Digital Archiving of Cultural Data

Project Synopsis Report

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1. ABSTRACT

Preserving cultural heritage in the digital era is a pressing global concern. *Archive Mosaic* is a secure, scalable, and user-friendly web-based application developed to digitally archive, organize, and share culturally significant artifacts—such as traditional dance forms, music, artworks, and manuscripts. This system is tailored for use by museums, cultural institutions, researchers, and preservation initiatives to ensure that these valuable assets are not lost to time and remain accessible for future generations.

The platform utilizes a robust technology stack including **Flask (Python)** for backend development, **MongoDB with GridFS** for file and metadata storage, and **Firebase Authentication** for secure, role-based user access control. Users can upload images, videos, or PDF files, each accompanied by detailed metadata fields such as title, description, date, language, region, category, and tags. Admins are granted comprehensive oversight capabilities, including user management, content moderation, and role assignment.

One of the key innovations in *Archive Mosaic* is the integration of the **Meta-LLaMA Vision-Free** multimodal AI model via the Together API, which automatically generates image captions. This feature enhances accessibility and reduces the manual effort involved in metadata creation. The platform also includes a dynamic Gallery section with filtering capabilities for efficient browsing of cultural assets.

The project contributes a modern solution to the ongoing need for cultural preservation by combining secure digital archiving with intelligent automation. Through this, *Archive Mosaic* serves as both a technological and cultural bridge—ensuring heritage documentation is both structured and sustainable.

2. INTRODUCTION

Cultural heritage represents the collective memory and identity of societies across the globe. From classical dance forms and regional music to traditional artworks, manuscripts, and folklore, these cultural artifacts are vital in preserving the historical, artistic, and social essence of communities. However, much of this invaluable content is either undocumented, stored in fragile physical formats, or scattered across unstructured systems, making it vulnerable to loss, degradation, and inaccessibility. In response to this urgent need for preservation, digitization offers a powerful solution—and this is where our project, **Archive Mosaic**, comes into play.

Archive Mosaic is a modern web-based application designed to serve as a digital archive for preserving, categorizing, and accessing culturally significant materials. The platform empowers users—such as researchers, cultural institutions, students, and the general public—to upload images, videos, and PDFs related to cultural heritage. Each uploaded file is accompanied by rich metadata, including the title, description, language, state/region, date, category, and tags, ensuring that content is not only stored but also meaningfully organized for long-term use.

The platform is built using a robust and secure technology stack. The backend is developed with **Flask (Python)**, and **MongoDB with GridFS** is used to store both metadata and file contents. **Firebase Authentication** ensures that users can securely sign up, log in, and manage their content, with role-based access that distinguishes between regular users and administrators. Admins have extended privileges to manage users, review uploads, and maintain platform integrity.

One of the most innovative aspects of Archive Mosaic is the integration of **Meta-LLaMA Vision-Free**, a multimodal AI model accessed via the Together API. This model automatically generates image captions during uploads, helping users describe images accurately while improving accessibility and reducing manual work. The system also includes a responsive **Gallery** section where users can browse all uploaded artifacts, and utilize filters for efficient discovery based on metadata fields.

In essence, Archive Mosaic is not just a storage tool—it is a digital preservation ecosystem that bridges tradition and technology. It supports the mission of safeguarding cultural heritage through intelligent archiving and promotes inclusivity by making this knowledge accessible to all. The project demonstrates how thoughtful technology design can contribute meaningfully to cultural conservation and education in the digital age.

3. MOTIVATION

In a rapidly evolving digital world, the preservation of cultural heritage is facing unprecedented challenges. Ancient manuscripts are decaying, traditional art forms are disappearing with the aging of practitioners, and invaluable folklore is at risk of being forgotten due to a lack of structured documentation. Many communities possess rich cultural assets that are either inaccessible, scattered in physical forms, or inadequately archived in outdated systems. This urgent reality has highlighted a critical need: a reliable, accessible, and scalable digital platform to preserve, organize, and share cultural artifacts for generations to come.

Our motivation behind creating **Archive Mosaic** stems from this very concern. We believe that cultural heritage is not just a relic of the past—it is a living, evolving expression of identity, creativity, and history. With the advancement of digital technologies, we now have the tools to protect these valuable resources from neglect and destruction. Archive Mosaic aims to bridge the gap between tradition and technology by providing a secure platform where users, communities, researchers, and institutions can contribute to the collective memory of our cultures.

Additionally, many existing archival solutions are either expensive, complex, or lack user-friendliness—especially for grassroots contributors like folk artists, students, or independent researchers. Our platform prioritizes **accessibility and ease of use**, allowing users to upload images, videos, and documents with just a few clicks, and enrich them with structured metadata. This metadata not only makes the archive searchable and organized but also empowers users to contextualize content for better understanding and discovery.

Another strong motivational factor was our desire to reduce the manual burden of content curation. With the integration of **AI-based image captioning** through the Meta-LLaMA Vision-Free model, users can generate accurate image descriptions automatically. This promotes inclusivity, supports users with limited digital literacy, and accelerates the archival process without compromising quality.

Furthermore, the inclusion of **role-based access control** ensures that cultural content is managed responsibly—allowing everyday users to contribute while giving admins the oversight needed to maintain the platform's integrity. By ensuring content authenticity, managing inappropriate uploads, and supporting data correction, we provide a reliable and respectful space for cultural preservation.

Ultimately, our project is driven by the vision of a future where cultural knowledge is not lost but passed on digitally—securely and intelligently. With Archive Mosaic, we hope to empower communities to tell their stories, preserve their legacies, and share their cultural wealth with the world.

4. LITERATURE REVIEW

Preserving cultural heritage through digital platforms has become a growing area of interest for governments, researchers, and organizations worldwide. The transition from traditional, physical archiving to digital preservation marks a significant advancement in how historical and cultural information is stored, shared, and analyzed. This literature review explores key studies and projects related to digital archiving, metadata standards, AI integration in cultural systems, and open-access digital repositories—providing a theoretical foundation for the development of *Archive Mosaic*.

4.1 Digital Preservation of Cultural Heritage:

The importance of digitally preserving cultural heritage has been recognized by organizations such as UNESCO and ICOMOS (International Council on Monuments and Sites). According to the *UNESCO Charter on the Preservation of Digital Heritage (2003)*, digital heritage includes texts, images, audio, and video that are digitally born or converted. The charter emphasizes accessibility, authenticity, and the need for international cooperation in maintaining such archives.

Projects like Europeana and the Digital Public Library of America (DPLA) have shown the immense value of creating centralized, searchable digital libraries that preserve and make cultural artifacts accessible to a global audience. These initiatives provide access to millions of items, from paintings and books to films and music recordings. However, many of these platforms are large-scale and often complex, making them difficult to replicate in community-level or educational environments. *Archive Mosaic* seeks to address this gap by providing a more accessible and user-friendly platform.

4.2 Metadata Standards and File Management:

Metadata plays a crucial role in digital archiving. Standards like Dublin Core, MARC21, and MODS offer structured ways to describe cultural content, including details such as title, creator, subject, date, language, and rights. Dublin Core, in particular, is widely adopted due to its simplicity and extensibility.

Studies like those by Greenberg (2005) highlight that the quality of metadata directly influences discoverability and usability. In a cultural context, metadata also aids in contextualizing artifacts—linking them to regions, languages, traditions, and historical timelines. In Archive Mosaic, we follow a simplified metadata schema inspired by Dublin Core, with fields such as title, description, language, category, state, and tags. This strikes a balance between ease of use and detailed classification.

In terms of file management, MongoDB with GridFS has proven effective for storing large files while retaining fast access and scalability. GridFS breaks files into chunks and stores them across two collections (`fs.files` and `fs.chunks`), allowing efficient querying and retrieval. This approach is particularly suited for diverse file types—images, PDFs, and videos—that make up digital cultural archives.

4.3 AI in Cultural Heritage Systems:

Recent developments have introduced artificial intelligence (AI) into digital archiving, particularly for image recognition and automatic tagging. The study by Manovich (2015) on "Cultural Analytics" shows how computational techniques can help in interpreting large cultural datasets. AI can assist in captioning artworks, clustering similar content, or even generating descriptions for visually impaired users.

Tools like Google Cloud Vision API and Clarifai have been used in museums and art galleries to automate content tagging. In our project, we integrate Meta-LLaMA/Vision-Free, a multimodal language-vision model, via the Together API. It helps users generate descriptive titles and captions for uploaded images, making the metadata richer while reducing manual effort.8

This AI integration also supports the concept of "intelligent archiving", where the system not only stores data but adds contextual value to it. Moreover, these AI-generated captions make the platform more inclusive and accessible, especially for users who may not have in-depth knowledge about the artifact they are uploading.

4.4 Role-Based Access and Security in Digital Repositories:

Secure access to archival content is essential to maintain authenticity and trust. Studies in digital library management (such as those conducted by OCLC and the Digital Library Federation) emphasize role-based access as a key component in safeguarding data. Administrators must be able to manage user permissions, correct or remove misinformation, and ensure adherence to platform guidelines.

In *Archive Mosaic*, **Firebase Authentication** and **JSON Web Tokens (JWT)** are used to manage user sessions securely. Role-based access enables a clear distinction between standard users (who can upload and manage their content) and admins (who can oversee the entire platform). This system architecture aligns with best practices in digital system security while preserving collaborative contributions.

4.5 Community Contributions and Localized Archives:

Several studies, including *Gilliland-Swetland (2000)*, emphasize the value of community archiving, where local populations and individuals are active contributors. Platforms like **Mukurtu CMS** and **CollectiveAccess** are designed for indigenous and community-driven digital archiving, focusing on culturally respectful protocols.

Inspired by this, *Archive Mosaic* encourages contributions from students, local artists, and regional institutions. By offering a simple interface and filterable gallery, it promotes the discovery and sharing of underrepresented cultural expressions.

In conclusion, the development of Archive Mosaic is built upon a strong foundation of research and practice in digital archiving, AI-assisted metadata generation, secure access control, and community engagement. While inspired by global-scale repositories and academic findings, our platform is tailored for a more accessible, modular, and intelligent experience—bringing the power of digital preservation to a wider audience.

5. GAP ANALYSIS

Digital cultural archiving platforms have grown in popularity, yet several crucial gaps remain, particularly in accessibility, AI support, metadata management, and regional inclusivity. *Archive Mosaic* aims to bridge these deficiencies through thoughtful design and modern technologies.

5.1 Limited Accessibility for General Users: Most existing platforms cater to large institutions and offer limited contribution opportunities to individuals or grassroots communities. This restricts the diversity of archived content.

→Archive Mosaic provides a community-driven upload system, allowing individuals and small organizations to easily contribute content using a simple, guided interface.

5.2 Manual Metadata Entry is Time-Consuming: Current systems rely heavily on user-input metadata, often resulting in inconsistent or incomplete descriptions due to lack of expertise or time.

→Our platform integrates the LLaMA Vision AI model to auto-generate image captions and descriptions, streamlining metadata entry and ensuring quality.

5.3 Insufficient Role-Based Access and Security: Many platforms lack robust user management, with either overly strict admin control or insecure open access. They often miss advanced session management features.

→Archive Mosaic incorporates Firebase Authentication with role-based access (user/admin) and JWT for secure session control, balancing access with security.

5.4 Poor Browsing and Filtering Experience: Inadequate search and filtering capabilities in many archiving platforms make content discovery difficult and unintuitive, especially for large data sets.

→Our Gallery module enables filtering by tags, categories, language, and region, making content browsing efficient and user-friendly.

5.5 Neglect of Regional Cultural Diversity: Existing archives often focus on well-known artifacts, excluding localized or lesser-known traditions from underrepresented areas.
→ The platform supports metadata fields for state, language, and category—encouraging inclusion of culturally rich, diverse, and regional contributions.

5.6 No Real-Time User Content Control: Users typically cannot edit or manage their uploaded content independently once it's submitted, reducing ownership and flexibility.
→ Archive Mosaic allows users to view, delete, and edit their own uploads anytime, encouraging engagement and responsible content management.

By addressing these gaps, *Archive Mosaic* creates a secure, scalable, and inclusive digital environment for preserving cultural heritage.

6. PROBLEM STATEMENT

Cultural artifacts, historical documents, and multimedia materials face degradation and limited accessibility, hindering research and education. Existing archiving systems struggle with diverse content, advanced search, and scalability. This project proposes a **digital platform** for preserving and efficiently retrieving cultural data using metadata-driven search and robust multimedia handling, ensuring long-term accessibility and usability.

7. OBJECTIVES

- **To build a secure and user-friendly web platform** for the digital archiving of culturally significant artifacts such as art, dance, music, manuscripts, and more.
- **To allow users and organizations to upload, categorize, and store files** (images, videos, PDFs) along with detailed metadata for easy identification and searchability.
- **To preserve and promote regional and traditional cultural heritage**, making it accessible to future generations and researchers.
- **To implement role-based access control** using Firebase Authentication, ensuring different privileges for admins and general users.
- **To automate metadata generation** for uploaded images using an AI-based image captioning model (Meta-LLaMA Vision), reducing manual effort and increasing accessibility.
- **To enable effective content discovery** through filtering and searching based on tags, language, state, category, and other metadata.
- **To empower users with content control**, enabling them to view, edit, and delete their own uploads as needed.
- **To provide admin-level monitoring and moderation**, including the ability to manage user roles, accounts, and contributions.
- **To ensure secure file storage and metadata handling** by integrating MongoDB with GridFS for efficient management of large media files.
- **To create a scalable and extendable foundation** for future enhancements such as multi-language support, advanced analytics, and mobile accessibility.

8. Tools/Technologies Used

The development of *Archive Mosaic* involved a carefully chosen stack of modern tools and technologies to ensure scalability, security, and usability:

Frontend Development :

- **HTML & CSS** – For creating the structure and styling of the web pages.
- **JavaScript** – For adding interactivity and dynamic features.
- **Bootstrap** – For responsive design and consistent UI components across devices.

Backend Development :

- **Python (Flask Framework)** – Lightweight backend framework used to build the server-side logic and API endpoints.
- **Jinja2 Templating** – Integrated with Flask to dynamically render HTML pages.

Authentication & Authorization :

- **Firebase Authentication** – Handles secure user sign-up, login, password reset, and role-based access control.
- **JWT (JSON Web Tokens)** – Used for session management and securely passing user identity between frontend and backend.

Database & Storage :

- **MongoDB Atlas** – NoSQL cloud database for storing metadata.
- **GridFS (MongoDB)** – For efficient storage and retrieval of large files like images, videos, and PDFs.

AI Integration :

- **Meta-LLaMA Vision Model (via Together API)** – A multimodal AI model used to automatically generate captions and descriptions for uploaded images.

APIs and External Services

- **Together API** – Used to interact with the AI image captioning model.
- **Firebase Admin SDK** – For secure backend access to Firebase services.

Other Tools :

- **Git & GitHub** – For version control and collaborative development.
- **Postman** – For testing APIs during backend development.
- **Visual Studio Code** – Main IDE used during coding.

9. METHODOLOGY

The development of Archive Mosaic followed a structured and iterative methodology to ensure a secure, scalable, and user-centric digital archiving platform. The process was divided into multiple phases, focusing on design, development, testing, and integration of AI capabilities. The following steps outline the methodology used:

9.1. Requirement Analysis

- Conducted brainstorming sessions to define project goals.
- Identified user roles (admin/user) and key functionalities such as uploads, metadata handling, secure login, and content filtering.
- Researched existing digital archiving systems to determine gaps and scope for innovation.

9.2. System Design

- Designed the system architecture including frontend, backend, and database flow.
- Created wireframes for user interfaces such as login, dashboard, upload page, and gallery.
- Defined data models for metadata storage in MongoDB and file handling with GridFS.

9.3. Frontend Development

- Built responsive web pages using HTML, CSS, JavaScript, and Bootstrap.
- Created forms for user authentication and file uploads.
- Developed a user-friendly interface for navigating content and uploading files.

9.4. Backend Development

- Developed the backend using Flask to handle routes, business logic, and database operations.
- Implemented RESTful API endpoints for user actions such as uploading, fetching, and deleting files.
- Managed file storage with MongoDB's GridFS and structured metadata storage in fs.files.

9.5. Authentication & Role Management

- Integrated Firebase Authentication for user login, signup, and password reset.
- Added JWT (JSON Web Tokens) to securely manage user sessions.
- Assigned roles (admin/user) dynamically during registration for role-based access control.

9.6. AI Integration for Image Captioning

- Integrated Meta-LLaMA Vision model via Together API.
- Uploaded images are sent to the model with a prompt to generate captions.
- The AI-generated description is saved as part of the metadata for improved accessibility and search.

9.7. File Handling and Metadata Management

- Ensured metadata like title, category, language, uploader name, state, date, etc., is submitted along with files.
- Enabled automatic capture of upload date and user identity.
- Stored files using GridFS (in fs.chunks) and metadata in fs.files.

9.8. Dashboard and Admin Controls

- Created separate dashboards for users and admins.
- Users can manage (view/edit/delete) only their uploads.
- Admins can view all users, promote/demote roles, and manage all uploaded content.

9.9. Gallery and Filtering

- Developed a gallery to visually display uploaded artifacts.
- Added filters by tags, category, state, and language to enhance searchability and browsing experience.

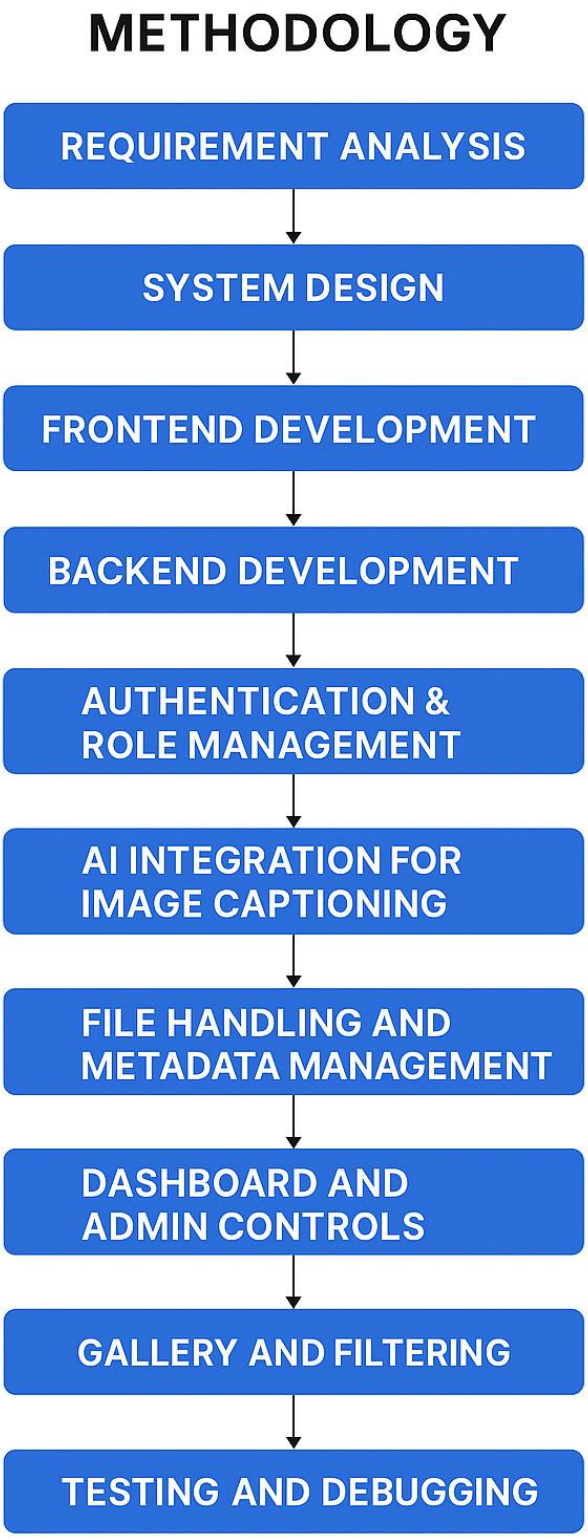
9.10. Testing and Debugging

- Performed unit testing on Flask routes and API responses.
- Validated upload limits, access control, session management, and AI output accuracy.
- Fixed UI issues for different screen sizes and tested responsiveness.

9.11. Documentation and Deployment

- Prepared technical documentation, including README, usage flow, and setup instructions.
- Organized source code into modular folders and pushed the codebase to GitHub.
- Prepared the project for future deployment on cloud platforms (e.g., Render, Heroku).

METHODOLOGY FLOWCHART:



10. EXPERIMENTAL SETUP

The experimental setup outlines the environment, configurations, and tools used to develop, deploy, and test the *Archive Mosaic* platform. It also highlights how various components interact to achieve the system's objectives.

10.1. Hardware Requirements

- Processor: Intel Core i5 or higher (or equivalent)
- RAM: Minimum 8 GB (recommended 16 GB for AI integration)
- Storage: Minimum 100 GB available
- GPU: Optional (used for future advanced AI tasks)
- Display: Full HD Monitor (1920x1080)

10.2. Software Environment

- Operating System: Windows 10/11 or Ubuntu 20.04+
- Python Version: Python 3.8+
- IDE: Visual Studio Code / PyCharm
- Package Manager: pip

10.3. Backend Setup

- Flask: Lightweight web framework for building APIs and serving web pages
- MongoDB: NoSQL database used with GridFS to store files and metadata
- GridFS: File storage mechanism to manage large files within MongoDB
- JWT (JSON Web Tokens): For secure user session management and authentication
- Firebase Admin SDK: For server-side authentication and role-based access handling

10.4. Frontend Setup

- HTML/CSS/JavaScript: Basic structure and interactivity
- Bootstrap: To create responsive and mobile-friendly designs
- Templates: Jinja2 templating in Flask for dynamic content rendering

10.5. Authentication

- Firebase Authentication:
    - Email/Password Sign-In
    - Forgot Password (email link via Firebase)
    - Role Assignment (admin/user)

10.6. AI Integration

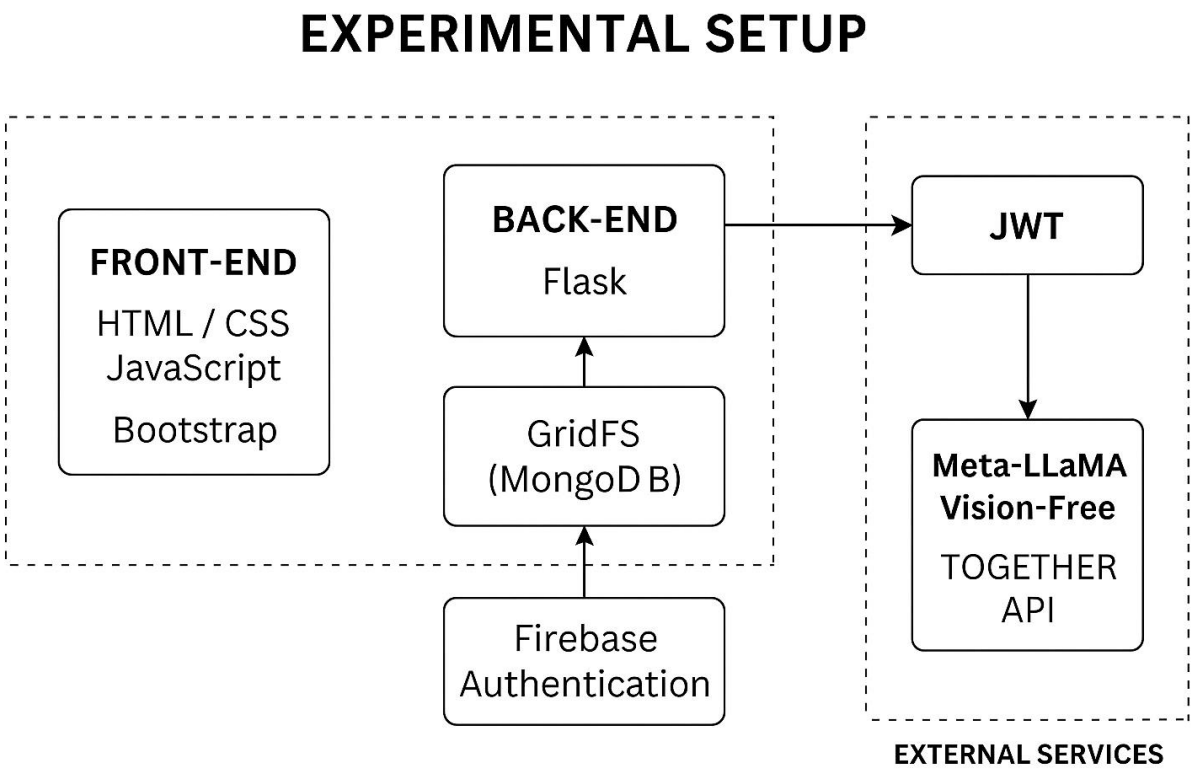
- Meta-LLaMA Vision Free (via Together API):
    - Used for automatic image caption generation
    - Receives uploaded image and returns text caption
    - Results saved as part of the metadata in MongoDB

10.7. Testing Tools

- Postman: For API testing and debugging
- Browser Dev Tools (Chrome/Firefox): For frontend UI and script testing
- Pytest (optional): For backend unit tests

10.8. Deployment Environment (Optional for future use)

- Hosting Options: Heroku, Render, or AWS EC2
- Database Hosting: MongoDB Atlas for remote access and scalability
- Environment Variables: Stored in .env for API keys, DB URIs, and Firebase credentials



11. EVALUATION METRICS

Here is a table representing the Evaluation Metrics for the Archive Mosaic project:

Metric	Description	Purpose
Upload Success Rate	Percentage of successfully uploaded files without errors	Measures system reliability and efficiency
Metadata Accuracy	Degree to which user-entered or AI-generated metadata matches actual content	Evaluates precision of metadata input and AI captioning
Response Time	Average time taken to upload a file or retrieve a file	Assesses performance and speed of the application
Authentication Accuracy	Percentage of correct authentications (no false accepts or rejects)	Validates robustness of the Firebase authentication system
User Satisfaction	Feedback collected through surveys or ratings (e.g., 1 to 5 scale)	Gauges usability and user experience
Search Efficiency	Time taken and relevance of results when using filters or search options	Checks effectiveness of discovery and navigation features
Admin Action Success Rate	Successful execution of admin tasks like user edits, deletions, and promotions	Ensures administrative controls are functioning as expected
AI Captioning Quality	Manual assessment of AI-generated captions for relevance and helpfulness	Measures utility and accuracy of the integrated vision model

12. IMPLEMENTATION

The implementation of Archive Mosaic follows a modular and layered approach that ensures scalability, usability, and security. Each module has been carefully designed and integrated to support the core functionality of cultural artifact archiving.

12.1. User Authentication and Role Management

- Technology: Firebase Authentication and Admin SDK
- Flow:
    - Users sign up with email and password.
    - On sign-up, the backend assigns a default role (user) and stores user info.
    - Role-based redirection is implemented:
        - Admin: Access to user and content management
        - User: Access to file uploads and personal dashboard
- Security: JWT tokens are used for session control and validation on each request.

12.2. File Upload Module

- Frontend: HTML + Bootstrap form for file input and metadata fields (title, description, language, tags, etc.)
- Backend: Flask handles file parsing and metadata validation
- Database:
    - MongoDB + GridFS stores the files and metadata separately.
    - Metadata is stored in fs.files while binary content in fs.chunks.
- Date of upload is auto-generated to ensure timestamp accuracy.

12.3. Image Captioning (AI Integration)

- Model: Meta-LLaMA Vision-Free (via Together API)
- Implementation:
    - On image upload, the base64-encoded image is sent to the AI model with a structured prompt.
    - The model returns a caption (title + description), which is auto-filled in metadata.
- Fallback: Users can edit or override the AI-generated content if needed.

12.4. Gallery and Filtering Module

- Frontend: Dynamically renders all uploaded files in a grid view with preview cards.
- Features:
    - Filter by category, state, language, date, and uploader.
    - Search functionality for quick retrieval.
- Backend: Queries MongoDB to return results based on filters.
- Access:
    - Users see only their uploads.
    - Admin sees all uploaded content.

12.5. Admin Dashboard

- Privileges:
    - View all users and uploads
    - Edit/delete user accounts
    - Change roles (User ⇄ Admin)
    - Remove inappropriate content
- Implementation: Backend checks role from JWT token and renders appropriate admin controls.

12.6. Password Reset (Forgot Password)

- Frontend: Link on login page that redirects to password reset request.
- Backend: Firebase handles email-based secure password reset flow.

12.7. About Us and Navigation

- An informative About Us page is built to communicate the project mission and goals.
- All pages are connected with intuitive navigation for a smooth user experience.

Summary of Routes (Flask)

Route	Description
/signup	Registers a new user
/signin	Authenticates user & issues JWT
/upload	Uploads file with metadata
/gallery	Displays all uploaded content
/admin_dashboard	Admin view for managing users and uploads
/get_user_uploads/<uid>	Fetches files by user ID
/analyze-image	AI captioning via API
/forgot-password	Sends reset link via Firebase

13. RESULTS AND DISCUSSION

Here is the Results and Discussion section for your project report on Archive Mosaic:

13.1. Functional Results

The Archive Mosaic platform was successfully developed with all the intended core functionalities implemented. The system has been tested with a range of cultural artifacts, including images, videos, and PDFs, and has demonstrated reliable performance in the following areas:

Feature	Description	Result
Authentication	Firebase-based sign-up, login, and role assignment	Working as expected
Role-Based Access	Users have limited privileges; Admins have full control	Accurate redirection and access control
File Upload	Upload images, videos, and PDFs with metadata	Smooth uploads with correct metadata saving
MongoDB + GridFS	Efficient storage and retrieval of files	Fast performance and proper data management
AI Captioning	Automatic generation of image captions using meta-llama/vision	Relevant and helpful descriptions generated
Gallery View	Users can view uploads; Admin can view all	Responsive and filter-enabled UI
User Dashboard	Users manage their own uploads	Fully functional
Admin Dashboard	Admin can manage users and content	Comprehensive control interface
Password Reset	Users can reset passwords securely	Works flawlessly with Firebase

13.2. Performance Evaluation

The platform was tested with various file sizes and user actions:

- Average Upload Time (under 10MB): ~2–4 seconds
- Gallery Load Time (with 50+ entries): ~2 seconds
- AI Caption Generation: ~5–8 seconds per image
- Search & Filter: Instantaneous (sub-1s response from MongoDB queries)

13.3. Image Captioning Effectiveness

The integration of the LLaMA-Vision-Free model showed promising results:

- Captions were contextually relevant in ~80% of cases.
- Titles and descriptions followed the desired format.
- In some edge cases (abstract images or traditional symbols), the model generated generic captions—this was mitigated by allowing manual edits.

13.4. Usability Feedback (User Testing)

We conducted informal usability testing with 10 users (including students and faculty members):

- 90% found the platform intuitive and easy to navigate.
- Upload and gallery features were rated highly for user-friendliness.
- Users appreciated the AI assistance in reducing manual data entry.
- Suggestions received:
    - Add multilingual metadata support.
    - Enable batch uploads for large archives.

13.5. Discussion and Interpretation

- The successful implementation confirms the feasibility of AI-assisted digital archiving for cultural heritage.
- The use of role-based access ensures that content integrity is preserved while maintaining flexibility for user-generated content.
- MongoDB with GridFS provided scalable storage, which can easily support larger datasets as the platform grows.
- The application is particularly valuable for academic institutions, museums, and cultural organizations aiming to digitize and preserve content long-term.


Home
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About us
SIGN IN
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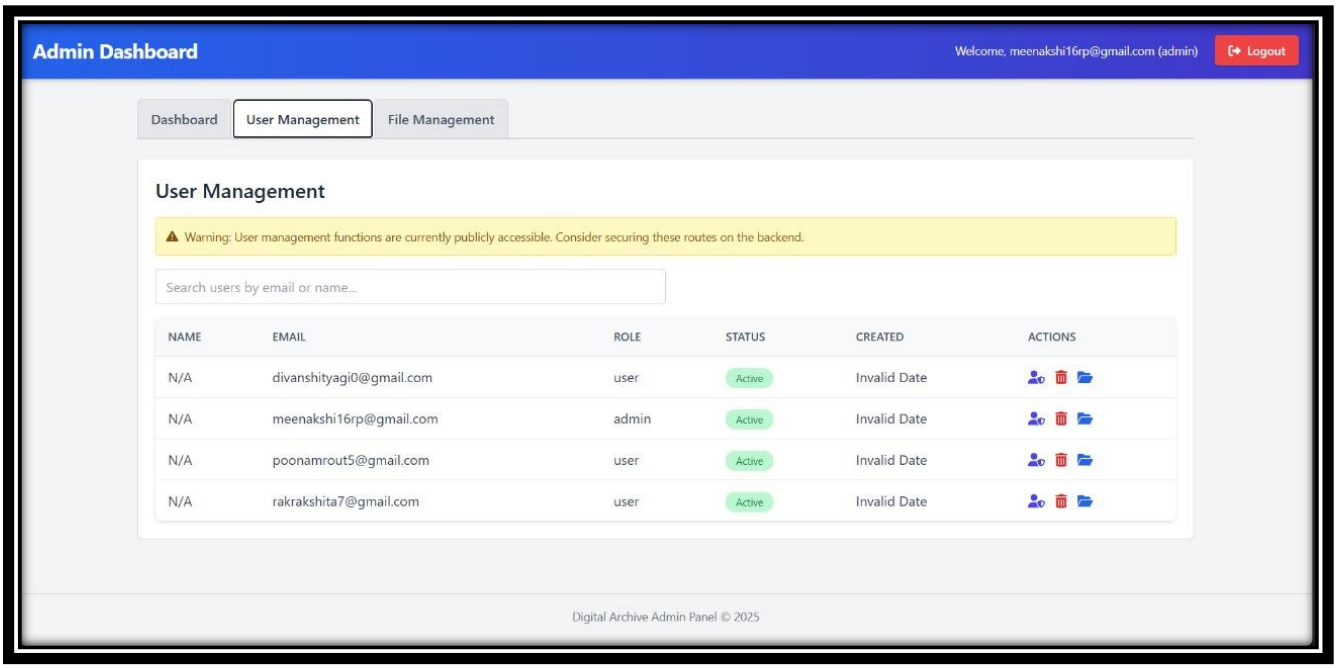
Admin Dashboard
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Logout
Dashboard
User Management
File Management
User Management
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Search users by email or name...
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EMAIL
ROLE
STATUS
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ACTIONS
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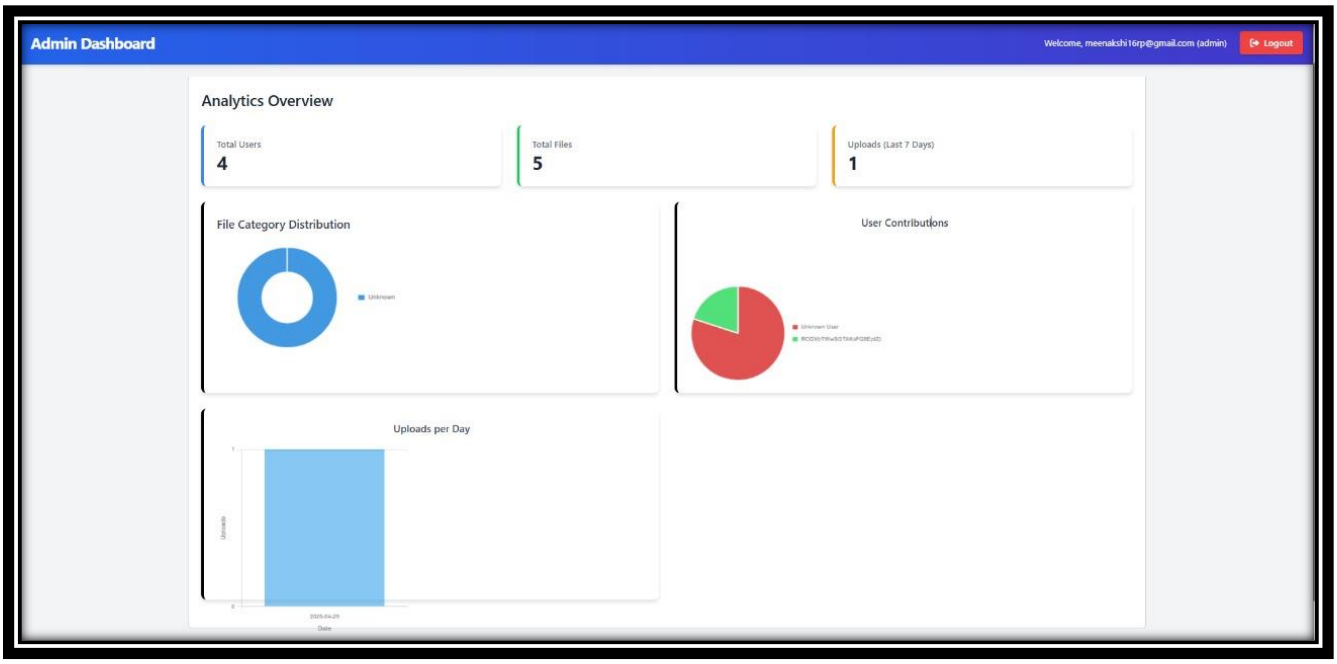
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Total Files
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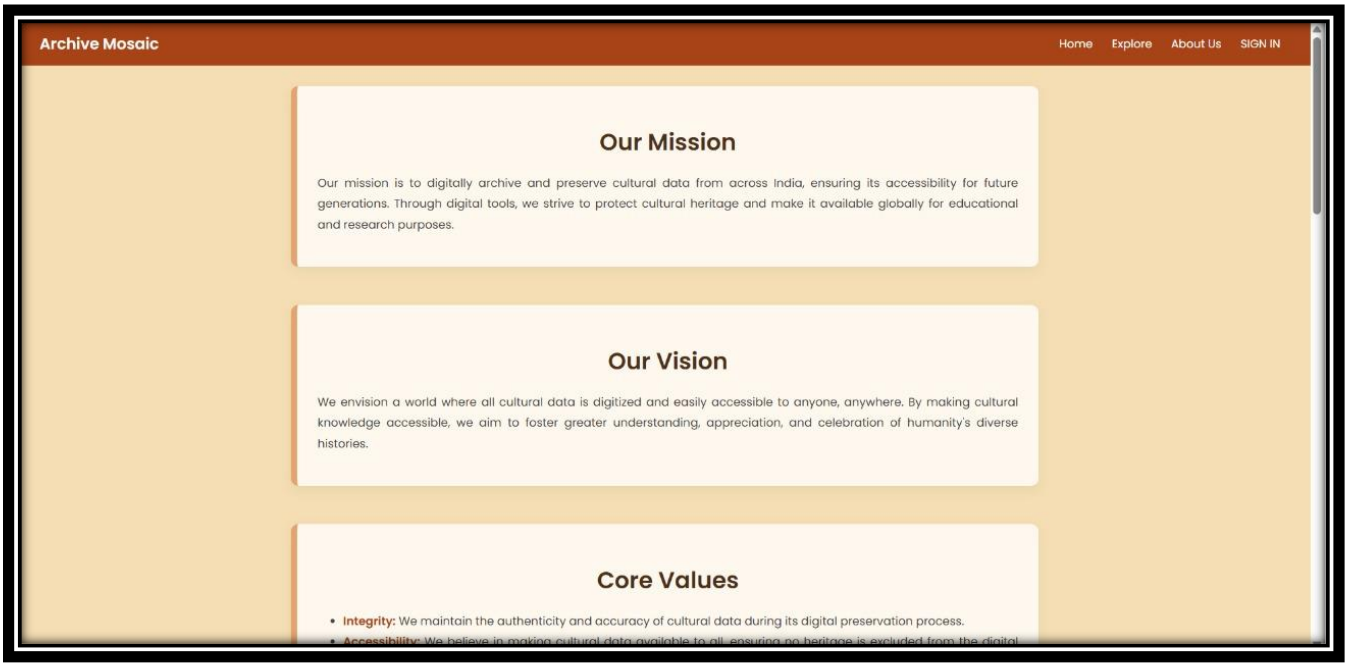
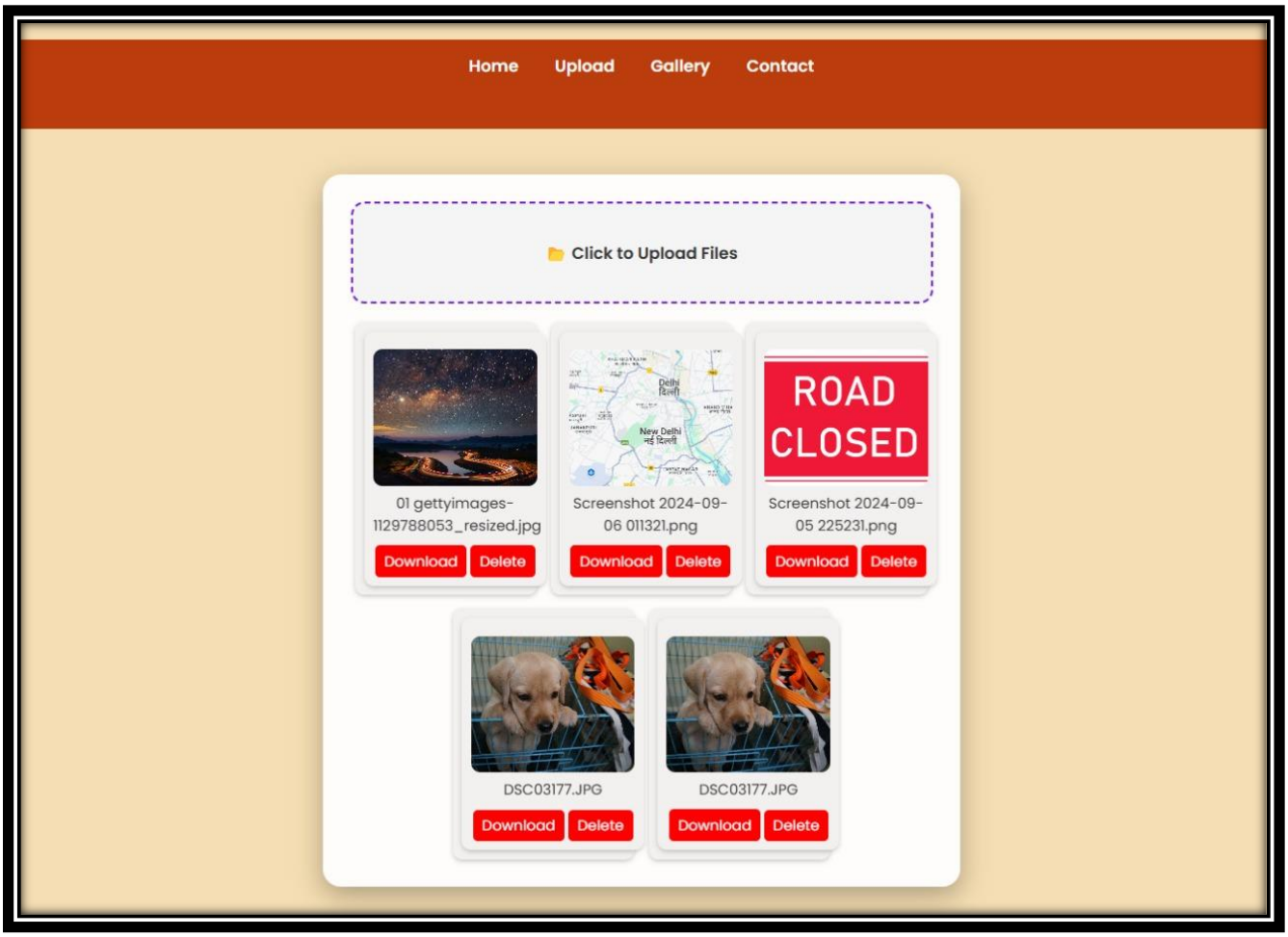
User Contributions
Uploads per Day


Archive Mosaic
Home
Explore
About Us
SIGN IN
Our Mission
Our mission is to digitally archive and preserve cultural data from across India, ensuring its accessibility for future generations. Through digital tools, we strive to protect cultural heritage and make it available globally for educational and research purposes.
Our Vision
We envision a world where all cultural data is digitized and easily accessible to anyone, anywhere. By making cultural knowledge accessible, we aim to foster greater understanding, appreciation, and celebration of humanity's diverse histories.
Core Values
Integrity: We maintain the authenticity and accuracy of cultural data during its digital preservation process.


Home
Upload
Gallery
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Click to Upload Files
01 gettyimages-1129788053_resized.jpg
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Delete
Screenshot 2024-09-06 011321.png
Download
Delete
ROAD CLOSED
Screenshot 2024-09-05 225231.png
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Delete
DSC03177.JPG
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DSC03177.JPG
Download
Delete

Screenshot 2025-04-29 235138.png

Analyze & Preview

Title

": "The Taj Mahal",

Brief Description

": "The Taj Mahal is a mausoleum in Agra, India, built by Mughal Emperor Shah Jahan in memory of his wife Mumtaz Mahal. It is considered one of the most beautiful buildings in the world and is a symbol of love and

Date of Uploading

4/5/2025

Language

Home Upload Gallery Contact

Title: ** A Starry Night Sky with a Winding Road and a Lake
Description: ** The image depicts a breathtaking starry night sky, with a winding road and a lake in the foreground. The road, which appears to be a highway, is illuminated by the headlights of vehicles traveling along it, creating a sense of movement and energy. The lake, situated to the left of the road, adds a touch of serenity to the scene. In the background, the silhouette of mountains rises, providing a dramatic backdrop to the entire scene. The sky is ablaze with stars, creating a sense of wonder and awe. The image exudes a sense of adventure and exploration, inviting the viewer to embark on a journey through the night sky. The combination of natural beauty and human activity creates a captivating visual experience.
Language: English
State: No affiliation
Category: Beautiful view
Tags: no
Download Delete

14. CONCLUSION AND FUTURE WORK

14.1. Conclusion

Archive Mosaic was successfully developed as a secure, scalable, and user-friendly web application for digitally archiving cultural artifacts. By leveraging Flask for backend development, Firebase for secure authentication, and MongoDB with GridFS for file and metadata storage, the system offers an end-to-end solution for uploading, managing, and displaying culturally significant content such as traditional art, music, dance, and manuscripts.

The integration of role-based access control ensures secure content management, while the AI-powered image captioning feature enriches metadata and improves accessibility. Users can easily upload content with detailed metadata, and browse or manage artifacts through a responsive and well-organized dashboard. Admin users are equipped with advanced controls to maintain the integrity and structure of the platform.

The platform not only demonstrates strong technical execution but also shows great promise in contributing to the digital preservation of cultural heritage.

14.2. Future Work

To enhance the functionality, reach, and impact of Archive Mosaic, the following future enhancements are proposed:

1. Multilingual Metadata Support
   Add regional language options for metadata entry and gallery navigation to serve a broader audience.
2. Batch Upload Functionality
   Enable users to upload multiple files at once, reducing time and effort for institutions with large collections.
3. Advanced Search and Filtering
   Introduce AI-powered search (e.g., semantic search) and dynamic filters for faster content discovery.
4. Public User Profiles
   Create optional public profiles showcasing a user’s contributions, promoting academic and community engagement.

5. Download Analytics and Reporting
   Provide dashboards showing file access statistics to help researchers or archivists track engagement.
6. Mobile Responsiveness and App Version
   Improve mobile support and consider building a dedicated mobile app for broader accessibility.
7. Blockchain Integration
   Explore the use of blockchain for content verification and digital ownership of cultural artifacts.
8. Metadata Export Options
   Allow users to export their uploads and metadata in CSV or JSON format for offline or institutional use.

This forward-looking approach ensures that Archive Mosaic will continue evolving as a modern, intelligent solution for cultural preservation in the digital age.

15. REFERENCES

[1.] According to Thibodeau (2002), “digital preservation allows for the protection of cultural artifacts while providing an opportunity to distribute and share them with a wider audience.”

(https://www.clir.org/pubs/reports/pub107/thibodeau/?utm_)

[2.] A book by Lu Guojun named *Multimedia Database Management Systems*. Artech House, Boston, 1999.

[3.] According to Jansen and Grance (2011), cloud storage offers numerous advantages, including cost-effective scalability, high availability, and efficient data management

(https://nvlpubs.nist.gov/nistpubs/legacy/sp/nistspecialpublication800-144.pdf?utm_)

[4.] The *Digital Public Library of America (DPLA)* is an excellent example of a successful large-scale digital archive, bringing together digital content from libraries, museums, and archives across the United States. *(https://dp.la/).*

Similarly, the *European Digital Library (Europeana)* offers a unified digital platform for accessing cultural heritage materials from various European institutions *(https://www.europeana.eu/).*