

SmartSDLC: AI-Enhanced Software Development Lifecycle

This document outlines SmartSDLC, an innovative AI-powered system designed to revolutionise the software development process. It integrates advanced artificial intelligence capabilities to streamline workflows, enhance efficiency, and improve the overall quality of software projects from conception to deployment.

Project Identification

Team ID: NM2025TMID03731

Team Leader: RUBAN D

Core Development Team

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Key Features of SmartSDLC

SmartSDLC offers a comprehensive suite of functionalities designed to streamline and enhance every stage of the software development lifecycle, leveraging cutting-edge AI to boost productivity and accuracy.



Requirement Analysis

Extracts functional, non-functional, and technical specifications directly from various document formats, including PDFs and plain text, ensuring comprehensive understanding.



AI Code Generation

Automatically generates high-quality, runnable code across multiple programming languages such as Python, Java, C++, and JavaScript, significantly accelerating development cycles.



Code Validation

Performs rigorous syntax checks and executes automated tests to ensure the generated code is correct, robust, and adheres to industry best practices.



SDLC Automation

Provides intelligent AI assistance throughout the design, coding, and testing phases, significantly reducing manual effort and potential for human error.



Interactive Interface

Features a user-friendly, web-based interface built with Gradio UI, offering an intuitive and accessible experience for all developers and team members.

System Requirements & Technology Stack

To ensure optimal performance, SmartSDLC requires specific system configurations and leverages a robust technology stack built on leading-edge AI and software engineering principles.

Hardware & Operating System

- **OS:** Windows 10/11, Ubuntu 20.04+, or macOS 12+
- **CPU:** Quad-core (i5/Ryzen 5 or better)
- **RAM:** 8 GB (16 GB recommended for optimal performance)
- **Disk:** 10 GB free storage space
- **GPU (optional):** NVIDIA with 6 GB+ VRAM for accelerated processing.

Software & Dependencies

- **Python:** Versions 3.9 - 3.11 are supported.
- **Key Packages:** gradio, torch, transformers, pypdf2, accelerate.
- **AI Model:** "ibm-granite/granite-3.2-2b-instruct" (~4 GB, auto-download from Hugging Face).

Frontend/UI

Gradio provides the interactive, web-based user interface, ensuring a seamless developer experience.

Backend

Python forms the core of the system's logic and processing, handling complex operations efficiently.

AI/ML Models

Powered by IBM Granite LLM and Hugging Face Transformers for advanced natural language processing and machine learning capabilities.

Libraries

Utilises PyTorch for deep learning, PyPDF2 for document handling, and AST for abstract syntax tree manipulation, ensuring robust functionality.

Domain

Rooted in comprehensive Software Engineering (SDLC) knowledge, ensuring practical and relevant solutions for development teams.

SmartSDLC: Project Overview

SmartSDLC is an AI-powered system designed to assist developers and teams across different phases of the Software Development Lifecycle (SDLC). It integrates Natural Language Processing (NLP), Machine Learning models, and automation tools to analyse requirements, generate code, and validate implementations. This platform reduces manual effort, speeds up development, and ensures higher quality by combining requirement analysis, code generation, testing, and validation in a single, cohesive environment.

Project Objective

The primary objective of SmartSDLC is to significantly enhance software development efficiency. It achieves this by leveraging AI to automate repetitive tasks, offer contextual coding suggestions, and minimise errors throughout the various phases of the SDLC, ultimately delivering faster and more reliable software.

Conclusion

The SmartSDLC project exemplifies how Artificial Intelligence can profoundly enhance the traditional Software Development Lifecycle. By automating key processes like requirement analysis, code generation, and validation, it demonstrably reduces development time, improves accuracy, and empowers developers with intelligent, real-time suggestions. This integration of AI into SDLC showcases its immense potential for building faster, more reliable, and highly efficient software systems tailored for real-world applications, marking a significant step forward in modern software engineering.