Responsible AI with GitHub Copilot

Best practices for developers in the AI era

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Introduction

What is Responsible AI?

The practice of designing, developing, and deploying AI with good intention to empower employees and businesses, and to fairly impact customers and society.

Copilot as a Pair Programmer

- ✓ AI is a tool to assist, not replace.
- ✓ Developers must remain the pilot in command.
- ✓ Always review and test AI-generated code.

Introduction

The Developer's New Reality

- AI coding assistants like GitHub Copilot are transforming software development speed and creativity.
- However, speed should not compromise safety.
- Developers are the "pilots" ensuring that AI-generated code is secure, fair, and functional.
- Responsible AI isn't just a policy; it's a daily coding practice.

Agenda

Mitigate AI Risks

Understanding potential pitfalls like hallucinations and bias.

6 Core Principles

Microsoft & GitHub's framework for ethical AI.

Practical Coding

Valid vs. Invalid patterns in C#, TS, and .NET.

Key Takeaways

Summary of best practices.

Mitigate AI Risks

Common Risks

- **Hallucinations:** AI suggesting libraries or APIs that don't exist.
- **Bias:** Generating code that reflects historical data biases.
- **Security:** Accidental exposure of secrets or use of vulnerable patterns.

The Mitigation Strategy

Human in the Loop: AI is the co-pilot; you are the pilot. Always review, test, and sanitize AI suggestions before merging.

Microsoft & GitHub's 6 Principles

These principles guide the development and usage of AI tools like Copilot.

- ✓ Fairness
- ✓ Reliability & Safety
- ✓ Privacy & Security
- ✓ Inclusiveness
- ✓ Transparency
- ✓ Accountability

Principles: Trust & Equity

Fairness

AI systems should treat all people fairly.

Dev Action: Check algorithms for bias against any group. Ensure training data is diverse.

Inclusiveness

AI should empower everyone and engage people.

Dev Action: Design accessible interfaces (WCAG) and consider users with different abilities.

Transparency

AI systems should be understandable.

Dev Action: Document how AI is used in your app. Explain limitations to users.

Principles: Safety & Integrity

Reliability & Safety

AI should perform reliably and safely.

Dev Action: Rigorous testing. Handle edge cases where AI fails gracefully.

Privacy & Security

Respect privacy and ensure security.

Dev Action: Never hardcode secrets. Don't send PII to public AI models.

Accountability

People should be accountable for AI systems.

Dev Action: Maintain human oversight. You are responsible for the code you ship.

C# Example: Managing Secrets

INVALID

```
public class AzureService {
    private string _apiKey = "AIzaSyD-...";
    // ❌ Risk: Hardcoding secrets exposes
    // keys in version control.

    public void Connect() { ... }
}
```

Never allow AI to autocomplete hardcoded credentials. Always review string assignments.

VALID

```
public class AzureService {
    private string _apiKey;

    public AzureService() {
        _apiKey =
Environment.GetEnvironmentVariable("AZURE_KEY");
        // ✅ Safe: Load from environment
        // or Key Vault.
    }
}
```

Use standard configuration patterns. Prompt Copilot to use "Environment Variables".

C# Example: **C# Security**

Scenario: Handling Database Queries. AI might suggest concatenating strings.

INVALID

```
ser GetUser(string username) {
    // ❌ VULNERABLE: Direct string concatenation
    string query = "SELECT * FROM Users WHERE Name = '"
                   + username + "'";

    using (var command = new SqlCommand(query, connection)) {
        // ... executes command
    }
}
```

AI might suggest this if context is simple string manipulation.

VALID

```
User GetUser(string username) {
    // ✅ SECURE: Using Parameters
    string query = "SELECT * FROM Users WHERE Name = @Name";

    using (var command = new SqlCommand(query, connection)) {
        command.Parameters.AddWithValue("@Name", username);
        // ... executes command
    }
}
```

Correct pattern: Always use parameterized queries.

C# Example: Security

Copilot might sometimes suggest hardcoding credentials if the context implies a quick test. Always refactor to use secure environment variables.

INVALID

```
const   aws_key = "AKIAIOSFODNN7EXAMPLE";
const   db_pass = "superSecret123"      ;
// Never commit secrets to repo!
```

VALID

```
const   aws_key = process.env.AWS_ACCESS_KEY;
const   db_pass = process.env.DB_PASSWORD;
// Load from .env file securely
```

Avoid Hardcoded Secrets

ASP.NET Core Example: Privacy

Scenario: Logging user actions for debugging.

INVALID

```
[HttpPost("login")]
public IActionResult Login(UserDto user) {
    // ❌ DANGEROUS: Logging entire object
    // This logs passwords and PII to plain text files
    _logger.LogInformation("Login attempt: {@User}", user);

    // ... logic
}
```

Violates Privacy principle by exposing sensitive data.

VALID

```
[HttpPost("login")]
public IActionResult Login(UserDto user) {
    // ✅ SAFE: Log only identifiers
    _logger.LogInformation("Login attempt for UserID: {Id}",
        user.Id);

    // ... logic
}
```

Respects user privacy and minimizes data risk.

ASP.NET Core: Authorization

INVALID

```
[AllowAnonymous]
public IActionResult DeleteUser(int id) {
    _repo.Delete(id);
    // ❌ Risk: Unprotected administrative
    // action suggested for "ease of testing".
    return Ok();
}
```

Be wary of AI removing security gates for convenience during scaffolding.

VALID

```
[Authorize(Roles = "Admin")]
public IActionResult DeleteUser(int id) {
    _repo.Delete(id);
    // ✅ Safe: Explicit role-based
    // access control.
    return Ok();
}
```

Always verify that generated controllers have correct attributes like `[Authorize]`.

TypeScript Example: Input Validation

INVALID

```
const processInput = (data: any) => {
    eval(data.expression);
    // ❌ Risk: 'eval' is dangerous and
    // opens up injection attacks.
};
```

AI might suggest quick hacks like `eval` or `innerHTML`. Reject these immediately.

VALID

```
const processInput = (data: string) => {
    const sanitized = sanitize(data);
    const result = safeParse(sanitized);
    // ✅ Safe: Validate and sanitize
    // all external inputs.
    return result;
};
```

Enforce strict typing and sanitization. Use established libraries over ad-hoc regex.

Key Takeaways

Checklist for Responsible Devs

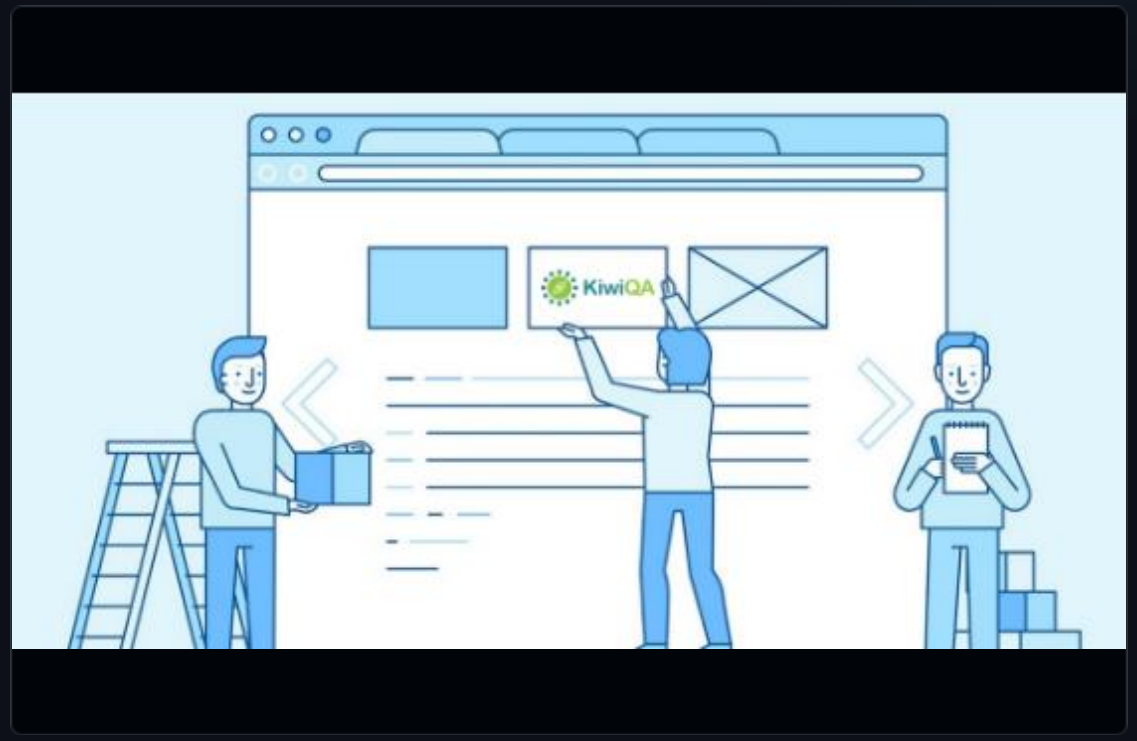
- ✓ **Review Everything:** Treat AI code as a suggestion, not a solution.
- ✓ **Scan for Secrets:** Ensure no API keys enter the codebase.
- ✓ **Test Rigorously:** Unit tests are more important than ever.
- ✓ **Stay Secure:** Apply standard security principles (OWASP) to AI code.

Key Takeaways

- **Review Everything:** Treat AI code as a suggestion, not a solution.
- **Context Matters:** You understand the business logic and ethics; AI predicts the next token.
- **Apply Principles:** Check for bias, security flaws, and accessibility in every PR.
- **Stay Secure:** Never let AI handle secrets or PII without sanitization.

Best Practices for Developers

- **Review Output:** Treat AI code like code from a junior developer—review it thoroughly.
- **Context is King:** Keep open tabs relevant. Copilot uses open tabs for context; close unrelated files to reduce hallucinations.
- **Use Filters:** Enable GitHub's public code filter to avoid potential IP issues.
- **Stay Updated:** AI models evolve. Keep your IDE extension updated for the latest security patches.



Q & A

Thank You!