AI-ASSISTED PROGRAMMING

LECTURE 2: INTRODUCTION TO THE FUTURE OF DEVELOPMENT

AI Assisted Programming Course
Duration: 60 minutes

LEARNING OBJECTIVES

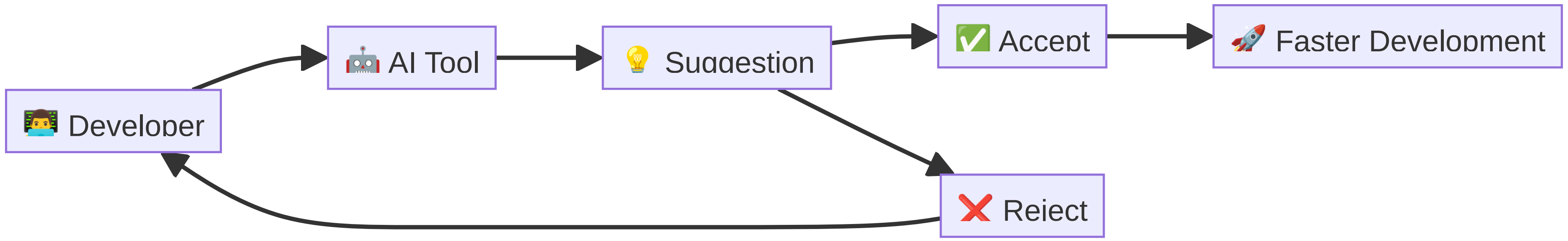
- Understand the concept of AI-assisted programming
- Explore current AI tools for developers
- Analyze the impact on productivity and code quality
- Examine real-world adoption statistics
- Discuss benefits and challenges
- Look ahead to the future of programming

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
- Debug and fix errors
- Translate between programming languages
- Generate documentation and tests

AI PROGRAMMING WORKFLOW



MARKET ADOPTION (2024)

92%
of developers use AI tools

46%
productivity improvement

70%
faster code completion

25%
reduction in bugs

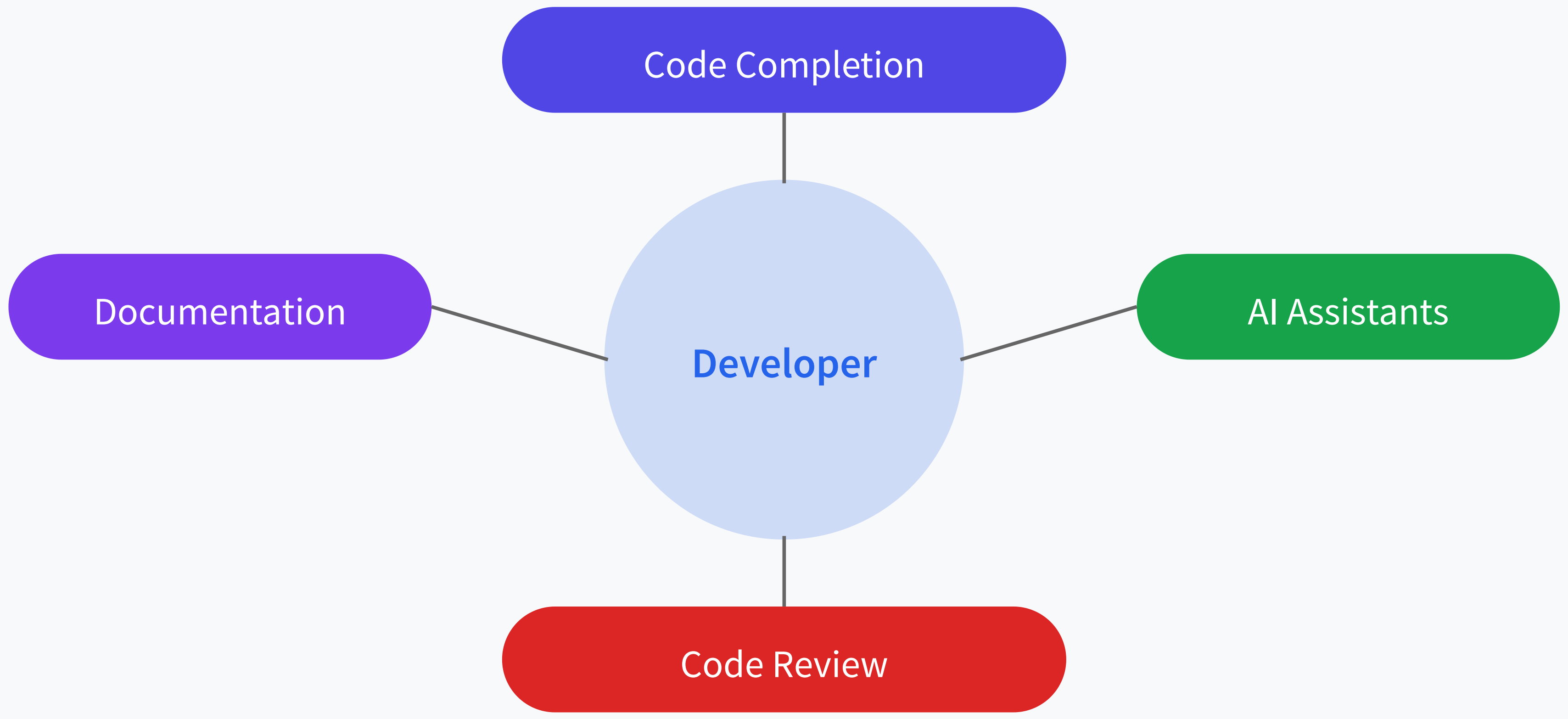
Sources: Stack Overflow Developer Survey 2024, GitHub Research

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

AI DEVELOPMENT ECOSYSTEM

AI Tools Support Every Development Stage



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.*

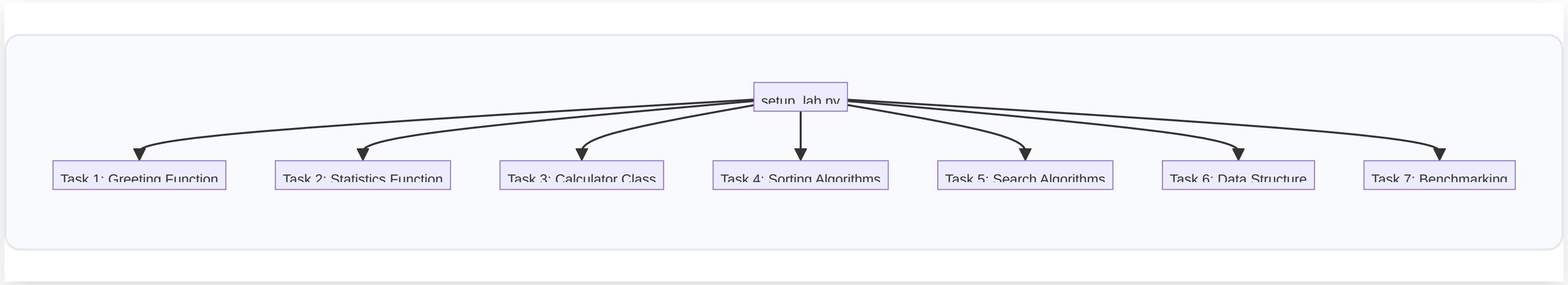
COMPLETING LABS WITH COPILOT

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.
6. 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.


setup_lab.py
Task 1: Greeting Function
Task 2: Statistics Function
Task 3: Calculator Class
Task 4: Sorting Algorithms
Task 5: Search Algorithms
Task 6: Data Structure
Task 7: Benchmarking

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

LATEST GITHUB COPILOT UPDATES (2025)

Exciting new features and improvements released in September 2025

🚀 MAJOR MODEL UPDATES

- **GPT-5 & GPT-5 mini** - Generally available with enhanced code generation
- **Claude Opus 4.1** - In public preview with improved reasoning
- **Gemini 2.5 Pro** - Available for advanced code analysis
- **Grok Code Fast 1** - Rolling out for faster completions

NEW FEATURES & CAPABILITIES

🤖 AI MODEL SELECTION

- Auto model selection in VS Code
- GPT-4.1 for code completion
- Context-aware model switching
- Performance optimization

🔧 DEVELOPER TOOLS

- Generated commit messages
- Read-only Sparks sharing
- Controlled data access
- Enhanced chat interface

INTEGRATION & ECOSYSTEM

GitHub MCP Registry enables seamless integration with external tools and services

- Raycast integration for productivity
- VS Code v1.104 with Copilot improvements
- Enhanced plugin ecosystem
- Better team collaboration features

IMPACT ON DEVELOPMENT WORKFLOW

EXPECTED IMPROVEMENTS (2025)

- **Code Quality:** 30% improvement
- **Development Speed:** 40% faster
- **Debugging Time:** 35% reduction
- **Learning Curve:** 50% reduction
- **Code Review:** 25% faster
- **Documentation:** 45% improvement

Projected based on new model capabilities and features

LIVE DEMO: AI CODE GENERATION

```javascript
// 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!

INTRODUCTION TO AI-ASSISTED PROGRAMMING

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Speaker notes