AI for Software Engineering - Part 1: Theoretical Analysis

Assignment Description

Week4 Assignment:AIin Software Engineering
Theme: 'Building Intelligent Software Solutions'

Objective: Evaluate understanding of AI applications in software engineering through theoretical analysis.

Q1: Explain how AI-driven code generation tools (e.g., GitHub Copilot) reduce development time. What are their limitations?

AI-drivencodegeneration toolsreduce development time by:
Generating boilerplate and repetitive code (CRUD, tests).Providing context-aware completions that speed prototyping.Suggesting full functions or refactors to reduce cognitive load.Limitations:
Hallucinations: plausible but incorrect outputs.Security & licensing risks.Poor system-level design support.Risk of over-reliance reducing review rigor.

Q2: Compare supervised and unsupervised learning in the context of automated bug detection

Supervised learning uses labeledexamples andisstrong whenlabeled bugdata exists; itgiveshigher precision for known bug types. Unsupervised learning detects anomalies without labels and surfaces novel bugs but yields more false positives. Hybrid approaches combine both.

Q3: Why is bias mitigation critical when using AI for user experience personalization?

Biasmitigationiscritical because personalizedmodelstrainedonbiaseddata canamplifyunfair treatment, damage user trust, and create feedback loops. Mitigation requires audits, fairness metrics, and corrective methods before deployment.

Case Study Analysis: 'AI in DevOps: Automating Deployment Pipelines' - How does AIOps improve deployment efficiency? Provide two examples.

AIOps improvesdeploymentefficiencythroughpredictiveanalytics,anomalydetection,andautomation across CI/CD pipelines.

Examples:
1) Predictive failure alerts for CI jobs: detect escalating failure trends and auto-block/re-run jobs to prevent faulty merges.
2) Smart rollout decisions: auto-promote or rollback canary deployments when telemetry shows anomalies, reducing MTTR and user impact.

References (selected):

1.Howto Elevate ITOperations with AIOps: A Practical Guide (itopsai.ai) 2. AIOps in Action: Predictive Analytics and Observability for Cloud Management (ResearchGate) 3. Integrating AI into DevOps pipelines (IJSRA 2024) 4. Best Practices for DevOps Pipelines in 2025 (refontelearning.com) 5. A Review of Generative AI and DevOps Pipelines (SSRN 2025)

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Course: AI for Software Engineering Part: Theoretical Analysis (30%)