

Review Article

A Systematic Literature Review on the Application of Generative Artificial Intelligence in Software Engineering

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Research methodology

This article adopts a systematic literature review (SLR) methodology to synthesize and evaluate current research on the application of Generative Artificial Intelligence (GenAI) in software engineering. A systematic review provides a structured and reproducible approach for identifying, selecting, and analyzing relevant scholarly publications while minimizing selection bias. The methodology follows widely accepted principles for evidence synthesis in software engineering research, including defining research questions, establishing inclusion and exclusion criteria, conducting structured searches, screening studies, extracting data, and synthesizing findings.

Unlike narrative reviews, a systematic review applies predefined procedures throughout the review process, thereby improving transparency and reliability. The primary objective of this review is to identify how Generative AI technologies have influenced different phases of the Software Development Life Cycle (SDLC), evaluates their benefits and limitations, and identify future research opportunities.

Research questions

The review is guided by the following research questions:

- RQ1: What are the major applications of Generative AI in software engineering?
- RQ2: Which software engineering phases benefit most from AI-assisted development?
- RQ3: What advantages and productivity improvements are reported in the literature?
- RQ4: What technical, ethical, and security challenges remain unresolved?
- RQ5: What research gaps and future opportunities exist for Generative AI in software engineering?

Literature search strategy

Relevant literature was identified through comprehensive searches of established scientific databases and digital libraries, including:

- IEEE Xplore
- ACM Digital Library
- SpringerLink
- ScienceDirect
- Wiley Online Library
- Google Scholar

Typical search terms included combinations of:

- "Generative AI"
- "Software Engineering"
- "Large Language Models"
- "Code Generation"

- "AI-assisted Programming"
- "Software Testing"
- "Software Development"
- "DevOps Automation"
- "Artificial Intelligence AND Software Development"

Studies published in recent years were prioritized because of the rapid evolution of foundation models and AI-assisted development tools.

Inclusion criteria

Publications were included if they:

- Focused on Generative AI or Large Language Models in software engineering.
- Presented applications across one or more SDLC phases.
- Were published in peer-reviewed journals or recognized conferences.
- Were written in English.
- Contained sufficient technical information for comparative analysis.

Exclusion criteria

The following publications were excluded:

- Articles unrelated to software engineering.
- Editorials without technical contributions.
- Duplicate publications.
- Non-English publications.
- Publications lacking sufficient methodological information.

Data extraction

Information extracted from each selected study included:

- Publication year
- Research objective
- AI technique employed
- Software engineering phase addressed
- Key findings
- Reported advantages
- Identified limitations
- Future research recommendations

The extracted information was organized into comparative tables to facilitate thematic analysis.

Table 2: Summary of review methodology.

Component	Description
Review Type	Systematic Literature Review
Databases	IEEE, ACM, Springer, ScienceDirect, Wiley, Google Scholar
Language	English
Publication Type	Journals and Conference Papers
Main Focus	Generative AI in Software Engineering
Analysis Method	Comparative and Thematic Analysis

Figure: Literature review Process



