SmartSDLC – AI-Powered SDLC Automation Platform

1. Introduction :

- **Project Title**: SmartSDLC – AI-Powered Software Development Lifecycle Automation
- **Team Members**:
  - ✧ **Vanaja Pulapa** – Team Leader, Full Stack & AI Integration
  - ✧ **Lakshmidurga Sathi** – Frontend Developer (Streamlit)
  - ✧ **Sonti Naga Tulasi** – Backend Developer (FastAPI, Model Integration)
  - ✧ **Yalla Manasa Siri** – PDF Processing & Testing

2. Project Overview :

Purpose:

SmartSDLC is a Generative AI-based platform that automates various stages of the Software Development Lifecycle (SDLC) such as requirement classification, code generation, test case generation, bug fixing, and code summarization, using IBM Watsonx.

Features:

- PDF upload and SDLC phase classification
- AI code generation in multiple languages
- Test case generator for given code
- Bug fixing using AI
- Code summarization
- AI Chat Assistant for developer queries
- User authentication and secure access

3. Architecture :

- **Frontend**:
  - ✧ Built using **Streamlit** for interactive UI
  - ✧ Separate pages for each SDLC stage
  - ✧ CSS for custom styling and responsive layout

- **Backend**:
  - ✧ Developed with **FastAPI** (Python)
  - ✧ Routes for handling SDLC features like /generate-code, /classify-pdf, etc.
  - ✧ Uses uvicorn server for API hosting
- **Database**:
  - ✧ Uses **SQLite** for storing user data, login credentials, and task history
  - ✧ File-based persistent storage using custom history management

4. Setup Instructions :

- **Prerequisites:**
  - ✧ Python 3.10+
  - ✧ pip
  - ✧ Streamlit
  - ✧ FastAPI
  - ✧ Uvicorn
  - ✧ SQLite3
- **Installation** :
  - ✧ # Clone the repository :

    git clone https://github.com/pulapa-vanaja/SmartSDLC-AI-Enhanced-Software-Development-Lifecycle smartsdlc
  - ✧ # Set up backendcd app :

    pip install -r requirements.txt
  - ✧ # Set up frontendcd ../smart_sdlc_frontend

    pip install -r requirements.txt
- **Environment Variables:**

  Create .env with your Watsonx credentials.

5. Folder Structure :

Frontend (Streamlit):

- smart_sdlc_frontend/
  - main.py
  - pages/
    - Upload_and_Classify.py
    - Code_Generator.py
    - ...
  - utils/
    - history.py
  - auth_pages/
    - login.py
    - signup.py

Backend (FastAPI):

- app/
  - main.py
- routes/
  - code.py
  - pdf.py
- services/
- models/
- utils/

6. Running the Application :

Start Backend Server:

```
cd app
uvicorn main:app --reload
```

Start Frontend (Streamlit):

```
cd smart_sdlc_frontend
```

```
streamlit run main.py
```

7. API Documentation :

Endpoint	Method	Description
/generate-code	POST	Generate code for given task
/generate-test-cases	POST	Generate test cases
/fix-bugs	POST	Fix bugs in code
/summarize-code	POST	Provide a summary of code
/classify-pdf	POST	Upload and classify PDF into SDLC phases

8. Authentication :

- **Method**: Custom username-password-based login system
- **Backend**: SQLite DB stores user credentials
- **Frontend**: Login, Sign-up, and Forgot Password pages using Streamlit
- **Security**: Passwords hashed; session state managed via Streamlit

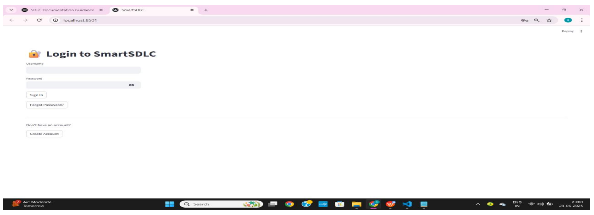
9. User Interface :

- Sidebar-based navigation
- Role-based features visible after login
- Light theme with custom CSS
- PDF upload, file preview, and code blocks with copy/download buttons

10. Testing :

- **Functional Testing**: All features tested with valid and invalid inputs
- **Performance Testing**: Tested under load (5 concurrent users)
- **Tools**: Manual + timers for response metrics
- **UAT**: Verified by team members with sign-off

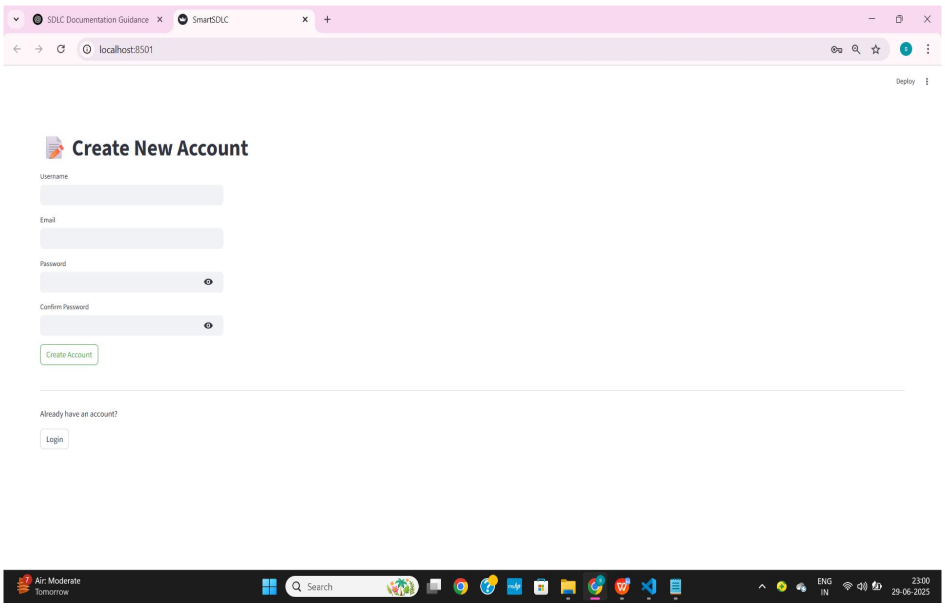
11. Screenshots or Demo :



Login to SmartSDLC

Username

Password



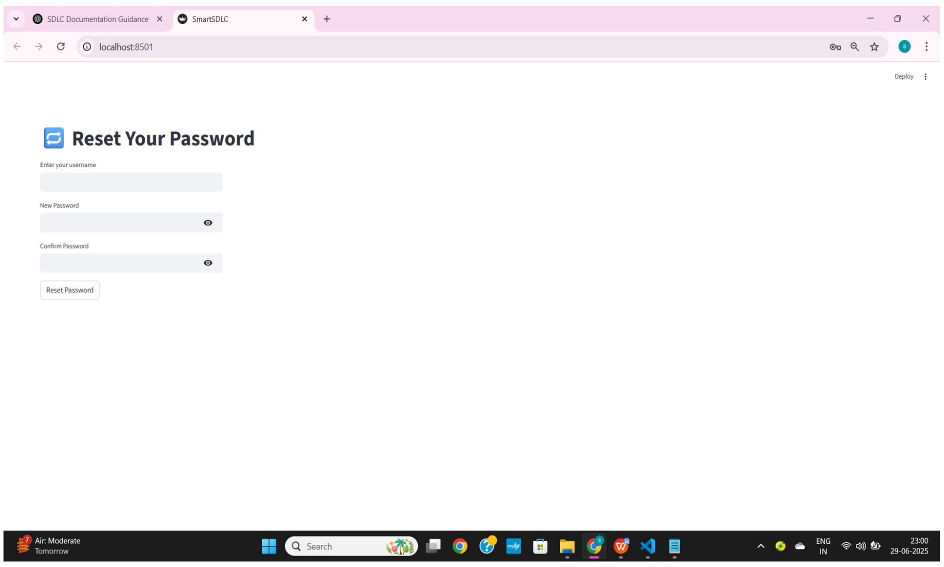
Create New Account

Username

Email

Password

Confirm Password

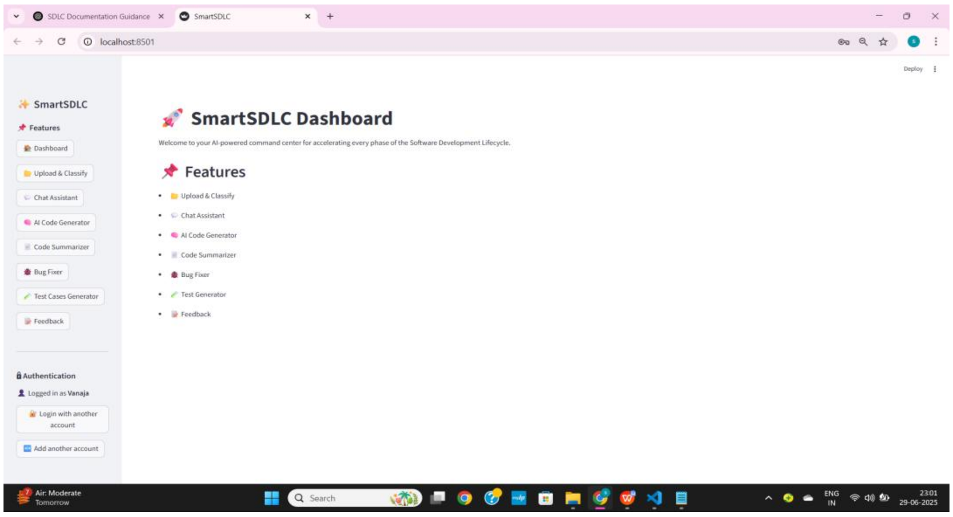


Reset Your Password

Enter your username

New Password

Confirm Password



SmartSDLC Dashboard

Welcome to your AI-powered command center for accelerating every phase of the Software Development Lifecycle.

Features

- Upload & Classify
- Chat Assistant
- AI Code Generator
- Code Summarizer
- Bug Fixer
- Test Generator
- Feedback

12. Known Issues :

- PDF classification may not work with scanned images (OCR pending)
- Minor alignment issues on very small screens
- Requires stable internet for Watsonx API

13. Future Enhancements

- Add GitHub integration to auto-fetch code
- Implement OCR for image-based PDFs
- Add support for project deployment to cloud (AWS/GCP)
- Improve role-based access control and team collaboration