

AI in Software Engineering

Tools and Applications

Exploring GitHub Copilot & LangGraph-based Agents for modern development workflows

Suraj Prasai

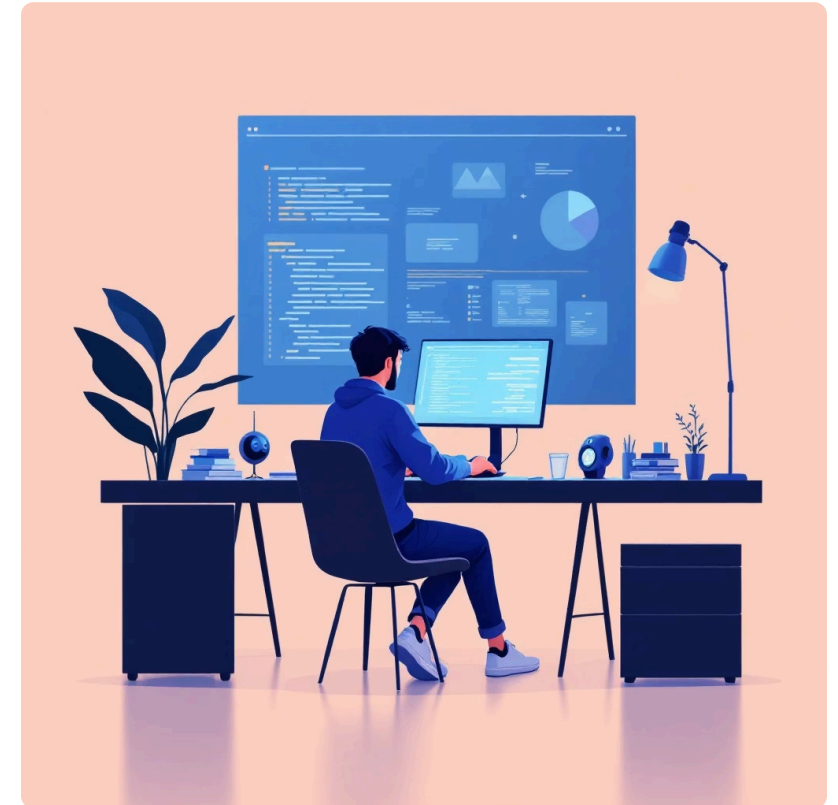
WFU, *CSC631 Software Engineering*



The AI Revolution in Development

Artificial Intelligence is transforming how we write, test, and maintain code. By automating repetitive tasks and providing intelligent assistance, AI tools are reshaping the developer experience.

Modern AI applications span from simple code completion to complex automated testing, letting engineers focus on high-level architecture and creative problem-solving rather than routine implementation details.



Core AI Applications



Code Generation

Intelligent autocompletion and full function generation based on context and comments



Bug Detection

Automated testing and vulnerability scanning with real-time feedback



Documentation

Automatic code explanation and comprehensive documentation generation

Key Benefit: AI abstracts away routine programming tasks, enabling developers to focus on design, logic, and innovation.

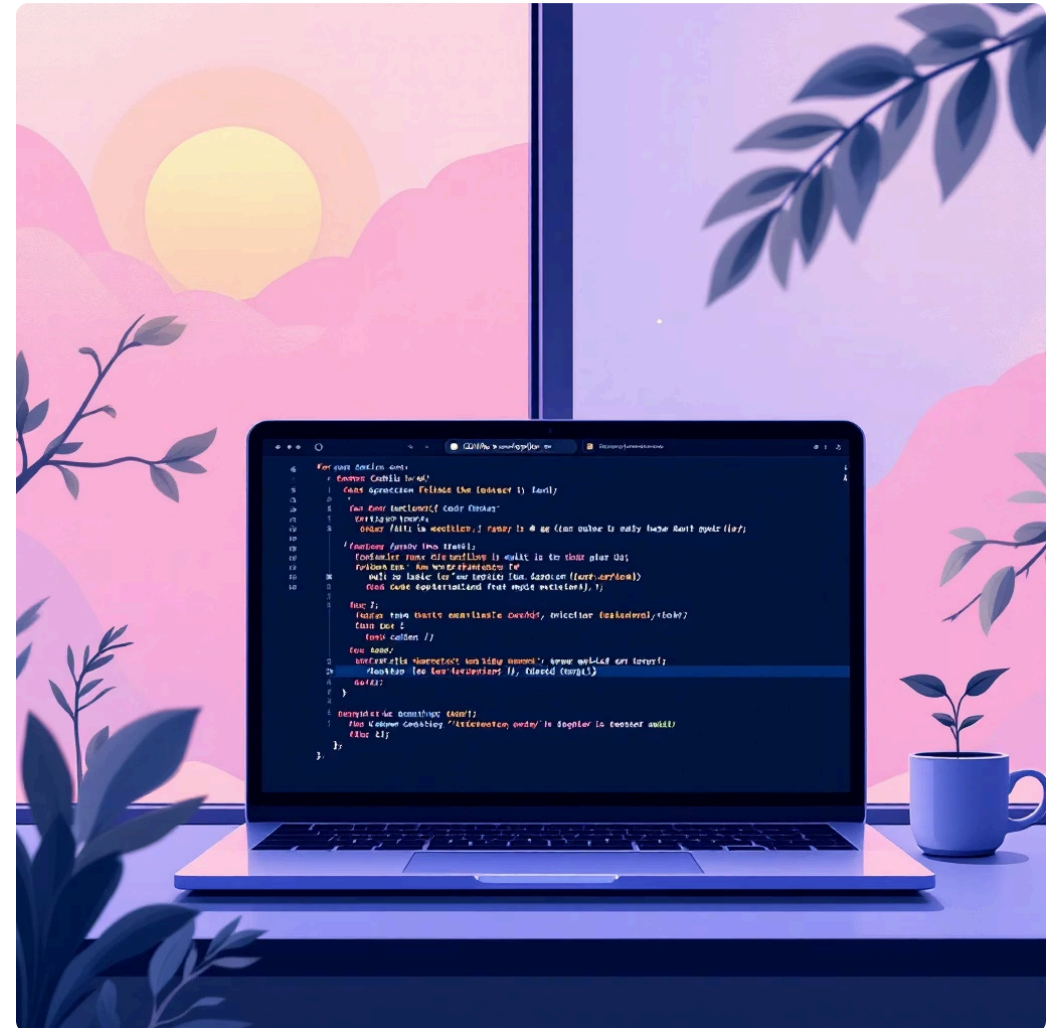
GitHub Copilot

Your AI Programming Partner

Smart Autocomplete

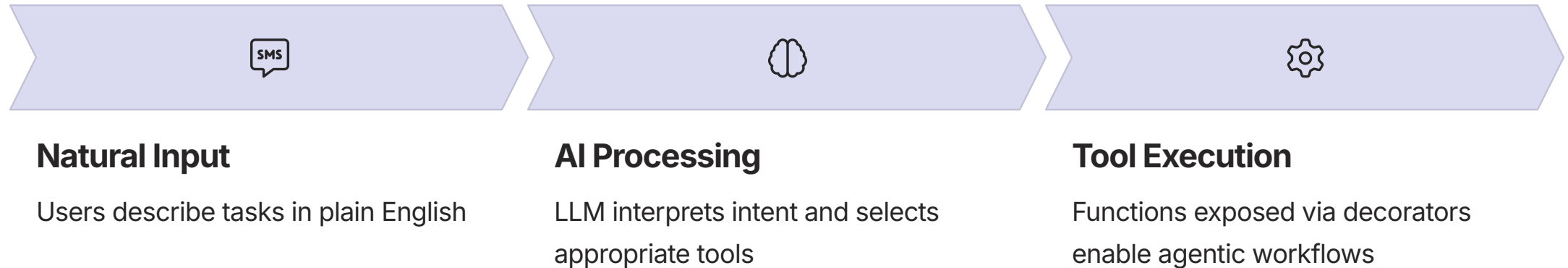
- Provides inline code suggestions in real-time
- Chat-style explanations for complex concepts
- Context-aware recommendations
- Multi-language support across frameworks

Acts like an intelligent pair programmer, understanding your intent and suggesting relevant code patterns.



LangGraph-based Agents

Natural Language Meets Code



The AI automatically decides which programmatic tool to invoke based on natural language queries, creating seamless human-machine collaboration.

Understanding the Limitations

GitHub Copilot Challenges

- May misinterpret complex instructions
- Non-deterministic outputs
- Suggestions may ignore best practices
- Debugging AI code can be complex

LangGraph Agent Limitations

- Dependent on precise tool definitions
- Struggles with multi-step instructions
- Latency issues with large LLMs
- Limited transparency in decision-making

⊗ **Critical Point:** Understanding these limitations ensures safe and effective adoption of AI tools in production environments.

Demo Setup

LangGraph Agent with Gemini LLM

01

Decimal ↔ Binary Conversion

Seamless number system transformations

02

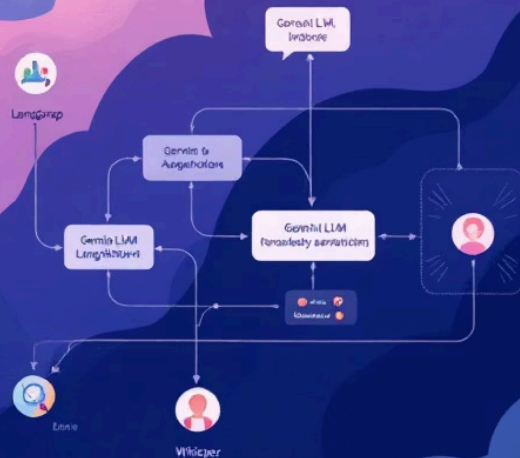
Binary Arithmetic Operations

Automated binary subtraction calculations

03

Natural Language Interface

Conversational interaction with the AI agent



Live Demo Showcase

"Convert 25 to binary"

Agent Response: 11001

"Subtract 1010 from 1111"

Agent Response: 0101

"Convert 1011 to decimal"

Agent Response: 11

Key Insight: Notice how the AI understands natural language instructions and automatically selects the correct computational tool, abstracting away complex implementation details.



Real-World Impact



Software Development

Accelerated coding cycles and rapid prototyping. Companies report 30-50% faster development with AI-assisted workflows.



Education

Enhanced programming education and interactive debugging. Students learn faster with AI explanations and guided problem-solving.



Enterprise

Large-scale automation of complex workflows. Organizations leverage LLM agents for sophisticated business process automation.

Thank You!

Questions & Discussion