

# AI-ASSISTED PROGRAMMING

## LECTURE 01: INTRODUCTION TO THE FUTURE OF DEVELOPMENT

AI-Assisted Programming Course | 2024

Duration: 60 minutes

## LEARNING OBJECTIVES

- Understand the concept of AI-assisted programming
- Explore current AI tools for developers
- Analyze the impact on productivity and code quality
- Examine real-world adoption statistics
- Discuss benefits and challenges
- Look ahead to the future of programming

# WHAT IS AI-ASSISTED PROGRAMMING?

AI-Assisted Programming is the use of artificial intelligence tools to:

- Generate code automatically
- Complete code as you type
- Suggest improvements and optimizations
- Find and fix bugs
- Generate documentation and tests
- Translate between programming languages

## MARKET ADOPTION (2024)

92%

of developers use AI tools

46%

productivity improvement

70%

faster code completion

25%

reduction in bugs

Sources: Stack Overflow Developer Survey 2024, GitHub Research

# POPULAR AI PROGRAMMING TOOLS

Tool	Company	Primary Feature	Languages
GitHub Copilot	Microsoft/GitHub	Code completion	40+ languages
ChatGPT/GPT-4	OpenAI	Code generation	All major languages
Claude	Anthropic	Code analysis	All major languages
Tabnine	Tabnine	AI completion	30+ languages



## GITHUB COPILOT

The most widely adopted AI programming assistant

- Trained on billions of lines of public code
- Integrated directly into IDEs (VS Code, JetBrains, etc.)
- Real-time code suggestions
- Context-aware completions
- Chat interface for code explanation

# COPILOT CAPABILITIES

## STRENGTHS

- Fast code completion
- Understands context
- Learns from comments
- Multiple suggestions
- Wide language support

## LIMITATIONS

- May suggest incorrect code
- Requires code review
- Limited business logic
- Potential licensing issues
- Internet dependency

## OUR LAB ENVIRONMENT: GITHUB CODESPACES

A cloud-based development environment fully configured for our course.

- **Instant Setup:** Click "Open in Codespace" and you're ready to go.
- **Pre-installed Tools:** Comes with Python, Jupyter, and all necessary extensions.
- **Integrated Copilot:** GitHub Copilot is built-in and ready to assist.
- **Consistent Environment:** Everyone has the exact same setup, eliminating "it works on my machine" issues.

*Codespaces provides a managed, on-demand development environment, allowing you to focus on learning, not on setup.*



## COMPLETING LABS WITH COPILOT

Follow these steps to complete your first lab:

1. Open the lab by creating a new **Codespace**.
2. Navigate to the lab file (e.g., `setup_lab.py`).
3. Read the `TODO` comments to understand the task.
4. Use **Copilot's suggestions** to help you write the code.
5. **Test your code** using the provided test block.
5. Commit and push your changes to GitHub.

## LAB 1: STRUCTURE OVERVIEW

Your first lab will guide you through several common programming tasks with AI assistance.

```
graph TD
  A[setup_lab.py] --> B[Task 1: Greeting Function]
  A --> C[Task 2: Statistics Function]
  A --> D[Task 3: Calculator Class]
  A --> E[Task 4: Sorting Algorithms]
  A --> F[Task 5: Search Algorithms]
  A --> G[Task 6: Data Structure]
  A --> H[Task 7: Benchmarking]
```

Use the Mermaid diagram to visualize the tasks in the lab file.

## LIVE DEMO: AI CODE GENERATION

```
// Comment: Create a function to calculate fibonacci numbers
```

```
function fibonacci(n) {  
    if (n <= 1) return n;  
    return fibonacci(n - 1) + fibonacci(n - 2);  
}
```

```
// Comment: Create an optimized version with memoization
```

```
function fibonacciMemo(n, memo = {}) {  
    if (n in memo) return memo[n];  
    if (n <= 1) return n;  
    memo[n] = fibonacciMemo(n - 1, memo) + fibonacciMemo(n - 2, memo);  
    return memo[n];  
}
```

```
// Comment: Generate test cases
```

```
console.log(fibonacci(10)); // Expected: 55
```

```
console.log(fibonacciMemo(50)); // Much faster for large numbers
```

Example of AI-generated code with improvements

# PRODUCTIVITY IMPACT

## DEVELOPER TASK TIME REDUCTION

- Code writing: **55% faster**
- Bug fixing: **37% faster**
- Code review: **30% faster**
- Documentation: **60% faster**
- Testing: **45% faster**
- Refactoring: **40% faster**
- Learning new APIs: **65% faster**
- Debugging: **35% faster**

Source: GitHub Copilot Research Study 2024

# KEY BENEFITS



## FOR DEVELOPERS

- Faster coding and reduced boilerplate
- Learning new languages and frameworks
- Reduced context switching
- Enhanced creativity and problem-solving



## FOR ORGANIZATIONS

- Increased development velocity
- Reduced time-to-market
- Lower training costs
- Improved code consistency

# CHALLENGES & CONSIDERATIONS



## TECHNICAL CHALLENGES

- Code quality and correctness
- Security vulnerabilities
- Over-reliance on AI suggestions
- Debugging AI-generated code



## ETHICAL & LEGAL

- Code ownership and licensing
- Privacy and data security
- Bias in AI models
- Impact on developer skills

## BEST PRACTICES

- Always review AI-generated code
- Write clear comments to guide AI suggestions
- Test thoroughly - AI code may have subtle bugs
- Understand the code before accepting suggestions



## **BEST PRACTICES (CONTINUED)**

- **Use AI as a tool, not a replacement** for thinking
- **Stay updated** on security and licensing implications
- **Maintain coding skills** alongside AI usage
- **Consider team consistency** in AI tool usage

## **FUTURE: EMERGING TRENDS**

- More specialized AI models for specific domains
- Better integration with development workflows
- AI-powered code review and testing
- Natural language to code translation
- Automated refactoring and optimization

## **FUTURE: IMPACT ON DEVELOPERS**

- Focus shifts to higher-level problem solving
- Increased importance of code review skills
- Need for AI literacy in development
- Emphasis on creative and architectural thinking
- Continuous learning becomes more critical

# THIS COURSE PREVIEW

## UPCOMING LECTURES:

- Code Generation & Completion
- Code Review & QA
- Testing & Debugging
- Documentation

## WHAT YOU'LL LEARN:

- Hands-on tool usage
- Best practices
- Real-world applications
- Ethical considerations

## QUESTIONS & DISCUSSION

What questions do you have about AI-assisted programming?

### DISCUSSION TOPICS:

- Have you used AI programming tools before?
- What concerns do you have about AI in development?
- Which tools are you most excited to learn about?

# THANK YOU!

Speaker notes