

# Trends in SDLC Document Review using Generative AI

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## ABSTRACT

This research paper explores the evolving role of Generative AI in Software Development Life Cycle (SDLC) document review. With AI-driven advancements in Natural Language Processing (NLP), models such as GPT, BERT, and domain-specific LLMs have been adapted to evaluate requirement specifications, test plans, and design documents. We present an analysis of how these models are being fine-tuned for document validation, compliance checking, and contextual feedback generation in the software industry. The paper also examines the integration of rule-based methods with AI, providing structured feedback for engineering domain documentation. Furthermore, we discuss emerging trends, challenges, and future research directions for enhancing AI-based document review in SDLC.

**Keywords:** Generative AI, SDLC, Document Review, Large Language Models, NLP

## Introduction

The Software Development Life Cycle (SDLC) involves multiple documentation phases, including requirement specifications, functional design, testing protocols, and compliance reports. Traditionally, these documents have been reviewed manually, leading to inconsistencies, human error, and inefficiencies. However, with the rise of Generative AI, automated document review has seen significant advancements.

Modern AI models, including Transformer-based architectures like GPT-4 and BERT, have demonstrated capabilities in text analysis, summarization, and contextual understanding. These

models are now being adapted for structured document validation in industrial applications. This paper explores recent trends in applying Generative AI to SDLC document review, modifications made to enhance AI's effectiveness for this use case, and the hybrid approaches combining rule-based logic with AI-driven insights.

## METHODS AND MATERIAL

### A. AI Models for Document Review

The primary AI models used for SDLC document review include:

- **GPT (Generative Pre-trained Transformer):** Fine-tuned for context-aware feedback and requirement validation.
- **BERT (Bidirectional Encoder Representations from Transformers):** Used for semantic understanding and classification of document inconsistencies.
- **T5 (Text-to-Text Transfer Transformer):** Applied for document summarization and extraction of key insights.
- **Domain-Specific LLMs:** Custom-trained models tailored for software engineering documentation.

### B. Fine-Tuning and Adaptations

Recent trends show a shift towards fine-tuning Generative AI models for specific domains. Techniques include:

- **Embedding Engineering:** Custom token embeddings to improve domain-specific understanding.
- **Prompt Engineering:** Tailored prompts for requirement analysis and compliance checking.
- **Hybrid AI-Rules Approach:** Combining AI-generated insights with predefined business rules for structured validation.
- **Few-Shot and Zero-Shot Learning:** Enabling models to generalize with minimal training examples.

### C. Evaluation Metrics

To assess AI's performance in SDLC document review, key metrics include:

- **Precision and Recall:** Evaluating accuracy in identifying inconsistencies.
- **Readability Scores:** Measuring document clarity post-review.
- **Domain-Specific Compliance Checks:** Benchmarking AI-generated feedback against industry standards.

## RESULTS AND DISCUSSION

### A. Emerging Trends

1. **AI-Augmented Document Review Tools:** Companies are integrating LLM-based document analysis within their SDLC workflows.
2. **Automated Compliance Verification:** AI tools now validate regulatory compliance in technical documentation.
3. **Real-Time Collaboration:** AI-powered assistants provide real-time suggestions during document drafting.
4. **Explainable AI for Transparency:** Efforts are being made to ensure AI-generated feedback is interpretable.

### B. Challenges

1. **Domain Adaptation Limitations:** AI models often require extensive fine-tuning to understand technical jargon.
2. **Bias in AI Feedback:** Large models trained on general datasets may generate misleading insights.
3. **Scalability Issues:** Processing large-scale documentation in enterprises poses computational challenges.
4. **Human-AI Collaboration:** Ensuring a balanced interaction between AI automation and human expertise remains a key concern.

## CONCLUSION

Generative AI is revolutionizing SDLC document review by improving efficiency, accuracy, and compliance checking. As AI models continue to evolve, integrating them with structured rule-based approaches is proving beneficial for engineering documentation. Future research should focus on enhancing explainability, domain adaptation, and optimizing AI-driven workflows.

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