast storage (e.g., SSDs or NVMe drives) with sufficient capacity. Consider RAID configurations for redundancy and data protection. Storage size depends entirely on your expected data volume.

- Database Server
  - Similar CPU and RAM requirements as the web server, potentially higher depending on database size and query complexity.
  - Fast storage is crucial for database performance.

- Network
  - High-bandwidth network connection (e.g., 1 Gbps or 10 Gbps) to handle data transfer and user traffic.
  - Firewall and intrusion detection/prevention systems for security.

B. Client-Side (for users accessing the app)

- Desktop/Laptop
  - Relatively modern CPU (e.g., Intel Core i5 or equivalent).
  - At least 4GB of RAM (8GB recommended).
  - Sufficient storage space for temporary files and browser cache.

- Mobile Devices
  - Modern smartphones or tablets with sufficient processing power and memory.

3.2 SOFTWARE REQUIREMENT

A. Server-Side

- Operating System
  Linux distributions (e.g., Ubuntu Server, CentOS) are commonly used for server environments due to their stability and security.
  Windows Server can also be used, but it might have higher licensing costs.
- Web Server Software
  HTTP Server requests==2.32.3, urllib3==2.2.3.
  Asynchronous server gateway interface (ASGI): asgiref==3.8.1.
- Database Management System (DBMS)
  PostgreSQL A powerful open-source relational database.
- Programming Languages and Frameworks
  Backend Python (with Django framework)
  Frontend HTML, CSS, JavaScript and Django Templates.
- Other Tools
  Version control system (e.g., Git).
  Backup and recovery software.
- Cloudinary for media storage
  cloudinary==1.41.0
  django-cloudinary-storage==0.3.0.
- Database adapter for PostgreSQL
  psycopg2-binary==2.9.9.
- Image processing
  pillow==10.4.0.
- Utilities
  certifi==2024.8.30, charset-normalizer==3.4.0
  idna==3.10, six==1.16.0, sqlparse==0.5.1
  tzdata==2024.1.

B. Client-Side

- Web Browser
  Modern web browsers (e.g., Chrome, Firefox, Safari, Edge) with support for HTML5, CSS3, and JavaScript.

- Operating System
  Windows, macOS, Linux, iOS, Android.

CHAPTER 4

SOFTWARE DESIGN

The software design for the Secure Research Data Management App (ResearchNest) prioritizes modularity, security, and scalability. A multi-tiered architecture will be employed, separating the presentation layer (user interface), application logic layer (business rules and processing), and data access layer (database interactions). This separation of concerns enhances maintainability and allows for independent scaling of different components.

The presentation layer will utilize modern web technologies like HTML5, CSS3, and Django templates to provide a responsive and intuitive user experience. The application logic layer, responsible for handling user requests, enforcing security policies, and managing data workflows, will be implemented using a robust backend framework (e.g., Python/Django). This layer will also handle authentication, authorization, and session management.

The data access layer will interact with a relational database (e.g., PostgreSQL), depending on the data characteristics and performance requirements. Secure communication protocols (HTTPS) and robust encryption methods will be implemented throughout the system to protect sensitive data both in transit and at rest. Access control mechanisms, such as role-based access control (RBAC), will be enforced at all levels to restrict data access based on user roles and permissions.

The design will emphasize data integrity through validation rules, version control, and audit trails. API endpoints will be designed using RESTful principles to facilitate integration with other research tools and platforms. The overall design aims to create a secure, scalable, and maintainable platform that meets the complex needs of modern research data management.

4.1 ARCHITECTURE OVERVIEW

Multi-tiered architecture for a web application built with a Django backend, emphasizing modularity and resilience. User interaction begins with requests directed to the Django backend, which acts as the central hub. An API Gateway serves as the entry point for all incoming requests, handling routing, authentication, and other cross-cutting concerns. The backend is logically divided into distinct services; an Authentication Service manages user authentication and authorization; a Project Service handles project-related data, interacting with a database for storage and retrieval; and a File Handling Service manages file uploads and downloads, utilizing cloud storage for persistent storage. This separation of concerns promotes maintainability and scalability.

The database stores structured data like user accounts and project metadata, while cloud storage provides scalable and cost-effective storage for user-uploaded files. The application also integrates with external services via an External API.

A Logging Service records application events and errors for debugging and monitoring, while a Chaos Monkey is employed to randomly introduce failures, testing the application's resilience and fault tolerance. This architecture, employing microservices, an API gateway, cloud storage, and resilience testing, demonstrates a well-structured approach for building a scalable, maintainable, and robust web application. The body of literature surrounding secure research data management underscores the increasing importance of efficient and secure platforms in modern scientific endeavors.

Researchers across disciplines face growing challenges with data storage, organization, and sharing due to the sheer volume and complexity of data being generated. For example, studies in biomedical and environmental sciences emphasize the necessity of safeguarding sensitive and proprietary information while maintaining compliance with stringent legal and ethical standards, such as GDPR (General Data Protection Regulation), HIPAA (Health Insurance Portability and Accountability Act), and institutional review board (IRB) guidelines. Despite these advancements, gaps remain in delivering a holistic solution that combines robust security, regulatory compliance, and collaboration tools in one package.

This project leverages insights from the literature to design a platform that addresses these challenges comprehensively, focusing on providing a secure, user-friendly, and feature-rich environment to support the evolving needs of the research community. By doing so, it seeks to contribute to the growing body of work aimed at advancing the efficiency, reliability, and integrity of research data management.

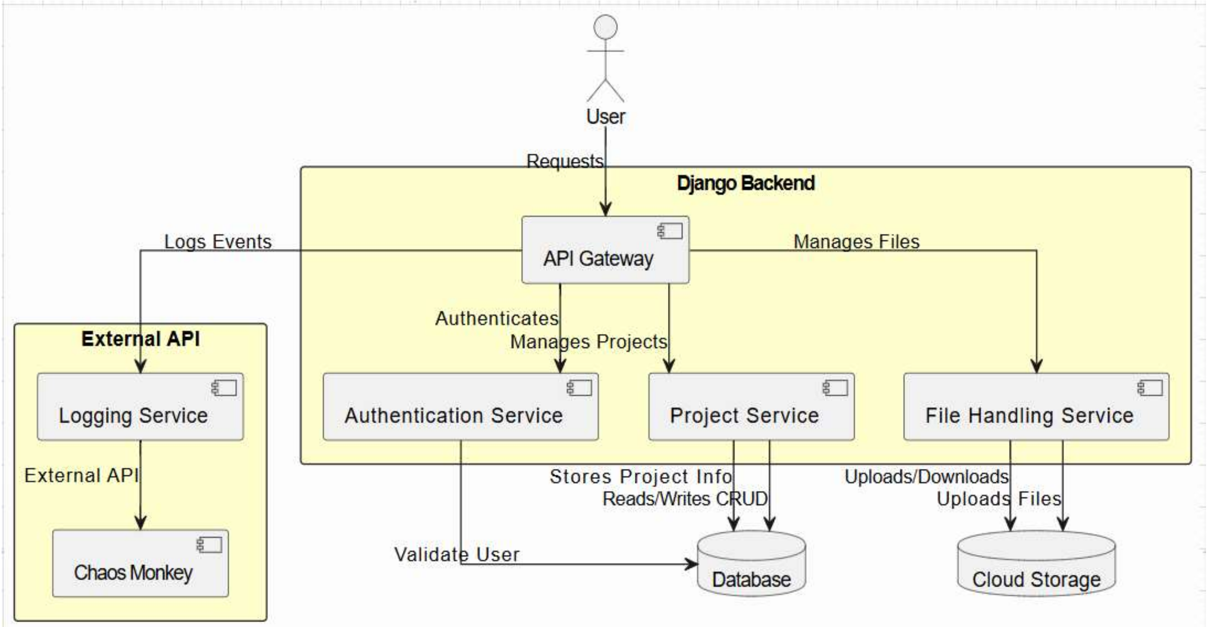


Fig 4.1.1 Architecture

The literature on secure research data management highlights the evolving needs and challenges researchers face in handling vast, complex datasets, especially in an era of interdisciplinary studies and global collaboration. A recurring theme in the research is the inadequacy of traditional data management practices in addressing modern demands such as scalability, real-time collaboration, and stringent security requirements. Many researchers struggle with fragmented workflows due to using multiple tools that do not integrate seamlessly, leading to inefficiencies and increased risk of data loss or breaches.

Security has been a focal point in the literature, with many studies emphasizing the importance of encryption, access controls, and audit trails in safeguarding sensitive data. Platforms like REDCap have shown promise for specific sectors, such as clinical research, by offering compliance with standards like HIPAA. However, their limited adaptability to other research domains points to the need for more versatile solutions. Research also underscores the growing risk of cyber threats, which necessitates platforms with advanced protection mechanisms such as end-to-end encryption, multi-factor authentication, and regular security updates.

4.2 MODULE DESCRIPTION

User Management Module

- **Purpose** - To manage user accounts, roles, and permissions for secure access.
  User registration, login, and profile management.
  Role-based access control (RBAC) to assign specific permissions to different user groups (e.g., researchers, administrators).
  Multi-factor authentication for enhanced security.
  Account recovery and password reset functionalities.

Data Organization and Metadata Management Module

- **Purpose** - To facilitate efficient organization, tagging, and retrieval of data.
  Hierarchical folder structures for organizing datasets.
  Automated and manual metadata tagging to describe data attributes.
  Advanced search and filtering capabilities for quick data discovery.
  Version control to maintain and track changes in datasets.

Data Security and Compliance Module

- **Purpose -** To ensure the security of sensitive data and compliance with regulations.
  End-to-end encryption for data in transit and at rest.
  Data anonymization tools to protect personal information.
  Built-in compliance checklists for standards like GDPR, HIPAA, and CCPA.
  Audit trails to track data access, modifications, and sharing activities.

Collaboration and Sharing Module

- **Purpose** - To enable seamless collaboration and secure sharing of research data.
  Real-time collaboration tools for team-based workflows.
  Role-based sharing with customizable permissions (e.g., read-only, edit, download).
  Integration with external repositories, journals, and citation systems (e.g., DOI generation).
  Notifications and activity logs for shared data updates.

4.3 DATA FLOW DIAGRAM

The diagram provides a structured overview of a secure research data management system, focusing on its core components and their interconnections. At the center of the system is the User, who interacts with various modules to manage research data efficiently. The User Registration & Login module handles account creation and authentication, storing user data and enabling updates to user profiles. The Profile Management module allows users to manage their personal information and preferences, while the Project Management module facilitates the creation and organization of project-specific data. Additionally, the File Management module supports the storage and organization of research files, along with metadata for efficient retrieval and tracking.

The system incorporates three primary storage modules: User Data, which stores user-specific information; Project Data, which holds project-related information; and File Data, which stores file content and metadata. These storage modules ensure data integrity and accessibility. All components are integrated with the Project Visibility & Access Control module, which enforces security protocols by granting access based on user roles and permissions. This architecture ensures seamless collaboration, secure data handling, and efficient project and file management while maintaining strict compliance with security and access policies**.**

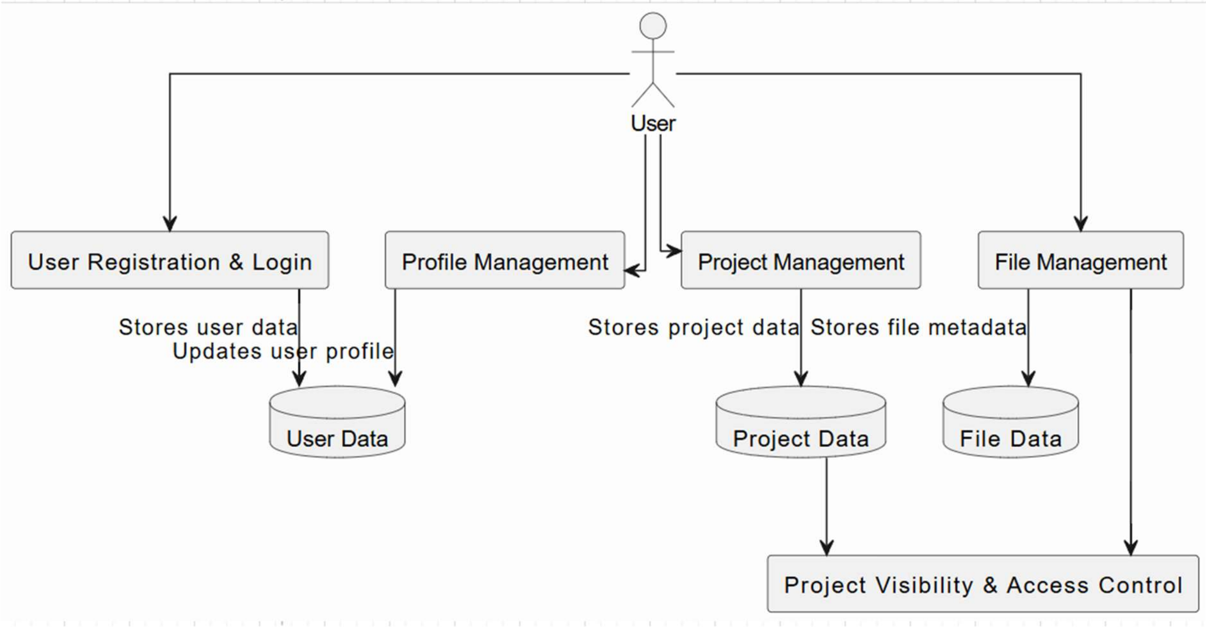


FIGURE 4.3.1 Data Flow Diagram

4.4 UML DIAGRAM'S

4.4.1 USECASE DIAGRAM

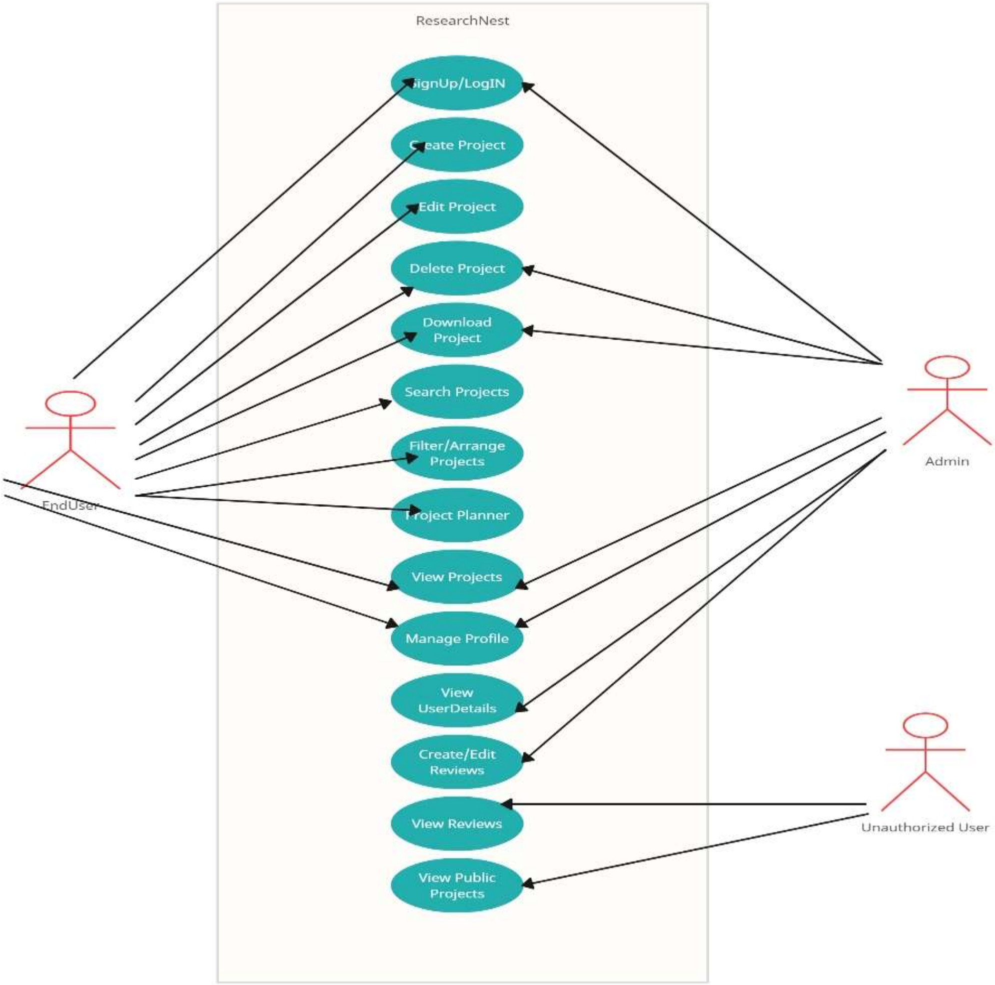


Figure 4.4.1 Usecase Diagram

The diagram provides an overview of the interaction flow between different user roles and the functionalities within the secure research data management platform, named "ResearchNest." The system accommodates three primary user roles: **End User**, **Admin**, and **Unauthorized User**, each with specific access rights and responsibilities. The **End User**, typically a researcher, can perform various core operations such as signing up or logging in, creating, editing, and deleting projects, downloading project data, searching and filtering projects, managing project workflows through the Project Planner, viewing project details, and updating their profile. These functionalities empower researchers to efficiently manage their research data and streamline their workflows.

The **Admin** role represents users with elevated privileges, allowing them to perform administrative tasks such as viewing user details, creating and editing reviews, and accessing project reviews. This ensures that the platform is monitored and regulated effectively, maintaining the integrity and compliance of research data. The **Unauthorized User**, representing a guest or unregistered user, is restricted to viewing public projects, ensuring limited access to sensitive or private data. The diagram highlights the secure and role-specific access structure, where arrows illustrate the flow of user interactions with system features. By organizing access based on roles, the platform ensures data confidentiality, fosters collaboration, and promotes a streamlined and secure environment for managing research data.

4.4.2 SEQUENCE DIAGRAM

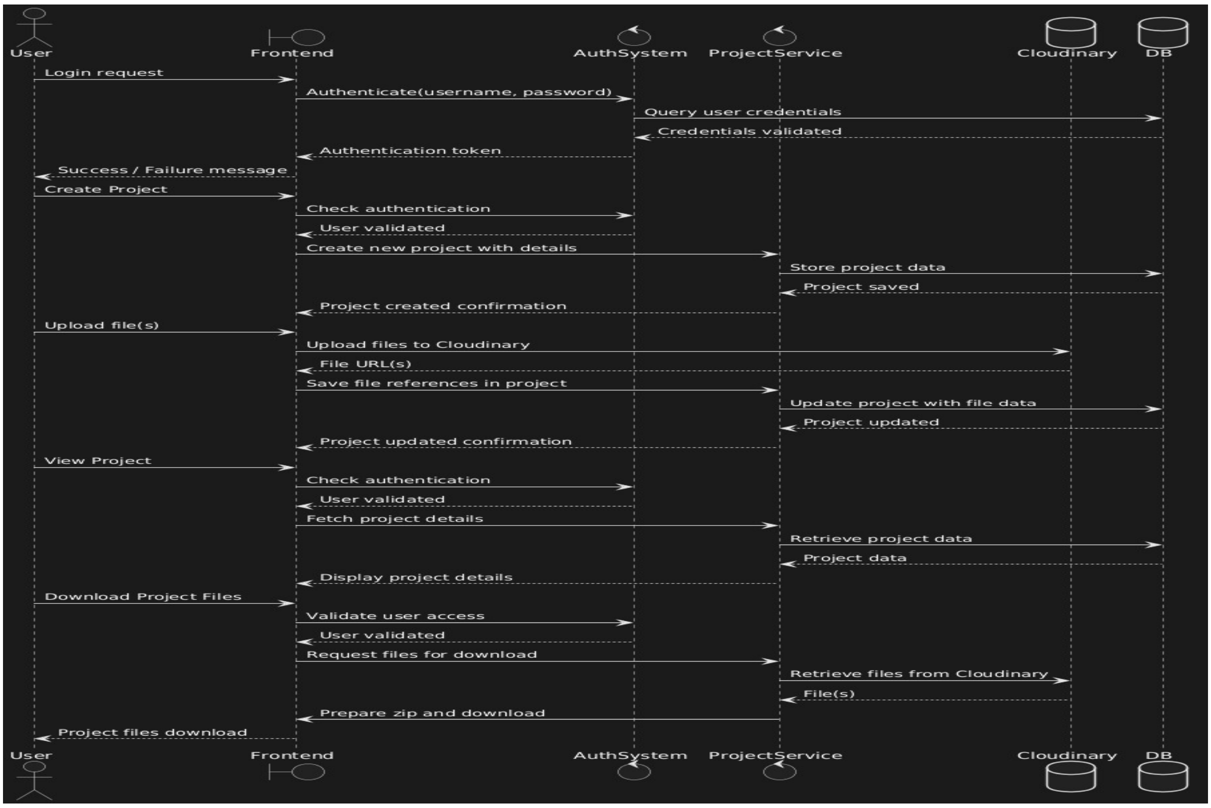


Figure 4.4.2 Sequence Diagram

This sequence diagram illustrates the workflow and interaction between a user, the frontend application, authentication system, project service, Cloudinary (as a file storage service), and the database within a secure research data management system. The process begins with the **user's login request**, where the frontend communicates with the authentication system to verify the provided credentials. Upon successful validation, an authentication token is returned to the frontend.

The user can then create a project by sending the relevant details through the frontend, which checks authentication and passes the data to the project service. The project service stores the project data in the database, and a confirmation is sent back to the frontend. For uploading files, the frontend uploads the files to Cloudinary, receives file URLs in return, and updates the project in the database by saving the file references.

When viewing a project, the user initiates a request, and the frontend validates the user's authentication before fetching project details from the project service. The retrieved project data is displayed to the user. For downloading project files, the system validates the user's access rights, retrieves the files from Cloudinary, and prepares them in a downloadable zip format. This sequence ensures seamless project management while maintaining robust security, data validation, and efficient interaction between components.

4.4.3 CLASS DIAGRAM

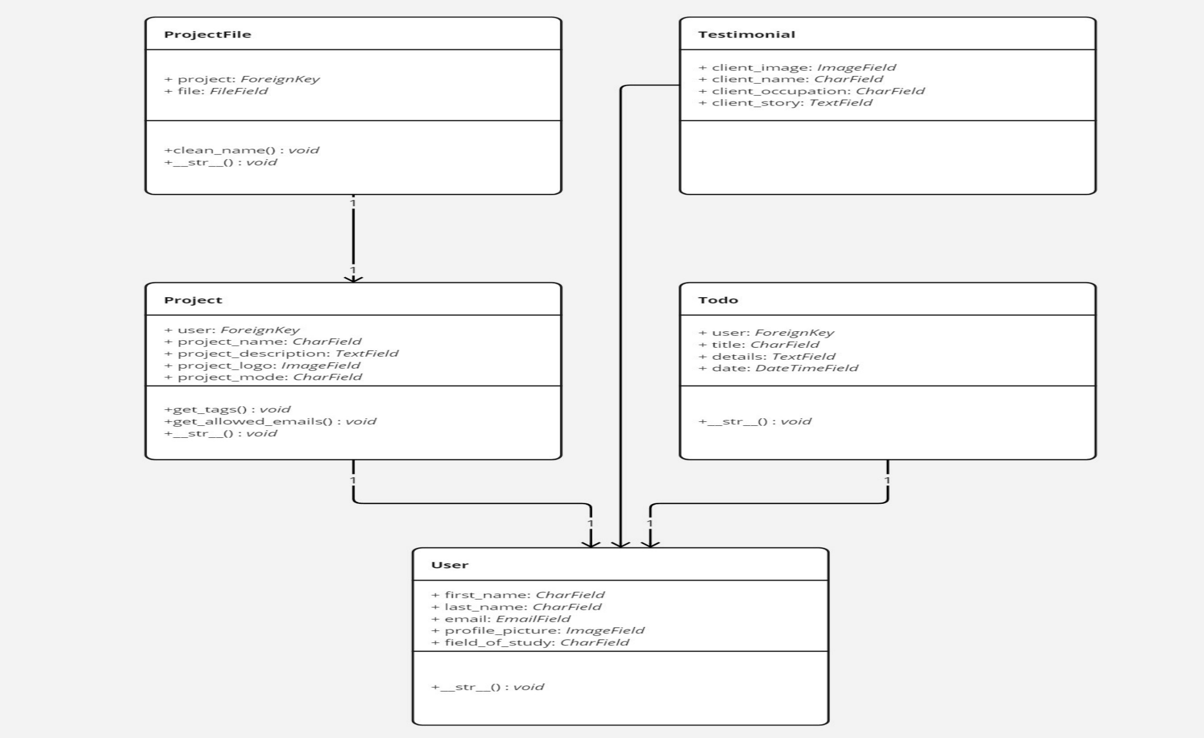


Figure 4.4.3 Class Diagram

4.4.4 ACTIVITY DIAGRAM

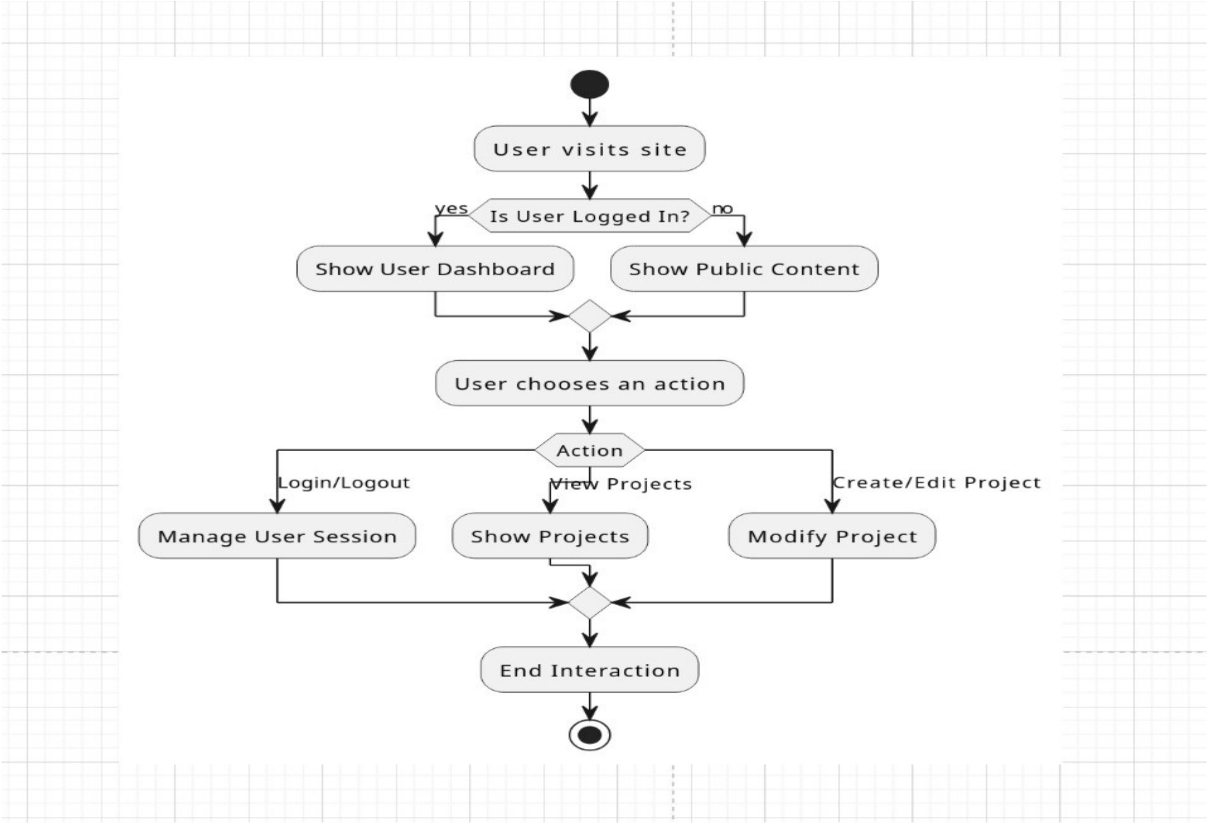


Figure 4.4.4 Activity Diagram

4.4.5 Deployment Diagram

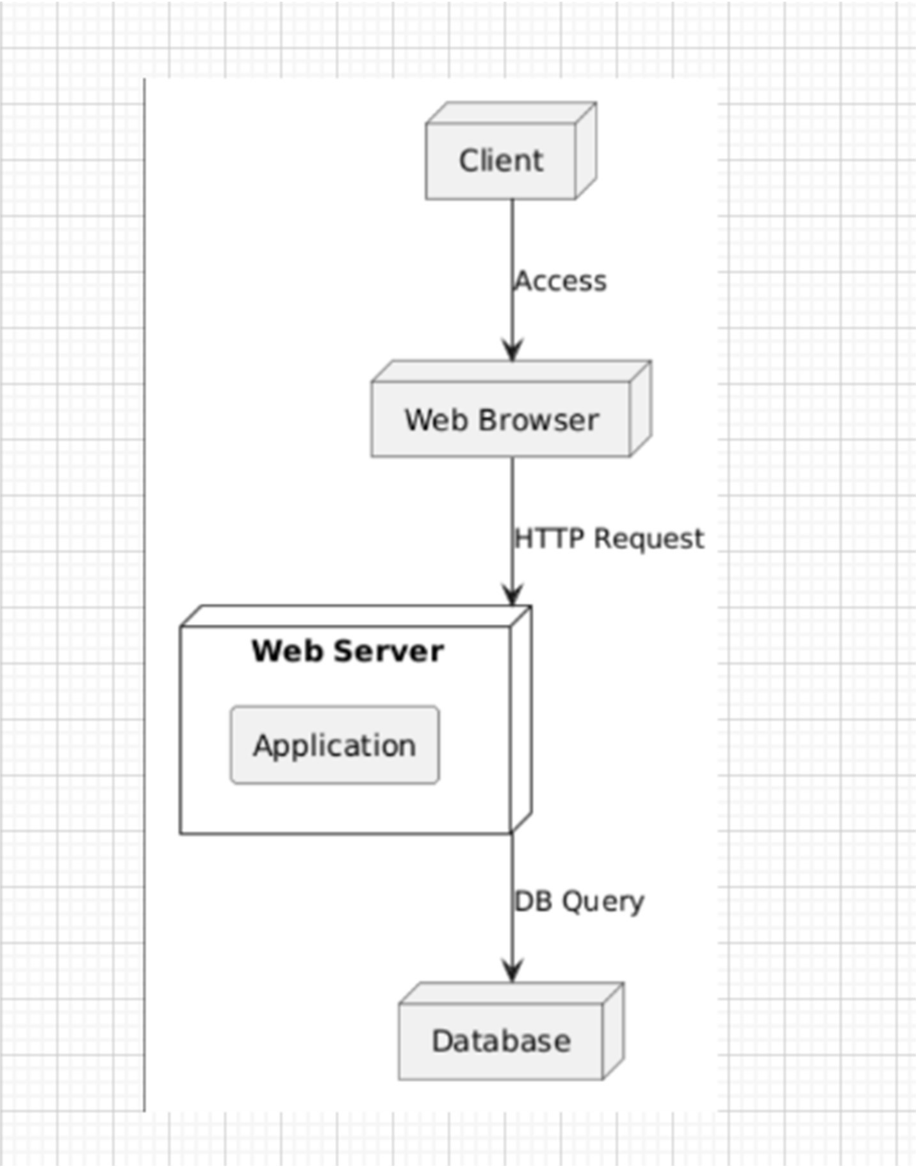


Figure 4.4.5 Deployment Diagram

The diagram depicts a robust architecture designed to handle the sensitive nature of research data. The user interacts with the system via requests routed through the Django backend, with the API Gateway acting as the central traffic

5. IMPLEMENTATION

The web application ReseachNest is a secure application for research and academic sector for storing information and access in different ways.

5.1 User Module

- User Information Management
  Storing user profiles (name, email, affiliation, research interests, etc.).
  Managing user roles and permissions (e.g., researcher, collaborator, administrator).
  Handling user registration, login, and password management.
- Authentication and Authorization
  Integrating with the Authentication Service to verify user identity and credentials.
  Enforcing access control based on user roles and permissions.
- User Interface (UI) Interaction
  Providing UI elements for user registration, login, and profile management.
  Displaying user-specific information and data based on their roles and permissions.
- Data Access and Usage
  Tracking user activity and data access for auditing and security purposes.
  Enforcing data usage policies and restrictions based on user roles.

Implementation

- The User Module could be implemented as a separate service within the Django backend, similar to the Project Service and File Handling Service.
- It might interact with the database to store and retrieve user information.
- It would likely work closely with the Authentication Service to manage user authentication and authorization.

5.1.1 User Registration Page

Registration Page Code

```
{% extends "base.html" %}
{% load static %}
<!-- Section: Design Block -->
{% block content %}
<section class="text-center">
  <!-- Background image -->
  <div class="p-5 bg-image loginpic" style="background-image: url('{% static
'imgs/Sign/banner.jpg' %}');"></div>
  <!-- Background image -->

  <div class="card mx-4 mx-md-5 shadow-5-strong bg-body-tertiary" style="
        margin-top: -100px;
        backdrop-filter: blur(30px);
        ">
    <div class="card-body py-5 px-md-5">
      <div class="row d-flex justify-content-center">
        <div class="col-lg-8">
          <h2 class="fw-bold mb-5 myff">Sign up now</h2>
          <form action="signup" method="post">
            {% csrf_token %}
            <div data-mdb-input-init class="form-outline mb-4">
              <input type="text" id="form3Example2" name="username" class="form-control" />
              <label class="form-label h5" for="form3Example2">Username</label>
              {% for error in form.username.errors %}
                <p class="text-danger">{{ error }}</p>
              {% endfor %}
            </div>
```

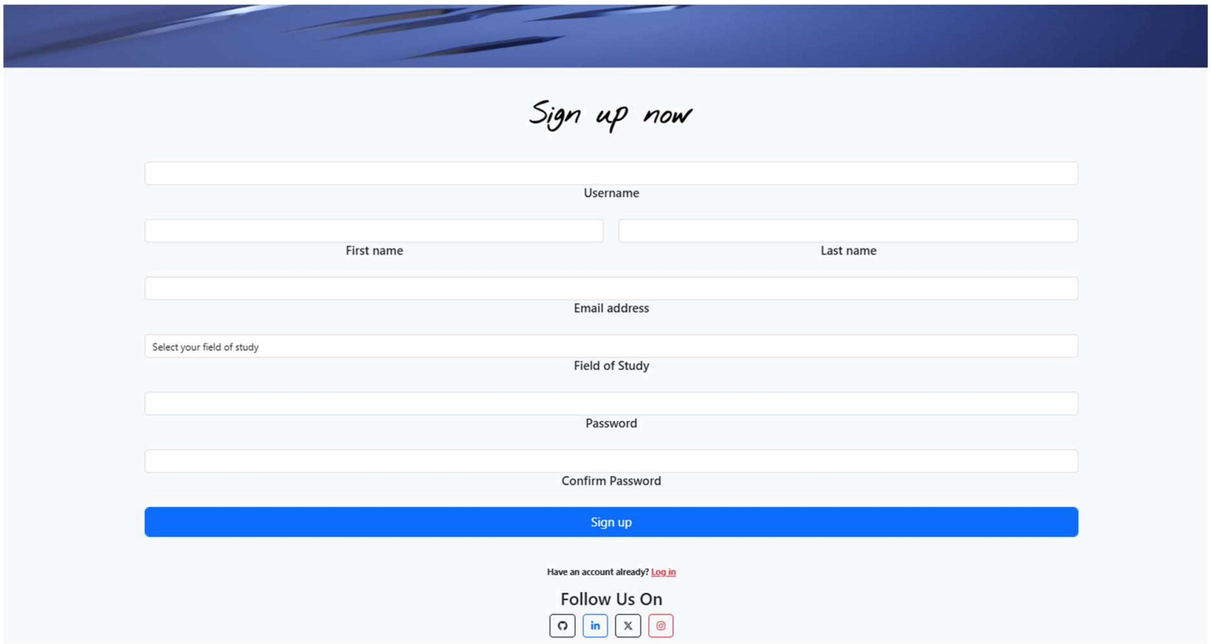
```
<!-- 2 column grid layout with text inputs for the first and last names -->
<div class="row">
  <div class="col-md-6 mb-4">
    <div data-mdb-input-init class="form-outline">
      <input type="text" id="form3Example1" name="first_name" class="form-control" />
      <label class="form-label h5" for="form3Example1">First name</label>
    </div>
  </div>
  <div class="col-md-6 mb-4">
    <div data-mdb-input-init class="form-outline">
      <input type="text" id="form3Example2" name="last_name" class="form-control" />
      <label class="form-label h5" for="form3Example2">Last name</label>
    </div>
  </div>
</div>



<!-- Email input -->
<div data-mdb-input-init class="form-outline mb-4">
  <input type="email" id="form3Example3" name="email" class="form-control" />
  <label class="form-label h5" for="form3Example3">Email address</label>
  {% for error in form.email.errors %}
    <p class="text-danger">{{ error }}</p>
  {% endfor %}
</div>

<div data-mdb-input-init class="form-outline mb-4">
```

```
            <select id="fieldOfStudy" name="field_of_study" class="form-control"
onchange="toggleOtherField(this)">
              <option value="" disabled selected>Select your field of study</option>
              <option value="biology">Biology</option>
              <option value="chemistry">Chemistry</option>
              <option value="physics">Physics</option>
              <option value="computer_science">Computer Science</option>
              <option value="psychology">Psychology</option>
              <option value="other">Other (Please specify)</option>
            </select>
            <label class="form-label h5" for="fieldOfStudy">Field of Study</label>
          </div>

          <!-- Text input for 'Other' field -->
          <div data-mdb-input-init class="form-outline mb-4" id="otherFieldDiv"
style="display: none;">
            <input type="text" id="otherFieldOfStudy" name="other_field_of_study"
class="form-control" />
            <label class="form-label h5" for="otherFieldOfStudy">Please specify your field of
study</label>
          </div>

           <!-- Password input -->
           <div data-mdb-input-init class="form-outline mb-4">
            <input type="password" id="form3Example4" name="password1" class="form-
control" />
            <label class="form-label h5" for="form3Example4">Password</label>
            {% for error in form.password1.errors %}
              <p class="text-danger">{{ error }}</p>
            {% endfor %}
           </div>
```

```
<div data-mdb-input-init class="form-outline mb-4">
  <input type="password" id="form3Example5" name="password2" class="form-control" />
  <label class="form-label h5" for="form3Example5">Confirm Password</label>
  {% for error in form.password2.errors %}
    <p class="text-danger">{{ error }}</p>
  {% endfor %}
</div>


<!-- Submit button -->
<button type="submit" data-mdb-button-init data-mdb-ripple-init class="btn btn-primary btn-lg btn-block mb-5 form-control">
  Sign up
</button>


<p class="small fw-bold text-center">Have an account already? <a href="{% url 'login' %}"
  class="link-danger">Log in</a></p>


<!-- Social Links -->
<div class="text-center">
  <h3>Follow Us On</h3>
  <a target="_blank" href="https://github.com/Yuvaprakash24" type="button" data-mdb-button-init data-mdb-ripple-init class="btn btn-outline-dark btn-floating mx-1">
    <i class="fab fa-github"></i>
  </a>


  <a target="_blank" type="button" data-mdb-button-init data-mdb-ripple-init class="btn btn-outline-primary btn-floating mx-1">
   <i class="fab fa-linkedin-in"></i>
```

```
        </a>


        <a target="_blank" type="button" data-mdb-button-init data-mdb-ripple-init
class="btn btn-outline-dark btn-floating mx-1">
         <i class="fab fa-x-twitter"></i>
        </a>


        <a target="_blank" type="button" data-mdb-button-init data-mdb-ripple-init
class="btn btn-outline-danger btn-floating mx-1">
          <i class="fab fa-instagram"></i>
        </a>


       </div>
      </form>
     </div>
    </div>
   </div>
  </div>
 </section>
 <!-- Section: Design Block -->

 <script>
  function toggleOtherField(select) {
    var otherFieldDiv = document.getElementById('otherFieldDiv');
    if (select.value === 'other') {
      otherFieldDiv.style.display = 'block';
    } else {
      otherFieldDiv.style.display = 'none';
    }
  }
```

```
</script>
{% endblock %}
```



Sign up now

Username

First name

Last name

Email address

Select your field of study

Field of Study

Password

Confirm Password

Have an account already? Log in

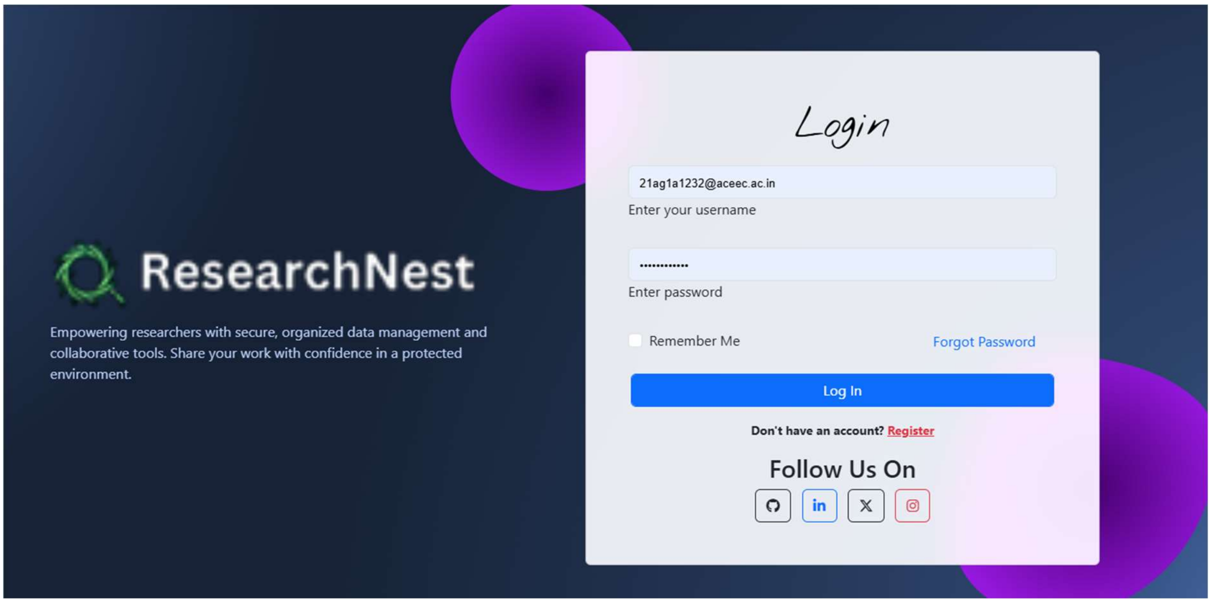
Follow Us On

Figure 5.1.1 Registration page

5.1.2 USER LOGIN

Login Page Code

```
{% extends 'base.html' %}
{% load static %}
{% block content %}
<section class="background-radial-gradient overflow-hidden">
  <div class="container px-4 py-5 px-md-5 text-center text-lg-start my-5">
    <div class="row gx-lg-5 align-items-center mb-5">
      <div class="col-lg-6 mb-5 mb-lg-0" style="z-index: 10">
        <img src="{% static 'imgs/logo/2ch.png' %}" width="90%" alt="">
        <p class="opacity-70 mx-4" style="color: hsl(218, 81%, 85%)">
          Empowering researchers with secure, organized data management and collaborative tools. Share your work with confidence in a protected environment.
        </p>
      </div>

      <div class="col-lg-6 mb-5 mb-lg-0 position-relative">
        <div id="radius-shape-1" class="position-absolute rounded-circle shadow-5-strong"></div>
        <div id="radius-shape-2" class="position-absolute shadow-5-strong"></div>

        <div class="card bg-glass">
          <div class="card-body px-4 py-5 px-md-5">
            <p class="myff text-center">Login</p>
            {% for message in messages %}
            <div class="alert alert-danger alert-dismissible fade show" role="alert">
              {{ message }}
              <button type="button" class="btn-close" data-bs-dismiss="alert" aria-label="Close"></button>
            </div>
          {% endfor %}
            <form action="{% url 'login' %}" method="post">
              {% csrf_token %}
              <div class="row">
              <input type="hidden" name="next" value="{{ next }}">
              <div data-mdb-input-init class="form-outline mb-4">
                <input type="text" name="username" id="form3Example3" class="form-control" />
                <label class="form-label" for="form3Example3">Enter your username</label>
              </div>

              <div data-mdb-input-init class="form-outline mb-4">
                <input type="password" name="password" id="form3Example4" class="form-control" />
                <label class="form-label" for="form3Example4">Enter password</label>
              </div>

              <div class="row d-flex align-items-center mb-4">
                <div class="col-md-6 d-flex justify-content-start">
                  <div class="form-check">
                    <input class="form-check-input me-2" type="checkbox" value="" id="rememberMe" />
                    <label class="form-check-label" for="rememberMe">
                      Remember Me
                    </label>
                  </div>
                </div>
                <div class="col-md-6 d-flex justify-content-end">
                  <a href="#" style="text-decoration: none;">Forgot Password</a>
                </div>
              </div>

              <button type="submit" data-mdb-button-init data-mdb-ripple-init class="btn btn-primary btn-block form-control mb-3">
                Log In
              </button>

              <p class="small fw-bold text-center">Don't have an account? <a href="{% url 'signup' %}"
                class="link-danger">Register</a></p>



            <div class="text-center">
              <h3>Follow Us On</h3>
              <a target="_blank" href="https://github.com/Yuvaprakash24" type="button" data-mdb-button-init data-mdb-ripple-init class="btn btn-outline-dark btn-floating mx-1">
                  <i class="fab fa-github"></i>
              </a>

              <a target="_blank" type="button" data-mdb-button-init data-mdb-ripple-init class="btn btn-outline-primary btn-floating mx-1">
                <i class="fab fa-linkedin-in"></i>
              </a>

              <a target="_blank" type="button" data-mdb-button-init data-mdb-ripple-init class="btn btn-outline-dark btn-floating mx-1">
                <i class="fab fa-x-twitter"></i>
              </a>
              <a target="_blank" type="button" data-mdb-button-init data-mdb-ripple-init
class="btn btn-outline-danger btn-floating mx-1">
          <i class="fab fa-instagram"></i>
        </a>


       </div>
       </form>
      </div>
     </div>
    </div>
   </div>
  </div>
 </section>
{% endblock %}
```



ResearchNest

Empowering researchers with secure, organized data management and collaborative tools. Share your work with confidence in a protected environment.

Login

21ag1a1232@aceec.ac.in

Enter your username

············

Enter password

□ Remember Me

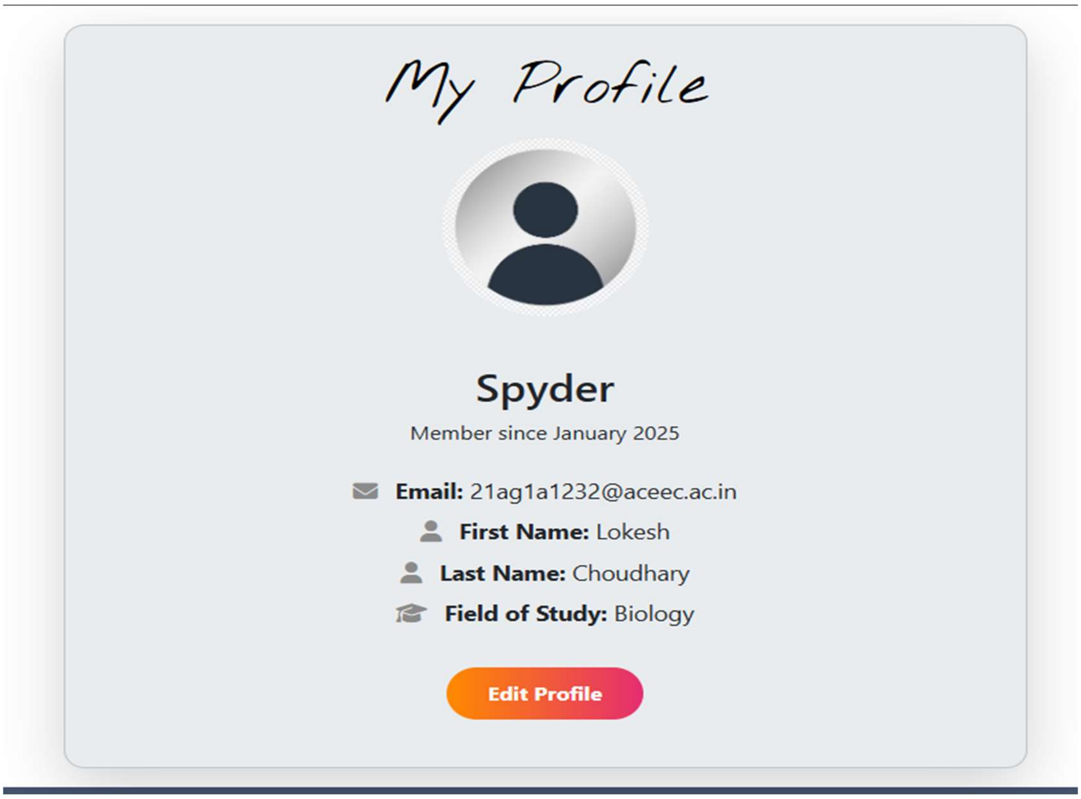
Don't have an account? Register

Fig 5.1.2 User Login

5.1.3 USER PROFILE

Profile Page Code

```
{% extends 'base.html'%}
{% load static%}
{% block content %}
{% include 'navbar.html' %}
<div class="container my-3">
    <div class="card profile-card text-dark bg-body-secondary mx-auto p-4 shadow-lg"
style="max-width: 700px; border-radius: 15px;">
        <h2 class="myff text-center">My Profile</h2>
        <div class="d-flex flex-column align-items-center">
            <div class="profile-image mb-4">
                {% if profile_picture %}
                    <img src="{{ profile_picture }}" alt="Profile Picture" class="rounded-circle"
style="width: 150px; height: 150px; object-fit: cover; transition: transform 0.3s;">
                {% else %}
                    <img src="https://img.freepik.com/premium-vector/silver-membership-icon-
default-avatar-profile-icon-membership-icon-social-media-user-image-vector-
illustration_561158-4215.jpg" alt="Default Profile Picture" class="rounded-circle"
style="width: 150px; height: 150px; object-fit: cover; transition: transform 0.3s;">
                {% endif %}
            </div>
            <div class="card-body text-center">
                <h2 class="card-title">{{ name|title }}</h2>
                <p class="mb-4">Member since {{ user.date_joined|date:"F Y" }}</p>
                <div class="text-left profile-info">
                    <p><i class="fas fa-envelope"></i> <strong>Email:</strong> {{ email }}</p>
                    <p><i class="fas fa-user"></i> <strong>First Name:</strong> {{ fname }}</p>
                    <p><i class="fas fa-user"></i> <strong>Last Name:</strong> {{ lname }}</p>
                    <p><i class="fas fa-graduation-cap"></i> <strong>Field of Study:</strong> {{
field_study|title }}</p>
                </div>
                <a href="{% url 'editprofile' %}" class="btn btn-gradient mt-4" style="padding:
10px 30px;">Edit Profile</a>
            </div>
        </div>
    </div>
</div>
<div class="d-none d-lg-block">
    {% include 'footer.html' %}
</div>
<div class="d-lg-none">
    {% include 'simplefooter.html' %}
</div>
{% endblock %}
```



Spyder

Member since January 2025

Email: 21ag1a1232@aceec.ac.in

First Name: Lokesh

Last Name: Choudhary

Field of Study: Biology

Figure 5.1.3 USER Profile

5.2 CREATE PROJECT

5.2.1 MY PUBLIC PROJECT

A "Public Project" within this application signifies a project where the research data and associated metadata are intentionally made accessible to the general public or a broader community beyond the original research team.
The actual research data files are available for download or access through the application's interface. The level of access (e.g., full data download, read-only access) might be configurable.

Public projects should be easily discoverable through search functionalities within the application and potentially through external search engines.

5.2.2 MY PROTECTED PROJECT

A "Protected Project" represents a level of access control where data and metadata are accessible only to authorized users. This is a more restrictive setting compared to "Public Projects" but less restrictive than entirely private projects.
Data sharing within the project is controlled and managed. Users might have varying levels of access (e.g., read-only, read-write) depending on their roles and permissions.
Protected projects may have additional security measures in place, such as stricter access controls, more frequent auditing, and potentially encryption at the file level.

5.2.3 MY PRIVATE PROJECT

This service is responsible for verifying the user's identity and authenticating their access to the application. It might use various methods like username/password, multi-factor authentication, or integration with institutional identity providers.
By combining these access control mechanisms and the interactions between the key components, the secure research data management app ensures that sensitive research data is protected and accessed only by authorized individuals.

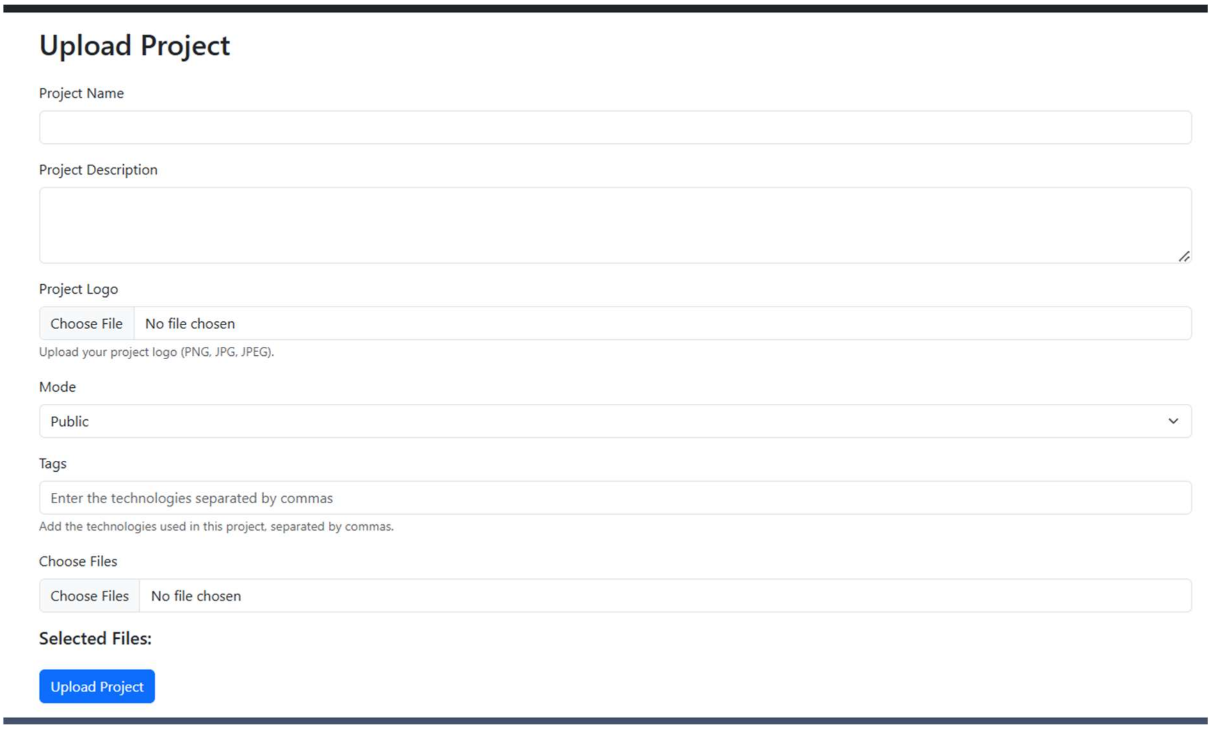
Upload Project Code

```
{% extends "base.html" %}
{% load static %}
{% block content %}
{% include "navbar.html" %}
<div class="container my-3">
   <h2 class="mb-4">{% if project %}Edit{% else %}Upload{% endif %} Project</h2>
```

```
  <form id="project-form" enctype="multipart/form-data" method="POST" action="{% if
project %}{% url 'editproject' project.id %}{% else %}{% url 'createproject' %}{% endif
%}">

    {% csrf_token %}
    <div class="mb-3">
      <label for="projectName" class="form-label">Project Name</label>
      <input type="text" class="form-control" id="projectName" name="projectName"
value="{{ project.project_name }}" required>
    </div>

    <div class="mb-3">
      <label for="projectDescription" class="form-label">Project Description</label>
      <textarea class="form-control" id="projectDescription" name="projectDescription"
rows="3" required>{{ project.project_description }}</textarea>
    </div>

    <div class="mb-3">
      <label for="projectLogo" class="form-label">Project Logo</label>
      <input type="file" class="form-control" id="projectLogo" name="projectLogo"
accept="image/*">
      {% if project.project_logo %}
        <img src="{{ project.project_logo.url }}" alt="Project Logo" class="img-thumbnail
mt-2" width="100">
      {% endif %}
      <small class="form-text text-muted">Upload your project logo (PNG, JPG,
JPEG).</small>
    </div>

    <div class="mb-3">
      <label for="projectMode" class="form-label">Mode</label>
      <select class="form-select" id="projectMode" name="projectMode" required>
        <option value="" disabled>Select mode</option>
        <option value="public" {% if project.project_mode == 'public' %}selected{% endif
%}>Public</option>
        <option value="private" {% if project.project_mode == 'private' %}selected{%
endif %}>Private</option>
        <option value="protected" {% if project.project_mode == 'protected' %}selected{%
endif %}>Protected</option>
      </select>
    </div>

    <!-- Conditional Email Input -->
    <div class="mb-3 hidden-field" id="emailField" style="display: {% if
project.project_mode == 'protected' %}block{% else %}none{% endif %};">
      <label for="protectedEmails" class="form-label">Allowed Emails (for Protected
mode)</label>
```

```
      <input type="text" class="form-control" id="protectedEmails"
name="protectedEmails" placeholder="Enter emails separated by commas" value="{{
project.protected_emails }}">
      <small class="form-text text-muted">Add emails of users allowed to access this
project, separated by commas.</small>
    </div>

    <div class="mb-3">
      <label for="tags" class="form-label">Tags</label>
      <input type="text" class="form-control" id="tagsused" name="tagsused" value="{{
project.tags }}" placeholder="Enter the technologies separated by commas">
      <small class="form-text text-muted">Add the technologies used in this project,
separated by commas.</small>
    </div>

    <div class="mb-3">
      <label for="filesInput" class="form-label">Choose Files</label>
      <input type="file" id="filesInput" name="files[]" class="form-control" multiple>
    </div>

    <div class="mb-3">
      <h5>Selected Files: <span id="fileCount">{{ project.project_files.count
}}</span></h5>
      <ul id="fileList" class="list-group">
        {% for file in project.project_files.all %}
          <li class="list-group-item d-flex justify-content-between align-items-center">
            {{ file.clean_name }}
            <a href="{% url 'delete_file' file.id %}" class="btn btn-danger btn-
sm">Delete</a>
          </li>
        {% endfor %}
      </ul>
    </div>

    <button type="submit" class="btn btn-primary text-end">{% if project %}Update{%
else %}Upload{% endif %} Project</button>
  </form>
</div>
{% include 'simplefooter.html' %}


<script>
  document.addEventListener('DOMContentLoaded', function() {
    var projectMode = document.getElementById('projectMode');
    var emailField = document.getElementById('emailField');
    var filesInput = document.getElementById('filesInput');
    var fileList = document.getElementById('fileList');
    var fileCount = document.getElementById('fileCount');
var selectedFiles = [];

function toggleEmailField() {
   if (projectMode.value === 'protected') {
      emailField.style.display = 'block';
   } else {
      emailField.style.display = 'none';
   }
}

// Initially hide the email field
if(projectMode.value === 'protected'){
   emailField.style.display = 'block';
} else {
   emailField.style.display = 'none';
}
projectMode.addEventListener('change', toggleEmailField);

// Function to handle file display for both files and folders
function displayFiles() {
   fileList.innerHTML = '';
   selectedFiles.forEach((file, index) => {
      const li = document.createElement('li');
      li.className = 'list-group-item d-flex justify-content-between align-items-center';
      li.textContent = file.name;

      const deleteButton = document.createElement('button');
      deleteButton.className = 'btn btn-danger btn-sm btn-close';
      deleteButton.addEventListener('click', () => removeFile(index));

      li.appendChild(deleteButton);
      fileList.appendChild(li);
   });

   fileCount.textContent = selectedFiles.length;
}

// Add new files to the existing selected files
function handleFileSelection(input) {
   const files = [...input.files];
   files.forEach(file => {
      if (!selectedFiles.some(f => f.name === file.name && f.size === file.size)) {
         selectedFiles.push(file); // Add unique files
      }
   });

   displayFiles();
}
```

```
        // Remove a file from the list
        function removeFile(index) {
            selectedFiles.splice(index, 1);
            displayFiles();
        }

        // When a user selects files, append them to the existing selection
        filesInput.addEventListener('change', function() {
            handleFileSelection(filesInput);
        });

        // Preserve the selected files when form is submitted
        document.getElementById('project-form').addEventListener('submit', function(e) {
            e.preventDefault();
            const formData = new FormData(this);

            // Append all selected files to the formData
            selectedFiles.forEach(file => {
                formData.append('files[]', file);
            });

            // Submit form via AJAX
            fetch(this.action, {
                method: 'POST',
                body: formData,
            }).then(response => {
                if (response.ok) {
                    // Check if the project exists, indicating it's an update
                    if ("{{ project }}" !== "") { // Replace with appropriate check
                        alert('Project updated successfully!');
                    } else {
                        alert('Project created successfully!');
                    }
                    window.location.href = "{% url 'allprojects' %}";
                } else {
                    alert('Error occurred while saving the project.');
                }
            });
        });
    });
</script>
{% endblock %}
```



Upload Project

Project Name

Project Description

Project Logo

No file chosen

Upload your project logo (PNG, JPG, JPEG).

Mode

Public

Tags

Enter the technologies separated by commas

Add the technologies used in this project, separated by commas.

Choose Files

No file chosen

Selected Files:

FIGURE 5.2.1 UPLOAD PROJECT MODES

5.3 LANDING PAGE:

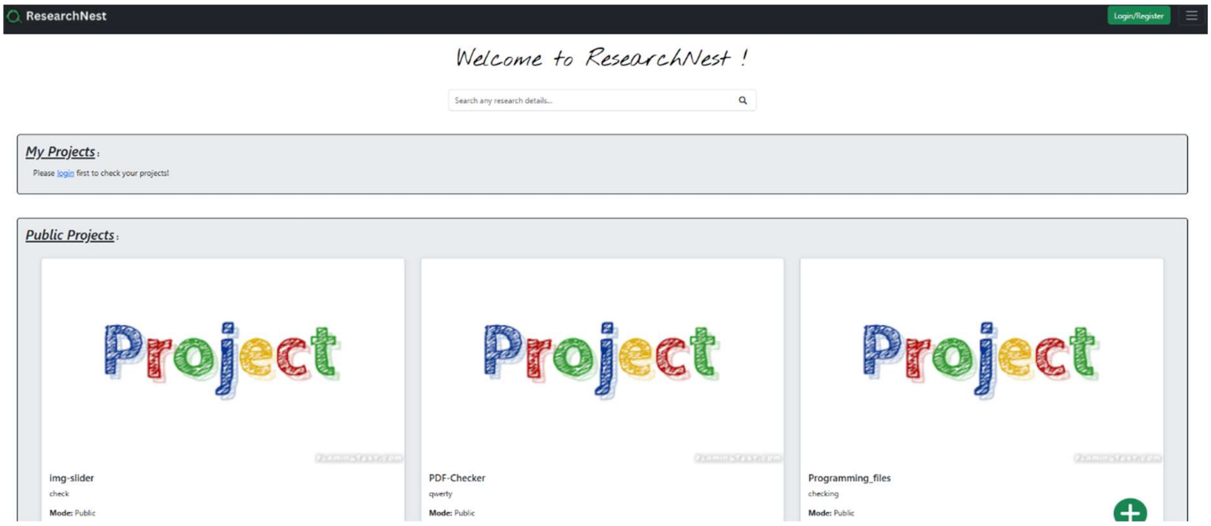
The page is divided into distinct sections, providing a clear separation between personal projects and public projects. The design is clean and simple, focusing on functionality and ease of navigation.

The landing page provides a clear overview of the platform's purpose: managing and sharing research projects. The separation of personal and public projects, the prominent search bar, and the call to action to login/register are well-placed. The design is simple and uncluttered, making it easy for users to understand the platform's functionality.

Code:

```
{% extends 'base.html' %}
{% load static %}
{% block content %}
<div class="container">
        <p class="myff text-center pt-3">Welcome to ResearchNest ! </p>
        <div class="grid">
            <div class="row">
                <div class="col-md-3"></div>
                <div class="col-md-6">
                  <form class="d-flex form-inputs pb-5" method="GET" action="{% url 'search'
%}">
                      <div style="position: relative; width: 100%;">
                          <input class="form-control" type="text" name="q" placeholder="Search any
research details..." aria-label="Search" style="padding-right: 40px;">
                          <button type="submit" style="position: absolute; right: 10px; top: 3%;
transform: translateY(-50%); border: none; background: transparent; padding: 0;">
                              <i class="fa fa-search"></i>
                          </button>
                      </div>
                  </form>
                </div>
                <div class="col-md-3"></div>
            </div>
        </div>
    </div>

    <div class="mx-5 p-3 bg-body-secondary rounded" style="border: solid black 2px;">
      <i style="text-decoration: underline;" class="h3">My Projects</i><span style="font-
weight: bold;"> : </span>
       {% if user.is_authenticated %}
           {% if my_projects %}
              <div class="row m-lg-3 hower_items">
                  {% for project in my_projects %}
                      <div class="col-md-4 mb-3 p-3">
                <a href="{% url 'seeproject' project.id %}" style="text-decoration: none;">
                  <div class="card h-100">
                    {% if project.project_logo %}
                      <img src="{{ project.project_logo.url }}" class="card-img-top"
alt="Project_logo">
                    {% else %}
                      <img src="https://encrypted-
tbn0.gstatic.com/images?q=tbn:ANd9GcQ21J3-WHf675Nz_mvKZ1dFRC50UpsJzpIQlg&s"
class="card-img-top" alt="Project_logo">
                    {% endif %}
                     <div class="card-body">
                       <h5 class="card-title">{{ project.project_name }}</h5>
                       <p class="card-text">{{ project.project_description }}</p>
                       <p><strong>Mode:</strong> {{ project.project_mode|capfirst }}</p>

                       {% if user.id != project.user.id %}
                         <p><strong>Created by:</strong> {{ project.user }}</p>
                       {% endif %}

                       {% if project.get_tags %}
                         <p><strong>Tags:</strong></p>
                         <div class="d-flex flex-wrap align-items-center gap-2">
                           <ul class="list-inline mb-0 d-flex flex-wrap gap-2">
                              {% for tag in project.get_tags|slice:":3" %}
                                <li class="list-inline-item badge bg-primary text-white">{{
tag }}</li>
                              {% endfor %}
                              {% if project.get_tags|length > 3 %}
                                <li class="list-inline-item badge bg-danger text-white">+{{
project.get_tags|length|add:"-3" }} more</li>
                              {% endif %}
                           </ul>
                         </div>
                       {% else %}
                         <p><em>No tags available</em></p>
                       {% endif %}

                     </div>
                  </div>
                </a>
              </div>
           {% endfor %}
           <div><a style="text-decoration: none;" href="{% url 'allprojects' %}"><h4
class="text-center">See all My Projects >>></h4></a></div>
        </div>
      {% else %}
         <p class="m-3">You have no projects to display. <a href="{% url 'createproject'
%}">Create</a> a new project </p>
```

```
        {% endif %}
      {% else %}
        <p class="m-3">Please <a href="{% url 'login' %}">login</a> first to check your
projects!</p>
      {% endif %}
  </div>

      {% if user.is_authenticated %}
        <button class="btn btn-success fixy my-3 rounded-circle" onclick="location.href='{%
url 'createproject' %}';"><i class="fa-solid fa-plus fa-3x"></i></button>
      {% else %}
        <button class="btn btn-success fixy my-3 rounded-circle" onclick="location.href='{%
url 'login' %}';"><i class="fa-solid fa-plus fa-3x"></i></button>
      {% endif %}
{% include 'footer.html' %}
{% endblock %}
```



Please login first to check your projects!

img-slider
check
Mode: Public

PDF-Checker
qwerty
Mode: Public

Programming_files
checking
Mode: Public

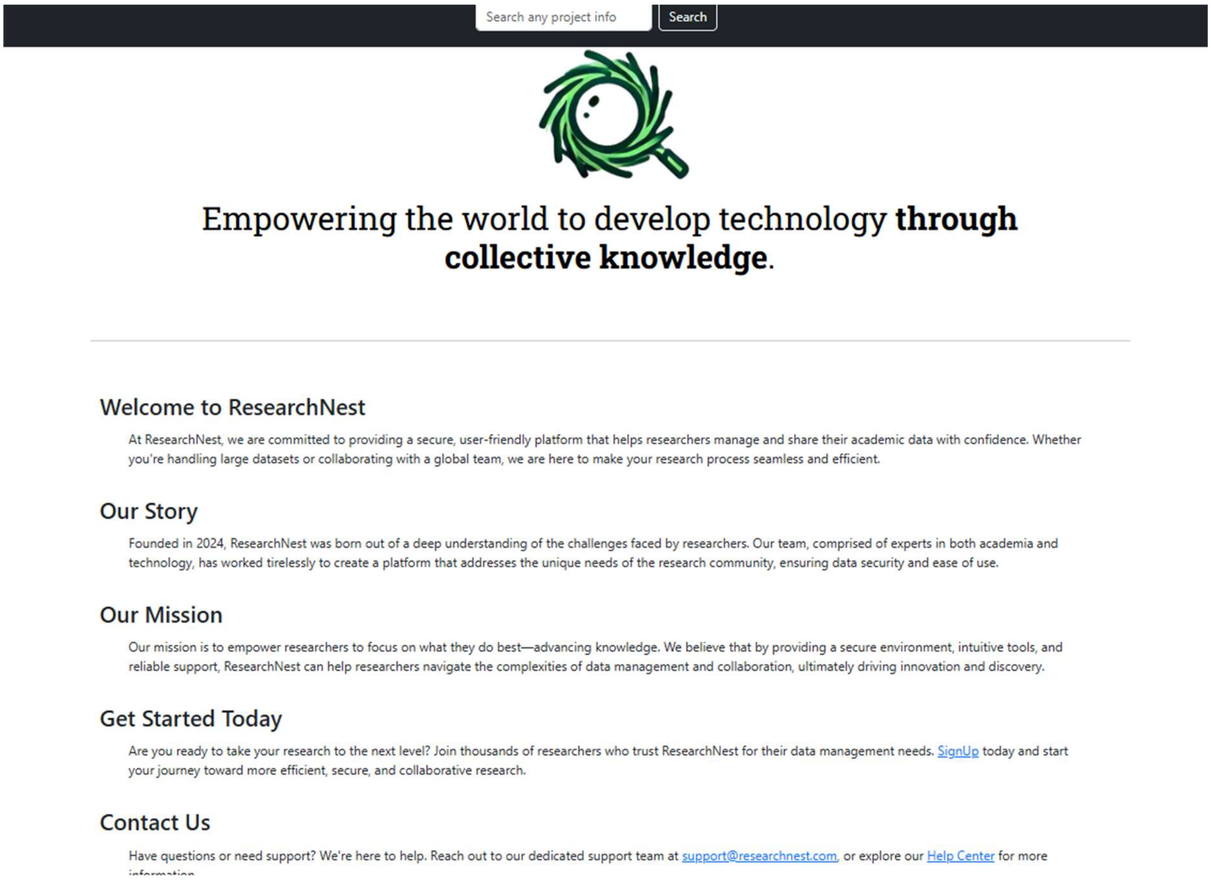
FIGURE 5.3.1 LANDING PAGE

5.3.1 ABOUT US

The About Us page serves as a vital resource, allowing users to gain a comprehensive understanding of our identity and the core objective behind our application. Through this section , we aim to provide clarity on our mission and vision, highlighting the purpose and values that drive our platform’s development.

Code

```
{% extends 'base.html' %}
{% load static %}
{% block content %}
{% include 'navbar.html' %}

<div class="container" style="background-color: #fff;">
   <div class="container p-5 text-center">
      <img class="pt-5 img-fluid" src="{% static 'imgs/logo/logo.png' %}" width="20%"
alt="">
      <!-- <h1 class="myff pt-1">Empowering the world to develop technology
<strong>through collective knowledge.</strong></h1> -->
      <h1 class="robot-slab py-2 mx-2 text-black">Empowering the world to develop
technology <strong>through collective knowledge</strong>.</h1>
   </div>
   <hr class="divider">
   <div class="container py-5">
      <div class="row">
         <h3>Welcome to ResearchNest</h3>
         <p class="px-5 py-1">At ResearchNest, we are committed to providing a secure, user-
friendly platform that helps researchers manage and share their academic data with
confidence. Whether you're handling large datasets or collaborating with a global team, we
are here to make your research process seamless and efficient.</p>
      </div>
      <div class="row mt-3">
         <h3>Our Story</h3>
         <p class="px-5 py-1">Founded in 2024, ResearchNest was born out of a deep
understanding of the challenges faced by researchers. Our team, comprised of experts in both
academia and technology, has worked tirelessly to create a platform that addresses the unique
needs of the research community, ensuring data security and ease of use.</p>
      </div>
      <div class="row mt-3">
         <h3>Our Mission</h3>
         <p class="px-5 py-1">Our mission is to empower researchers to focus on what they
do best—advancing knowledge. We believe that by providing a secure environment, intuitive
tools, and reliable support, ResearchNest can help researchers navigate the complexities of
data management and collaboration, ultimately driving innovation and discovery.</p>
      </div>
{% include 'footer.html' %}
{% endblock %}
```



Empowering the world to develop technology **through collective knowledge**.

Welcome to ResearchNest

At ResearchNest, we are committed to providing a secure, user-friendly platform that helps researchers manage and share their academic data with confidence. Whether you're handling large datasets or collaborating with a global team, we are here to make your research process seamless and efficient.

Our Story

Founded in 2024, ResearchNest was born out of a deep understanding of the challenges faced by researchers. Our team, comprised of experts in both academia and technology, has worked tirelessly to create a platform that addresses the unique needs of the research community, ensuring data security and ease of use.

Our Mission

Our mission is to empower researchers to focus on what they do best—advancing knowledge. We believe that by providing a secure environment, intuitive tools, and reliable support, ResearchNest can help researchers navigate the complexities of data management and collaboration, ultimately driving innovation and discovery.

Get Started Today

Are you ready to take your research to the next level? Join thousands of researchers who trust ResearchNest for their data management needs. SignUp today and start your journey toward more efficient, secure, and collaborative research.

Contact Us

Have questions or need support? We're here to help. Reach out to our dedicated support team at support@researchnest.com, or explore our Help Center for more information

FIGURE 5.3 ABOUT US PAGE

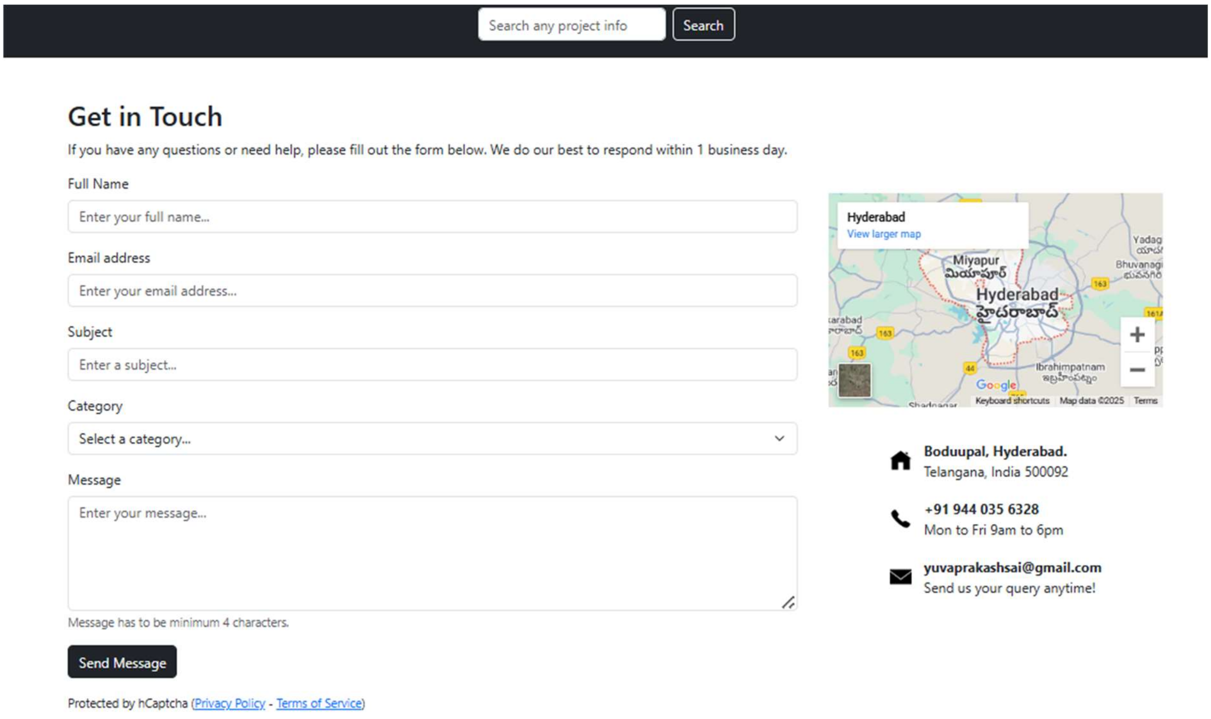
5.3.2 CONTACT PAGE

The "Contact Us" page serves as a central point of communication for users to reach out to the platform administrators or support team. It can be easily accessible and provide clear channels for users to seek assistance, report issues.

Contact us Code

```
{% extends 'base.html' %}
{% load static %}
{% block content %}
{% include 'navbar.html' %}
{% if form.errors %}
   <div class="alert alert-danger">
      <strong>Please fix the following errors:</strong>
      <ul>
         {% for field, errors in form.errors.items %}
            <li>{{ field }}: {{ errors|join:", " }}</li>
         {% endfor %}
      </ul>
   </div>
{% endif %}
<div class="container my-5">
   <h2>Get in Touch</h2>
   <p>If you have any questions or need help, please fill out the form below. We do our best
to respond within 1 business day.</p>
   <div class="row mt-2">
      <div class="col-md-8">
         <form method="POST">
            {% csrf_token %}
            <div class="mb-3">
               <label for="fullName" class="form-label">Full Name</label>
               <input type="text" name="full_name" class="form-control" id="fullName"
placeholder="Enter your full name...">
            </div>
            <div class="mb-3">
               <label for="email" class="form-label">Email address</label>
               <input type="email" name="email" class="form-control" id="email"
placeholder="Enter your email address...">
            </div>
            <div class="mb-3">
               <label for="subject" class="form-label">Subject</label>
               <input type="text" name="subject" class="form-control" id="subject"
placeholder="Enter a subject...">
            </div>
            <div class="mb-3">
               <label for="category" class="form-label">Category</label>
               <select class="form-select" id="category" name="category">
            <option selected>Select a category...</option>
            <option value="general">General Inquiry</option>
            <option value="support">Support</option>
            <option value="feedback">Feedback</option>
          </select>
        </div>
        <div class="mb-3">
          <label for="message" class="form-label">Message</label>
          <textarea name="message" class="form-control" id="message" rows="5"
placeholder="Enter your message..."></textarea>
          <div class="form-text">Message has to be minimum 4 characters.</div>
        </div>
        <button type="submit" class="btn btn-dark">Send Message</button>
      </form>

      <div class="mt-3">
        <small>Protected by hCaptcha (<a href="#">Privacy Policy</a> - <a
href="#">Terms of Service</a>)</small>
      </div>
    </div>
    <!-- <div class="col-md-1"></div> -->
    <div class="col-md-4 mt-4">
      <div class="container rounded">
        <div id="map" style="height: 290px; position: relative; overflow: hidden;">
          <iframe
src="https://www.google.com/maps/embed?pb=!1m18!1m12!1m3!1d243647.25176871577!2
d78.40804555!3d17.4123487!2m3!1f0!2f0!3f0!3m2!1i1024!2i768!4f13.1!3m3!1m2!1s0x3bc
b99daeaebd2c7%3A0xae93b78392bafbc2!2sHyderabad%2C%20Telangana!5e0!3m2!1sen!2s
in!4v1720530015254!5m2!1sen!2sin" width="100%" height="250" style="border:0;"
allowfullscreen="" loading="lazy" referrerpolicy="no-referrer-when-downgrade"></iframe>
        </div>
      </div>
      <div class="container d-flex justify-content-center align-items-center">
        <div class="contact-info">
          <div class="contact-info-item">
            <img src="https://img.icons8.com/ios-filled/50/000000/home.png" alt="home"
width="25" height="25">
            <div>
              <strong>Boduupal, Hyderabad.</strong><br>
              Telangana, India 500092
            </div>
          </div>
          <div class="contact-info-item">
            <img src="https://img.icons8.com/ios-filled/50/000000/phone.png"
alt="phone" width="25" height="25">
            <div>
              <strong>+91 944 035 6328</strong><br>
              Mon to Fri 9am to 6pm
```

```
                        </div>
                    </div>
                    <div class="contact-info-item">
                        <img
src="https://img.icons8.com/?size=100&id=12623&format=png&color=000000" alt="email"
width="25" height="25">
                        <div>
                            <strong>yuvaprakashsai@gmail.com</strong><br>
                            Send us your query anytime!
                        </div>
                    </div>
                </div>
            </div>
        </div>
    </div>
</div>
{% include 'simplefooter.html' %}
{% endblock %}
```



Get in Touch

If you have any questions or need help, please fill out the form below. We do our best to respond within 1 business day.

Full Name

Enter your full name...

Email address

Enter your email address...

Subject

Enter a subject...

Category

Select a category...

Message

Enter your message...

Message has to be minimum 4 characters.

Protected by hCaptcha (Privacy Policy - Terms of Service)

Boduupal, Hyderabad.
Telangana, India 500092

+91 944 035 6328
Mon to Fri 9am to 6pm

yuvaprakashsai@gmail.com
Send us your query anytime!

FIGURE 5.3.3 CONTACT US PAGE

5.4 User Dashboard

The User Dashboard in the ResearchNest platform serves as a central hub for users to manage their research projects efficiently. It provides features such as creating new projects, viewing public projects, and managing personal project details. Additionally, it offers streamlined navigation through categories, tags, and a project planner for better organization. The dashboard ensures an intuitive experience with easy access to profile management, client stories, and contact information.

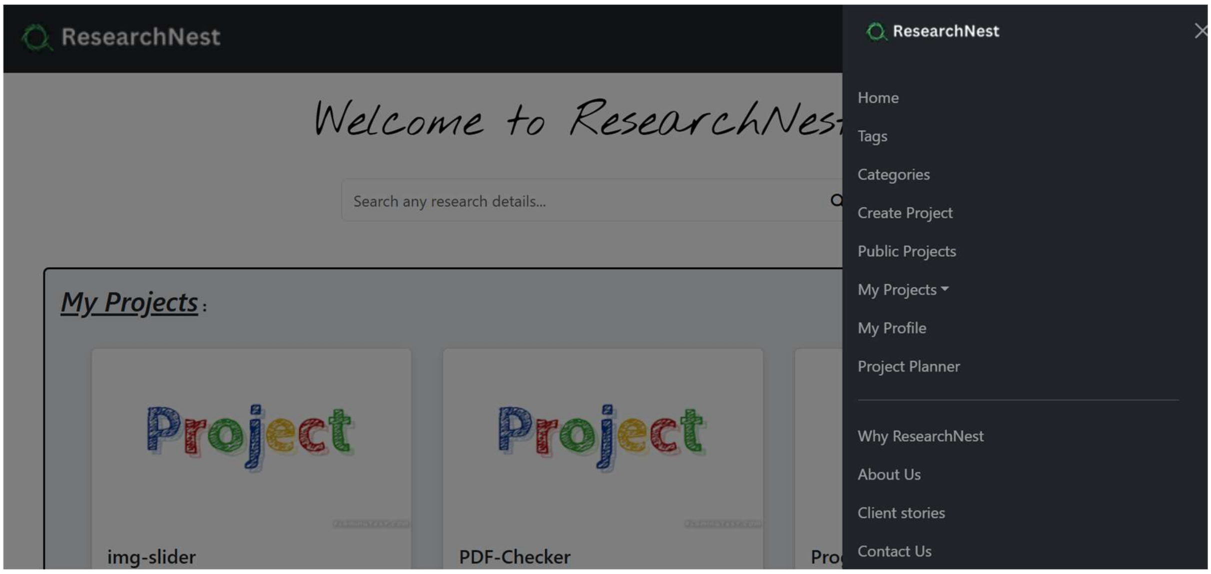


FIGURE 5.4.1 User Dashboard

5.5 Filters

By applying filters, users can efficiently sort through projects and find those aligned with their interests or queries. This functionality enhances the platform's usability, ensuring easier navigation with similar research topics or themes.

5.5.1 File Categories

The File Categories feature in ResearchNest allows users to efficiently organize and access their files based on predefined categories such as Images, Documents, Spreadsheets, Text Files, Programming Files, and Others.

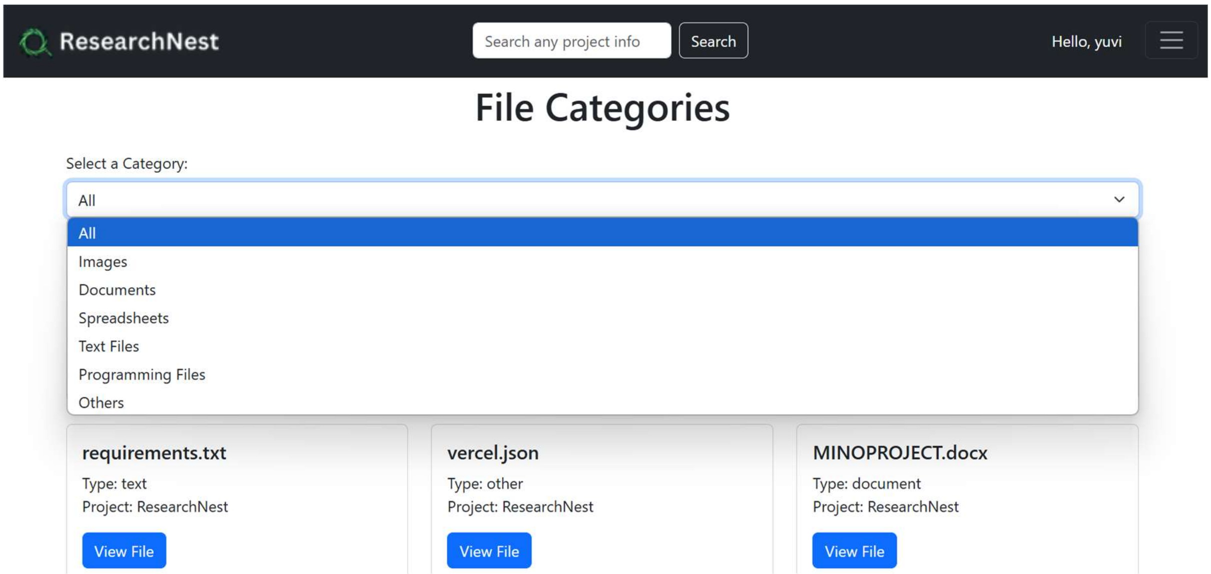
This functionality enhances user experience by enabling quick filtering and retrieval of files related to their projects.

Users can view specific files within each category, ensuring a structured and streamlined approach to managing project resources.

Categories Code

```
{% extends 'base.html' %}
{% load static %}
{% block content %}
{% include 'navbar.html' %}
<div class="container my-5">
  <h1 class="text-center mb-4">File Categories</h1>
  <div class="mb-4">
        <option value="All" {% if selected_category == 'All' %}selected{% endif
%}>All</option>
        {% for category in categories %}
          <option value="{{ category }}" {% if selected_category == category %}selected{%
endif %}>
              {{ category }}
          </option>
        {% endfor %}
     </select>
  </div>
          <div class="card mb-4">
              <div class="card-body">
                 <h5 class="card-title">{{ file.original_filename }}</h5>
                 <p class="card-text">Type: {{ file.file_type }} <br> Project: {{
file.project.project_name }}</p>
                 <a href="{{ file.get_file_url }}" target="_blank" class="btn btn-
primary">View File</a>
              </div>
```

```
                </div>
            </div>
        {% empty %}
            <div class="container d-flex justify-content-center align-items-center">
                <div class="col-12 text-center">
                    <img src="https://cdn.iconscout.com/icon/free/png-256/free-donnees-introuvables-1965034-1662569.png" alt="No Files" class="img-fluid">
                    <p class="text-muted fw-bolder fs-4">No files available in this category.</p>
                </div>
            </div>
        {% endfor %}
    </div>
</div>

<script>
    document.getElementById('category-select').addEventListener('change', function() {
        const selectedCategory = this.value;
        const url = new URL(window.location.href);
        url.searchParams.set('category', selectedCategory);
        window.location.href = url.toString();
    });
</script>
{% include 'simplefooter.html' %}
{% endblock %}
```



requirements.txt
Type: text
Project: ResearchNest

vercel.json
Type: other
Project: ResearchNest

MINOPROJECT.docx
Type: document
Project: ResearchNest

FIGURE 5.5.1 File Categories

5.5.2 Filter by Tags

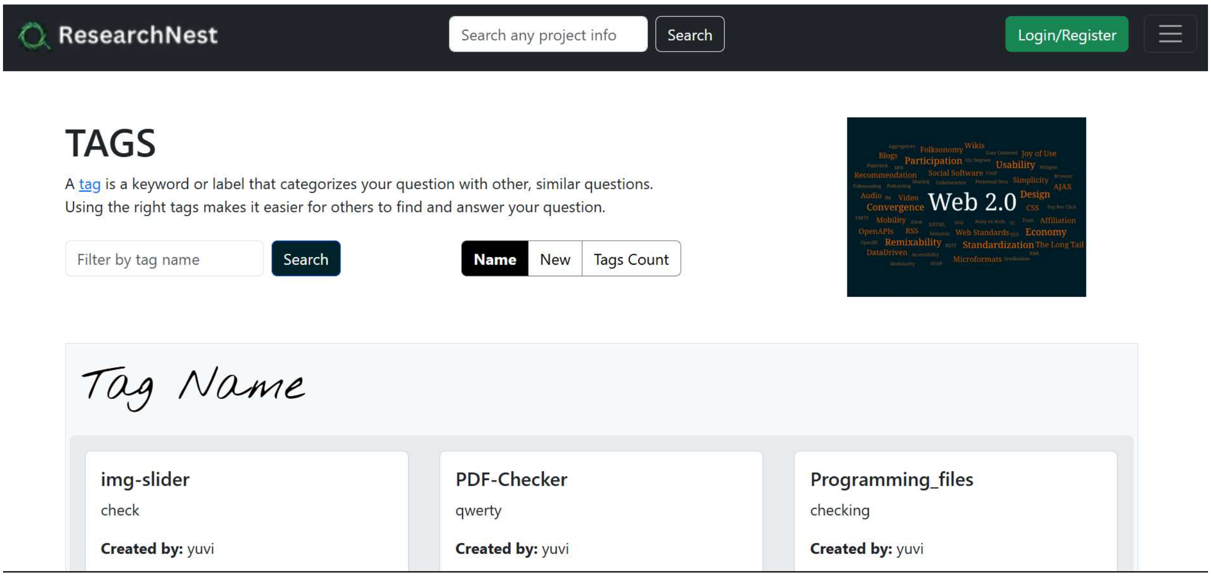
The "Filter by Tags" feature in ResearchNest allows users to search for projects using tags that categorize them by topic or functionality. Users can type a specific tag name into the search bar to find relevant projects or explore available tags based on popularity, recency, or count. This feature ensures efficient project discovery and fosters collaboration by grouping projects under shared thematic keywords.

Tags Code

```
{% extends 'base.html' %}
{% load static %}
{% block content %}
{% include 'navbar.html' %}
<div class="container pb-3">
   <div class="row py-5">
      <div class="col-md-7">
         <h1>TAGS</h1>
         <p>A <a href="https://en.wikipedia.org/wiki/Tag_(metadata)"
target="_blank">tag</a> is a keyword or label that categorizes your question with other,
similar questions. <br> Using the right tags makes it easier for others to find and answer your
question.</p>
         </div>
      </div>
      <div class="col-md-1"></div>
      <div class="col-md-4 text-center">
         <img src="{% static 'imgs/tags.png' %}" alt="" width="70%">
      </div>
    </div>
    <div class="container p-3 border bg-light">
      <h3 class="myff">
         {% if query%}
         Results for {{ query }}
         {% else %}
            Tag Name
         {% endif %}
      </h3>
      <div class="row tags_filtered bg-body-secondary rounded">
         {% if projects %}
            {% for project in projects %}
            <div class="col-md-4 mb-3 p-3">
               <a href="{% url 'seeproject' project.id %}" style="text-decoration: none;">
                  <div class="card h-100">
                     <div class="card-body">
                        <h5 class="card-title">{{ project.project_name }}</h5>
```

```
                <p class="card-text">{{ project.project_description }}</p>
                <p><strong>Created by:</strong> {{ project.user }}</p>
                {% if project.get_tags %}
                  <p><strong>Tags:</strong></p>
                  <ul>
                    {% for tag in project.get_tags|slice:":3" %}
                      <li>{{ tag }}</li>
                    {% endfor %}
                  </ul>
                  {% if project.get_tags|length > 3 %}
                    <p>+{{ project.get_tags|length|add:"-3" }} more</p>
                  {% endif %}
                {% else %}
                  <p><em>No tags available</em></p>
                {% endif %}
              </div>
            </div>
          </a>
        </div>
        {% endfor %}
      {% else %}
      <h4>No projects on the given tag. Please try another tags!</h4>
      {% endif %}
    </div>
  </div>
</div>
<script>
  function filterTags(button) {
    var buttons = document.querySelectorAll('.btn-group .btn');
    buttons.forEach(function(btn) {
      btn.classList.remove('active');
    });
    var filterType = button.getAttribute('data-filter');

    // Make an AJAX request to fetch filtered tags
    fetch(`/tags/filter?type=${filterType}`)
    .then(response => response.json())
    .then(data => {
      const tagsContainer = document.querySelector('.tags_filtered');
      tagsContainer.innerHTML = '';
          const projectCard = `
          <div class="col-md-4 mb-3 p-3">
            <a href="/seeproject/${project.id}" style="text-decoration: none;">
              <div class="card h-100">
                <div class="card-body">
                  <h5 class="card-title">${project.project_name}</h5>
                  <p class="card-text">${project.project_description}</p>
                  <p><strong>Created by:</strong> ${project.user}</p>
```

```
                                    ${project.tags.length > 0 ? `
                                        <p><strong>Tags:</strong></p>
                                        <ul>${tagsList}</ul>
                                        ${remainingTags}
                                    ` : `<p><em>No tags available</em></p>`}
                                </div>
                            </div>
                        </a>
                    </div>`;
                    tagsContainer.innerHTML += projectCard;
                });
            }
        })
    }
</script>
{% include 'footer.html' %}
{% endblock %}
```



TAGS

A tag is a keyword or label that categorizes your question with other, similar questions. Using the right tags makes it easier for others to find and answer your question.

Tag Name

img-slider
check
Created by: yuvi

PDF-Checker
qwerty
Created by: yuvi

Programming_files
checking
Created by: yuvi

FIGURE 5.5.2 Filter by Tag

6.TESTING

6.1 TESTING STRATEGIES

Testing strategies for a secure research data management app should focus on ensuring data integrity, security, usability, and performance. Begin with functional testing to verify that all features, such as user authentication, role-based access control, and data upload/download workflows, work as intended. Next, conduct security testing, including penetration testing, vulnerability assessments, and compliance checks with standards like GDPR or HIPAA, to identify and mitigate risks to sensitive research data. Perform load and stress testing to ensure the system can handle high volumes of concurrent users and data without performance degradation. Usability testing is essential to validate that researchers and administrators can navigate the app intuitively, minimizing the learning curve. Incorporate compatibility testing across various devices, operating systems, and browsers to guarantee accessibility. Finally, implement regression testing to ensure new updates or fixes do not introduce new issues, and automate key test cases where feasible to streamline ongoing maintenance and quality assurance.

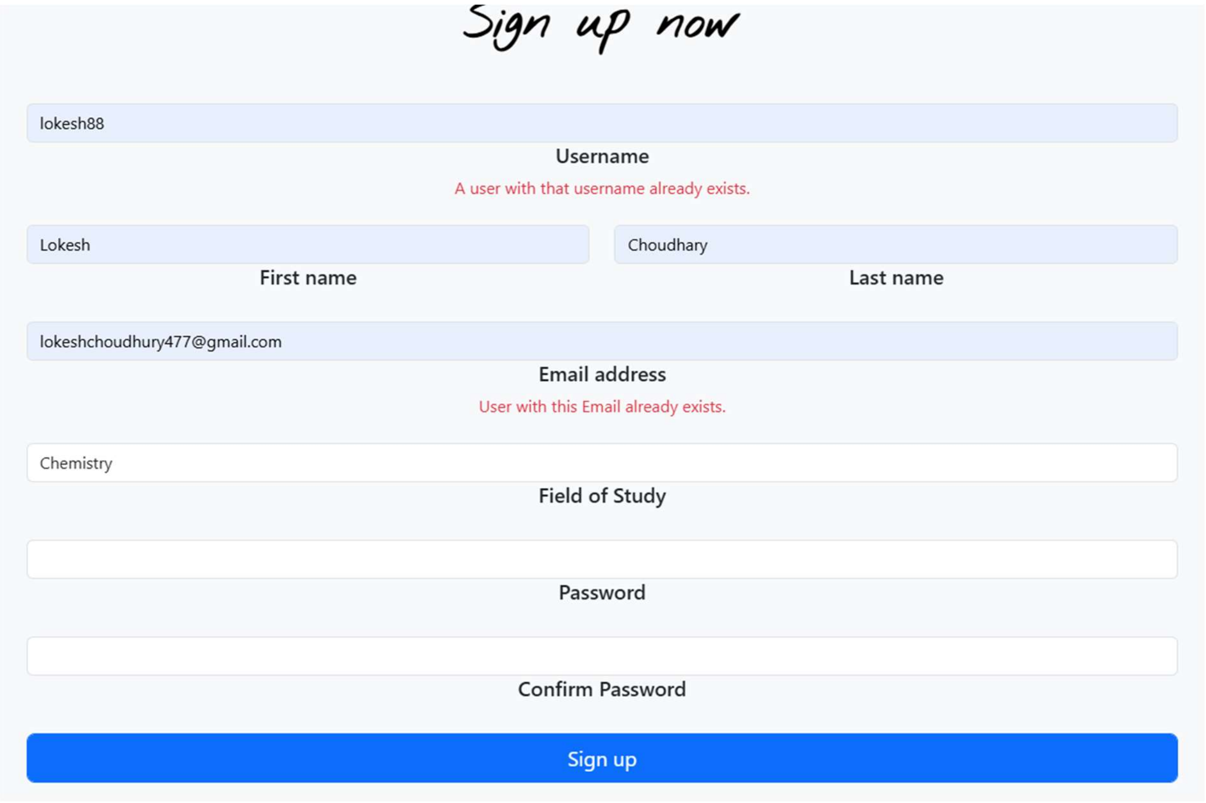
To further enhance the testing strategy for the secure research data management app, incorporate **data integrity testing** to ensure that data remains unaltered during storage, retrieval, and transmission processes. Implement **encryption validation testing** to verify that sensitive data is encrypted both at rest and in transit, using robust encryption algorithms. Conduct **access control testing** to confirm that users only have access to data and functionality based on their assigned roles and permissions.

Engage in **data recovery testing** to evaluate the app's ability to restore data accurately from backups in the event of data loss or corruption. Perform **audit trail testing** to verify the logging of user activities, ensuring transparency and accountability for all operations involving sensitive data. Utilize **cross-site scripting (XSS)** and **SQL injection testing** to identify and mitigate common web application vulnerabilities.
Introduce **end-to-end testing** to assess the app’s functionality in a real-world scenario, including interactions with external systems such as APIs or cloud storage services. Execute **compliance testing** to ensure the app adheres to relevant legal and ethical standards for research data management, such as ISO 27001 or local data protection laws. Conduct **user acceptance testing (UAT)** with actual researchers and stakeholders to ensure the app meets practical needs and expectations. Finally, establish a continuous integration and continuous deployment (CI/CD) pipeline with automated tests to maintain high-quality standards as the app evolves.

6.2 SAMPLE TEST CASES AND RESULTS

TEST CASE 1:

When a user attempts to register usinf an email that is already in use, an error message will be displayed indicating the email is already registered.



Sign up now

Username: lokesh88

A user with that username already exists.

First name: Lokesh

Last name: Choudhary

Email address: lokeshchoudhury477@gmail.com

User with this Email already exists.

Field of Study: Chemistry

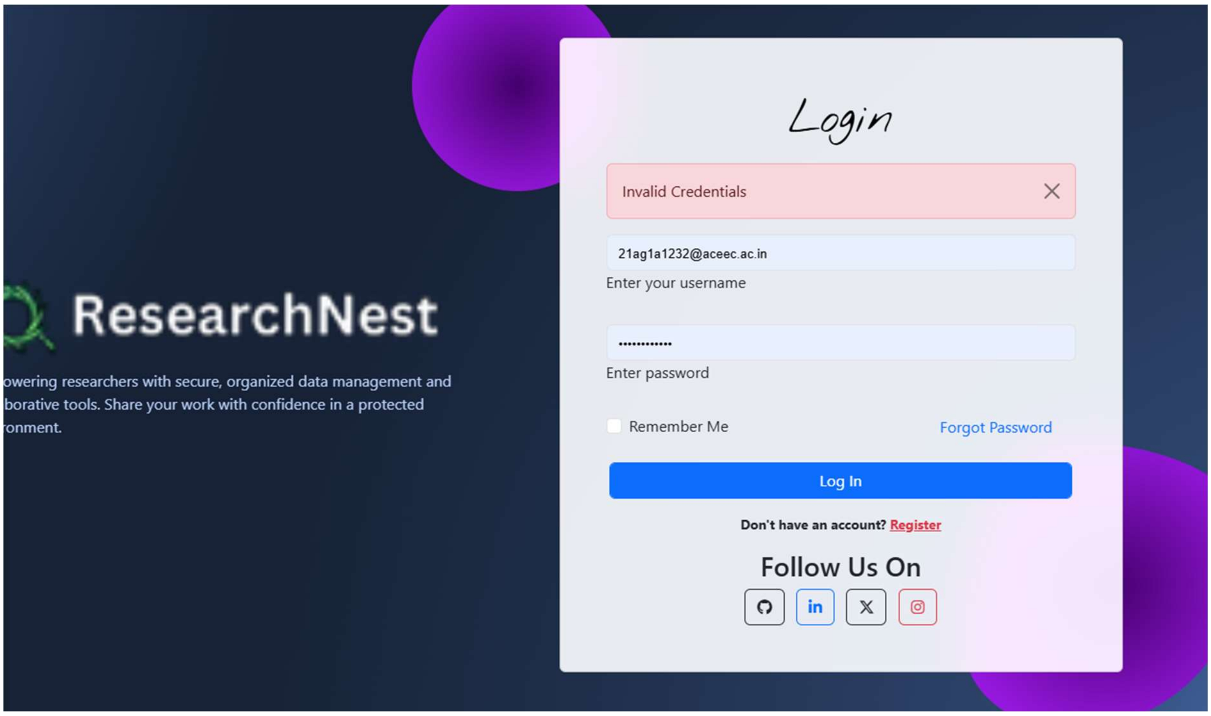
Password:

Confirm Password:

Fig 6.2.1 Test case 1

TEST CASE 2:

If invalid login details are provided , the system will prompt an error message, signaling The login attempt was unsuccessful.



ResearchNest

owering researchers with secure, organized data management and borative tools. Share your work with confidence in a protected ronment.

Login

Invalid Credentials

21ag1a1232@aceec.ac.in

Enter your username

•••••••••••

Enter password

□ Remember Me

Forgot Password

Log In

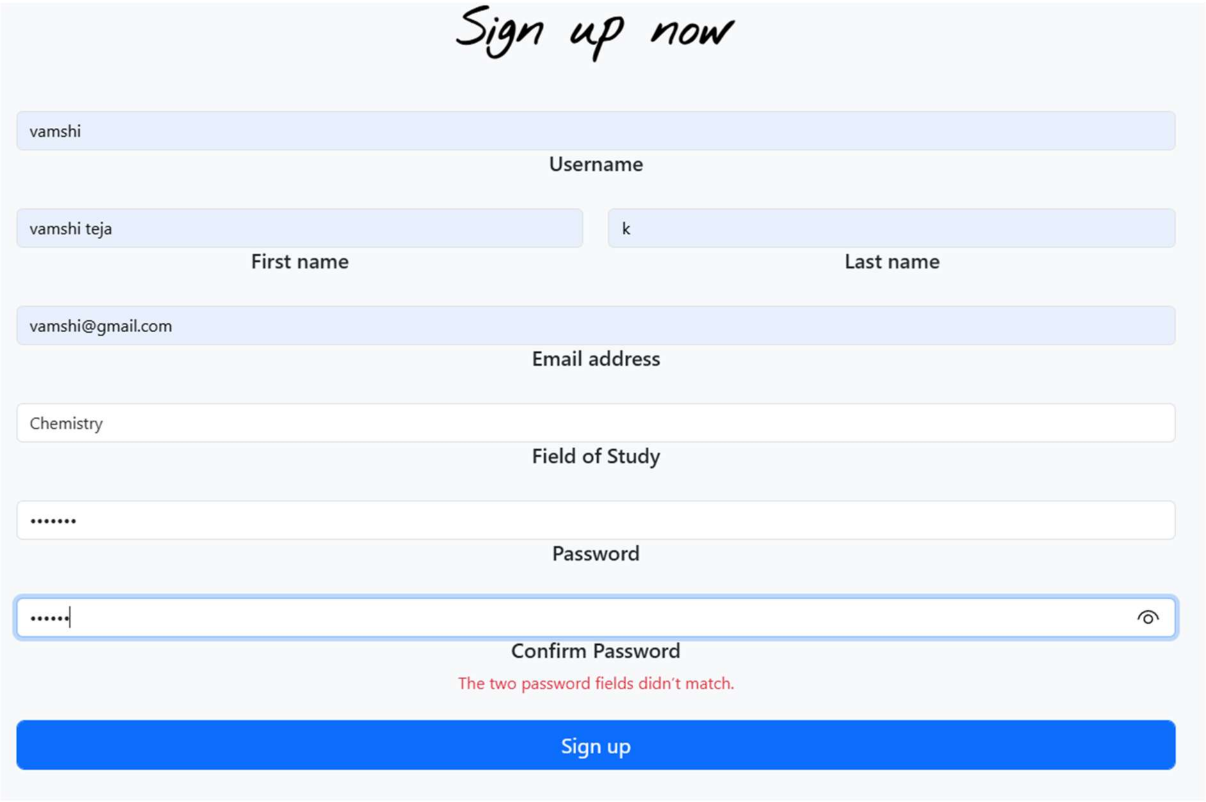
Don't have an account? Register

Follow Us On

Figure 6.2.2 Test case 2

TEST CASE 3:

During registration, if the password and confirm password fields do not match, the system will typically display an error message prompting the user to ensure both password match.



Sign up now

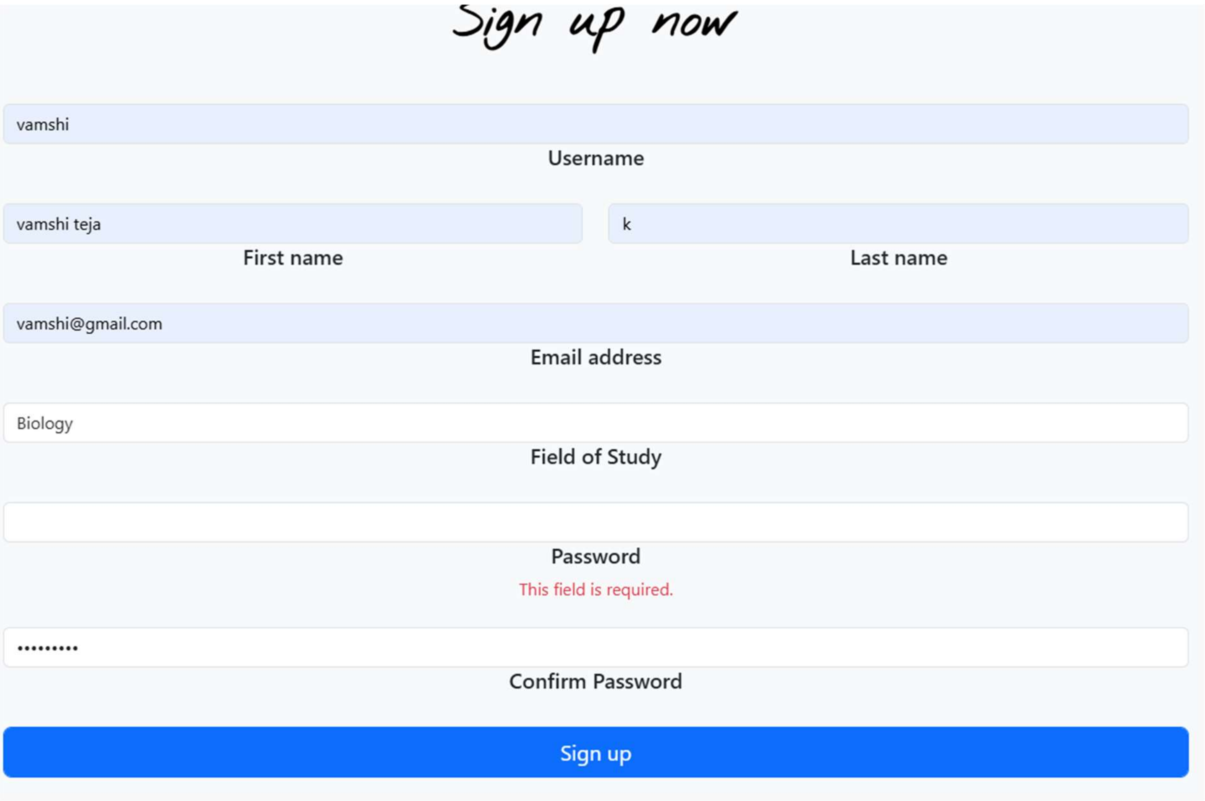
Username	vamshi
First name	vamshi teja
Last name	k
Email address	vamshi@gmail.com
Field of Study	Chemistry
Password	•••••••
Confirm Password	••••••

The two password fields didn't match.

Figure 6.2.3 Test case 3

TEST CASE 4:

If any of the required fields are left blank during a submission, the system will generate an error message, reminding the user to fill in all mandatory fields.



Sign up now

Username: vamshi

First name: vamshi teja

Last name: k

Email address: vamshi@gmail.com

Field of Study: Biology

Password:

This field is required.

Confirm Password: •••••••••

Figure 6.2.4 Test case 4

7. CONCLUSION

In conclusion, the secure research data management app represents a critical solution for safeguarding sensitive research data while streamlining collaboration and compliance. By implementing robust security measures, such as encryption, access controls, and audit trails, the app ensures data confidentiality, integrity, and accountability.
Through comprehensive testing strategies, including functional, security, performance, and usability testing, the app achieves high reliability and user satisfaction. Moreover, its adherence to regulatory standards like GDPR or HIPAA ensures legal compliance, fostering trust among researchers and stakeholders. By addressing the unique challenges of managing research data in a digital environment, the app empowers researchers to focus on innovation while minimizing risks, ultimately supporting the advancement of science and technology in a secure and efficient manner.

The secure research data management app provides a comprehensive platform that balances the need for robust security with seamless usability, ensuring that researchers can manage their data with confidence and efficiency.

The app's strong encryption protocols, role-based access controls, and audit capabilities protect sensitive data from unauthorized access and breaches. Rigorous testing strategies validate its functionality, performance, and resilience, ensuring it can meet the demands of high-volume, collaborative research environments.

Additionally, its scalability and compatibility across devices and operating systems enhance accessibility, while compliance with legal and ethical standards solidifies trust and accountability. This app not only safeguards valuable research data but also fosters innovation by enabling secure sharing, version control, and streamlined workflows, positioning it as an indispensable tool for modern research endeavors.

8. FUTURE ENHANCEMENTS

Future enhancements for the secure research data management app could focus on expanding functionality, improving user experience, and integrating advanced technologies to stay ahead of evolving security and research needs. Key areas for enhancement include

Blockchain Integration: Leverage blockchain technology to enhance data integrity and transparency through immutable records and decentralized storage for critical datasets.

Interoperability with Other Systems: Develop APIs and integrations to seamlessly connect with popular research tools, cloud platforms, and institutional repositories, enabling a more unified ecosystem.

Mobile Optimization: Expand functionality and usability for mobile devices, ensuring researchers can securely access and manage data on-the-go without compromising security.

Collaborative Features: Add advanced tools for real-time collaboration, such as shared workspaces, in-app communication, and customizable workflows tailored to specific research needs.

Improved Usability and Accessibility: Incorporate adaptive interfaces and assistive technologies to ensure the app meets the needs of users with disabilities and those working in diverse environments.

Data Visualization Tools: Offer built-in visualization tools that help researchers analyze and present data more effectively, supporting quicker decision-making and impactful reporting.

Regulatory Adaptability: Regularly update the app to comply with emerging data protection laws and standards, ensuring it remains legally compliant across regions and sectors.

Scalability for Big Data: Enhance infrastructure to handle larger datasets efficiently, enabling compatibility with high-performance computing (HPC) systems for data-intensive research projects.

Globalization and Localization: Expand language support and localization features to cater to international research teams and ensure cultural relevance.

By implementing these enhancements, the app can continue to evolve as a future-ready, indispensable tool that meets the growing complexities of secure research data management.

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