

IT 314

Group 25

# Gen-scholar:- A Collaborative Research Platform



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# **1. Requirement Identification:**

- Functional Requirements**

- User Authentication and Management**

- FR1: If user want to access any features of the system then users must be registered and log in.
    - FR2: Users will be able to set a username and password after registering for a new account via email verification.
    - FR3: The system will provide a secure password reset mechanism for users who have forgotten their password.

- Workspace and Document Management**

- FR4: An authenticated user can create a new, private collaborative workspace.
    - FR5: The creator of a workspace can invite other registered users as Researcher or Reviewer to join via their Valid Username and Invited User can Accept Or Decline their invitation.
    - FR6: Users can upload PDF documents from their local devices into a shared workspace.
    - FR7: Users can view a list of all documents within a workspace and open them for reading.
    - FR8: Users with appropriate permissions can delete documents from a workspace.

- Collaboration and Communication**

- FR9: The same PDF document can be viewed concurrently by multiple users in a workspace.
  - FR10: Users can highlight sections of the PDF text and do comments to these annotations.
  - FR11: Every member of the workspace will be able to view all annotations and comments in real time.
  - FR12: The system shall support threaded discussions, allowing users to reply directly to comments to maintain context.
  - FR13: Every workspace must have a general chat section for conversations unrelated to any particular document. Additionally, users can mention other reviewers or researchers in the chat, and their account will receive a notification.
- AI and Search Functionality
    - FR14: The system shall provide a feature to generate an AI-based summary,/Can ask questions to AI about an uploaded research paper.

## ● Non-Functional Requirements

- NFR1: Usability: The user interface needs to be clean, easy to understand, and simple to use.
- NFR2: Performance: The system needs to be able to quickly process and display PDFs. AI summary generation should complete within a reasonable timeframe.
- NFR3: Scalability: The platform needs to support multiple concurrent users (approx. 4-5 per workspace) without performance degradation.

- NFR4: Reliability: User data, especially annotations and comments, must be saved reliably and protected against loss.
- NFR5: Security: All user data and documents must be stored securely, with role-based access control to manage permissions.
- NFR6: Compatibility: The web platform must be responsive and functional on major web browsers and across different screen sizes.

## 2.Use Cases

### UC-1: Account Registration

Primary Actor	New User
Secondary Actors	None
Preconditions	User is not logged in and is on the registration page
Trigger	User clicks "Register" after entering credentials
Main Success Flow	<ol style="list-style-type: none"> <li>1. User enters username and password.</li> <li>2. User clicks Register.</li> <li>3. System validates input.</li> <li>4. System creates account.</li> <li>5. System logs user in automatically.</li> <li>6. System redirects to dashboard.</li> </ol>
Alternative / Exception Flows	A1: Username already exists → Show error. A2: Weak password → Show validation rules.
Postconditions	User account exists and user is logged in
Success Guarantee	User can immediately begin using the platform

### UC-2: Account Recovery

Primary Actor	Existing User
Secondary Actors	None
Preconditions	User has an existing account and access to the recovery page
Trigger	User clicks “Forgot Password”
Main Success Flow	<ol style="list-style-type: none"> <li>1. User clicks “Forgot Password”</li> <li>2. User enters registered email/username.</li> <li>3. System verifies the account.</li> <li>4. System sends reset link to email.</li> <li>5. User opens the link</li> <li>6. User sets a new password.</li> <li>7. System confirms reset and logs in user.</li> </ol>
Alternative / Exception Flows	A1: Email/username not found → show error.
Postconditions	User regains access to their account with a new password
Success Guarantee	User can continue research without losing access

## UC-3: Create Workspace

Primary Actor	Research Group Member
Secondary Actors	None
Preconditions	User is logged in
Trigger	User clicks “Create Workspace”
Main Success Flow	<ol style="list-style-type: none"> <li>1. User enters workspace name and description.</li> <li>2. User confirms creation.</li> <li>3. System creates workspace</li> <li>4. System assigns the user as Workspace Creator.</li> <li>5. System redirects the user to the new workspace dashboard.</li> </ol>
Alternative / Exception Flows	A1: Workspace name already exists → show error

Postconditions	A new workspace exists and the user becomes its admin
Success Guarantee	User can start uploading PDFs, inviting members, and collaborating

## UC-4: Uploading a PDF

Primary Actor	Research Group Member
Secondary Actors	None
Preconditions	User is logged into the workspace
Trigger	User selects and uploads a research PDF
Main Success Flow	<ol style="list-style-type: none"> <li>1. User clicks Upload PDF</li> <li>2. User selects a PDF file from device</li> <li>3. System uploads and securely stores the PDF</li> <li>4. System adds the PDF to workspace documents list.</li> </ol>
Alternative / Exception Flows	A1: File is not a PDF → show Invalid file format.
Postconditions	The uploaded PDF becomes immediately accessible to all workspace members
Success Guarantee	All team members can view the PDF without delay and without access issues

## UC-5: Inviting Users

Primary Actor	Workspace Creator
Secondary Actors	Invited User
Preconditions	Workspace exists and the creator is logged in
Trigger	Creator enters the username/email of an existing user to invite

Main Success Flow	<ol style="list-style-type: none"> <li>1. Creator opens Invite Members</li> <li>2. Creator enters username/email and selects a role</li> <li>3. System verifies that the user exists</li> <li>4. System sends an invitation notification to the user</li> <li>5. Invited user views the invitation</li> <li>6. Invited user accepts the invitation</li> <li>7. System adds the user to the workspace with the assigned role.</li> </ol>
Alternative / Exception Flows	<p>A1: User does not exist → show User not found  A2: User already have pending invitation → show invitation already pending.  A3: User already exists in workspace → show User already a member.</p>
Postconditions	New user becomes part of the workspace with the assigned role (if accepted)
Success Guarantee	Workspace members can start collaborating without delay

## UC-6: Role Management

Primary Actor	Workspace Creator
Secondary Actors	Workspace Members (affected by role change)
Preconditions	Workspace exists and the actor has permission to manage roles
Trigger	Creator selects a workspace member and updates their role
Main Success Flow	<ol style="list-style-type: none"> <li>1. Creator opens the member list</li> <li>2. Creator selects the member whose role needs to be changed</li> <li>3. Creator selects a new role</li> <li>4. System validates the permission change</li> <li>5. System updates the member's permissions.</li> <li>6. System sends a notification to the affected member about the role update.</li> </ol>
Alternative / Exception Flows	A1: Creator attempts to change their own role in a way that removes their admin rights → show warning / deny action..
Postconditions	Member's role and permissions are updated across the workspace

Success Guarantee	Member can continue working with newly updated access rights without interruption
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## UC-7: PDF Search

Primary Actor	Research Group Member
Secondary Actors	None
Preconditions	Multiple PDFs exist in the workspace
Trigger	User applies a search keyword or filter on the PDF list
Main Success Flow	<ol style="list-style-type: none"> <li>1. User opens the PDF list section</li> <li>2. User enters a search for pdf.</li> <li>3. System processes the search criteria.</li> <li>4. System displays only matching PDFs in real time</li> </ol>
Alternative / Exception Flows	A1: No PDFs match the criteria → show “No matching documents found”.
Postconditions	User can view and access the required PDF from the filtered results
Success Guarantee	User quickly finds relevant research documents without browsing the full list

## UC-8: PDF Deletion

Primary Actor	Research Group Member with delete permission
Secondary Actors	Workspace Members (affected by deletion)
Preconditions	At least one PDF exists in the workspace and the actor has delete permissions
Trigger	User selects a PDF and clicks Delete

Main Success Flow	<ol style="list-style-type: none"> <li>1. User selects a PDF from the document list</li> <li>2. User clicks Delete</li> <li>3. System permanently deletes the PDF from storage</li> <li>4. System updates the PDF list and removes the deleted file entry</li> </ol>
Alternative / Exception Flows	A1: User does not have permission → show Access denied.
Postconditions	The deleted PDF is permanently removed from the workspace for all members
Success Guarantee	The workspace remains clean and free of unnecessary or outdated documents

## UC-9: Real-Time Annotation

Primary Actor	Research Group Member
Secondary Actors	All Workspace Members (who view shared annotations)
Preconditions	A PDF is open in the workspace viewer
Trigger	User highlights text or adds a comment on the PDF
Main Success Flow	<ol style="list-style-type: none"> <li>1. User highlights text or selects a PDF section and adds a comment</li> <li>2. System saves the annotation instantly without manual action.</li> <li>3. All members see the new annotation in real time on the same section of the PDF</li> <li>5. Annotation stays even if the document is reopened.</li> </ol>
Alternative / Exception Flows	A1: Conflicting annotations (same section) → system displays both while preserving timestamps and authors.
Postconditions	Annotation is securely saved and visible to all workspace members in real time
Success Guarantee	Team collaboration becomes seamless with instant visibility of insights

## **UC-10: Annotation Undo**

Primary Actor	Research Group Member
Secondary Actors	All Workspace Members (who see updated annotations)
Preconditions	The user has made at least one annotation during the current editing session
Trigger	User clicks “Undo” while annotating
Main Success Flow	<ol style="list-style-type: none"><li>1. User clicks the “Undo” button during annotation editing</li><li>2. System identifies the most recent annotation action by that user</li><li>3. System reverts the annotation to the previous state or removes it if newly added</li></ol>
Alternative / Exception Flows	A1: No annotation exists to undo → system disables the Undo button
Postconditions	The reverted annotation state is saved and displayed to all team members
Success Guarantee	Users can confidently annotate without fear of mistakes, improving collaboration quality

## **UC-11: User Profile Stats**

Primary Actor	Research Group Member
Secondary Actors	None
Preconditions	The user profile page exists and the user is logged in
Trigger	User opens their profile page

Main Success Flow	<ol style="list-style-type: none"> <li>1. User navigates to the profile section</li> <li>2. System loads the profile data for the logged-in user</li> <li>3. System displays key contribution statistics such as number of uploads, messages set.</li> </ol>
Alternative / Exception Flows	A1: Profile data fails to load → system shows Failed to load profile retry.
Postconditions	User successfully views their contribution statistics
Success Guarantee	User gains insight into their overall participation and contribution to the research workspace

## UC-12: Add Short Note

Primary Actor	Research Group Member
Secondary Actors	All Workspace Members
Preconditions	User is a member of the workspace and has access to pinned notes
Trigger	User clicks on the pinned notes section
Main Success Flow	<ol style="list-style-type: none"> <li>1. User opens the pinned notes panel.</li> <li>2. User writes or edits a note intended for all workspace members</li> <li>3. User saves the note</li> <li>4. System updates and displays the note in the pinned notes section for all members</li> <li>5. All members can view the updated note instantly.</li> </ol>
Alternative / Exception Flows	A1: User leaves the note blank and hits save → show validation message.
Postconditions	Note becomes visible to all workspace members in the pinned notes section
Success Guarantee	team stays informed through shared announcements, reminders, and key information

## UC-13: Theme Toggle

Primary Actor	User
Secondary Actors	None
Preconditions	User is logged in and theme toggle feature is available in the interface
Trigger	User switches between light and dark themes using the theme toggle control
Main Success Flow	<ol style="list-style-type: none"> <li>1. User clicks the theme toggle (Light ↔ Dark)</li> <li>2. System immediately applies the selected theme across the interface</li> <li>3. System saves the theme preference .</li> </ol>
Alternative / Exception Flows	None
Postconditions	User continues working with their preferred theme
Success Guarantee	User has a comfortable viewing experience across sessions and devices

## UC-14: Threaded Discussions

Primary Actor	Research Group Member
Secondary Actors	Workspace Members (who view and respond to the thread)
Preconditions	A PDF or document is open in the workspace and discussions are enabled
Trigger	User highlights text or selects a figure and starts a discussion by adding a comment
Main Success Flow	<ol style="list-style-type: none"> <li>1. User highlights a section of the document</li> <li>2. User adds a comment to start a discussion thread</li> <li>3. System creates a new discussion thread linked to the selected part of the document</li> <li>4. Other members reply within the thread in a nested format.</li> </ol>

	5. Replies appear instantly under the original comment for all members.
Alternative / Exception Flows	A1: User tries to create a thread without highlighting/selecting → system prompts to select a document section first.
Postconditions	A threaded discussion is created and visible to all workspace members at the relevant document section
Success Guarantee	Conversations remain organized, contextual, and easy to follow during collaboration

## UC-15: Threaded Discussions Storage

Primary Actor	Research Group Member
Secondary Actors	Workspace Members (who view the stored discussion)
Preconditions	At least one threaded discussion already exists for a selected section of the document
Trigger	User clicks the “Threaded Discussion” icon
Main Success Flow	<ol style="list-style-type: none"> <li>1. User clicks the Threaded Discussion icon while viewing a document</li> <li>2. System loads all stored comments and replies associated with that thread</li> <li>3. System displays the full threaded conversation in nested format</li> <li>4. User reviews the discussion history and any new replies if available.</li> </ol>
Alternative / Exception Flows	A2: Discussion exists but some messages failed to sync earlier → system restores all available messages.
Postconditions	The stored discussion is successfully shown to the user, preserving message order and structure
Success Guarantee	Users can revisit past discussions anytime without losing context or insights

## UC-16: AI-Generated Summaries

Primary Actor	Research Group Member
Secondary Actors	AI Processing Service / Model
Preconditions	A research paper (PDF) is uploaded and accessible in the workspace
Trigger	User requests an AI-generated summary for the selected paper
Main Success Flow	<ol style="list-style-type: none"> <li>1. User opens a paper and prompts chatbot to give summary</li> <li>2. System sends the document content to the AI processing service</li> <li>3. AI analyzes the paper and extracts key insights</li> <li>4. System receives the generated summary</li> <li>5. System displays the summary to the user</li> <li>6. User reads and optionally shares or saves the summary.</li> </ol>
Alternative / Exception Flows	A1: AI processing takes longer than expected.
Postconditions	The user receives a concise, accurate summary of the research paper
Success Guarantee	Users can understand key insights from lengthy papers quickly without reading the full text

### **3.User stories**

#### **As a Research Group Member**

- Story: Account Registration

As a new user, I want to register for an account, so that I can join workspaces and start collaborating.

Given I am on the registration page, When I enter my username and a valid password, Then my account is created, and I am automatically logged in,

- Story:Account recovery

As an existing user I want to recover my account ,so that I can start working on my research.

Given existing user System should provide a forgot password functionality through which user can recover their account

- Story: Creating a Workspace

As a research group member, I want to create a shared, collaborative workspace, so that my team and I can coordinate our research activities in a single location.

Given a member is logged into the shared workspace, When they add, edit, or comment on a document, Then all team members must see the updates in real time, And a built-in chat feature must allow discussions directly within the workspace.

- Story: Uploading a PDF.

As a research group member, I want to upload research PDFs, so that my team can access and review shared papers.

Given a member is logged into the shared workspace, When they select and upload a research PDF, Then the file must be stored securely and become immediately accessible to all team members, And each member must be able to view the PDF.

- Story: Inviting users

As a research group member, I want to invite users in my workspace based on role, so we can start working together.

Given the creator of the workspace when I enter the username/email of an existing user then an invitation must be sent to the user and the invited user should be able to accept/decline the invitation.

- Story: Role Management

As a workspace creator, I want to manage user roles so that collaborators have appropriate permissions.

Given I am the creator, When I change a member's role, Then their permissions update immediately and they receive a notification.

- Story: PDF Search & Filtering

As a research group member, I want to search and filter PDFs so that I can find documents quickly

Given multiple PDFs exist, When I apply a search or filter, then only matching PDFs should appear.

- Story: PDF Deletion

As a researcher, I want to delete PDFs so that the workspace stays organized.

Given I have permissions, When I delete a PDF, then it is removed for all members and the index updates.

- Story: Real-Time Annotation

As a research group member, I want to annotate PDFs in real-time, so that my team can instantly view and respond to my insights.

Given a PDF is open in the workspace, When a member highlights or comments on text, Then all group members should see the annotation immediately, And annotations should auto-save without manual action.

- Story: Annotation Undo

As a research group member, I want to undo my annotations so I can correct mistakes.

Given I am annotating, When I click Undo, Then the last annotation is reverted.

- Story: User Profile Stats

As a research group member, I want to view my profile stats so that I can understand my contributions.

Given I open the profile page, When it loads, Then I should see stats like uploads, messages, annotations, and threads.

- Story: Add Short Note

As a research group member, I want to add a note to all the members of the workspaces.

Given a member of the workspace when clicked on pinned notes then he should be able to write/edit notes.

- Story: Theme Toggle

As a user, I want to toggle between light and dark themes so that I can work comfortably.

Given I use the theme switch, When I change the theme, Then it saves in localStorage and loads automatically next time.

- Story: Threaded Discussions

As a research group member, I want to create threaded discussions on specific document parts, so that our conversations remain contextual and structured.

Given a member highlights text or a figure, When they start a discussion by adding a comment, Then a new thread should be created and linked to that section, And replies should appear in a nested format under the original comment.

- Story: Threaded Discussions storage

As a research group member, I want to store my threaded discussion so I can review it again.

Given a number when they click on threaded discussion icon then they should be able to see all§ the discussion for that thread.

- Story: AI-Generated Summaries

As a research group member, I want to get AI-generated summaries of papers, so that I can quickly understand key insights without reading the full text.

Given a research paper is uploaded, When a member requests a summary, Then the system should generate a concise summary, And results must be delivered within a reasonable timeframe. And the summary must include the paper's objectives, methods, and results.

- Story: Data Reliability

As a research group member, I want to ensure annotations and discussions are reliably saved, so that no insights are lost during collaboration.

Given a member creates annotations, When the system crashes or the internet disconnects temporarily, Then annotations must still be preserved and restored upon reconnection, And all saved annotations must remain linked to the correct document section.

- Story: Main Chat

As a research group member, I want to have a main chat area in my workspace, so that I can have general discussions with my team that are not tied to a specific part of a document.

Given that I am in my workspace, When I open the main chat panel, Then I can see the conversation history with my team, And I can send new messages that are visible to everyone in the workspace in real-time.

## As a Reviewer

- Story: Reviewing Annotations

As a reviewer, I want to view all annotations and discussions made by researchers, so that I can assess the quality of their analysis and collaboration.

Given a paper with annotations made by researchers, When the reviewer opens the paper, Then they should see all annotations along with the associated threaded discussions.

- Story: Giving feedback

As a reviewer, I want to give feedback to researchers accordingly for their work so that I can guide them..

Given a workspace when the reviewer tries to add a review then they should be able to add the review in the main chat.

