Introduction to TypeScript

TypeScript is a powerful programming language developed by Microsoft, first released in 2012. As a syntactic superset of JavaScript, it has gained significant popularity for building scalable web applications while maintaining compatibility with existing JavaScript code.

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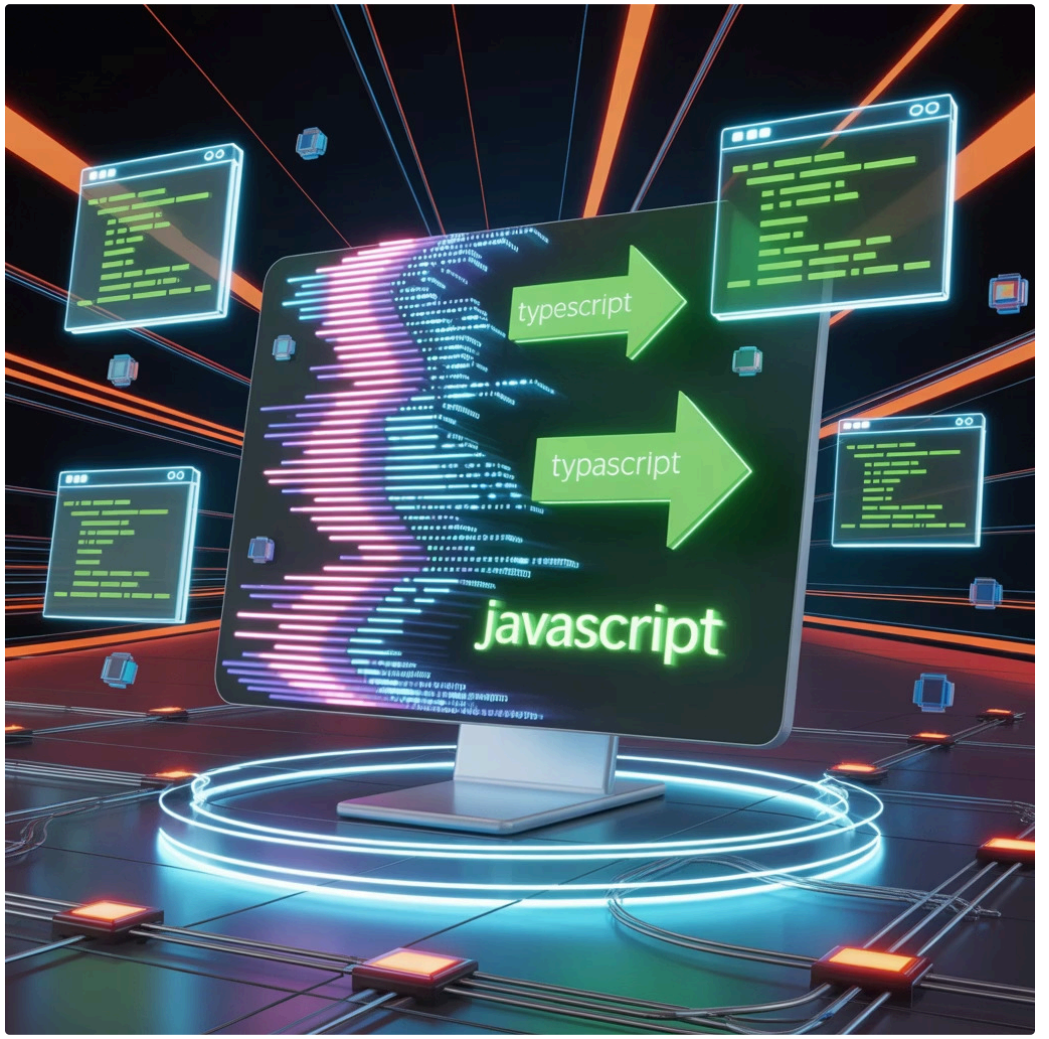
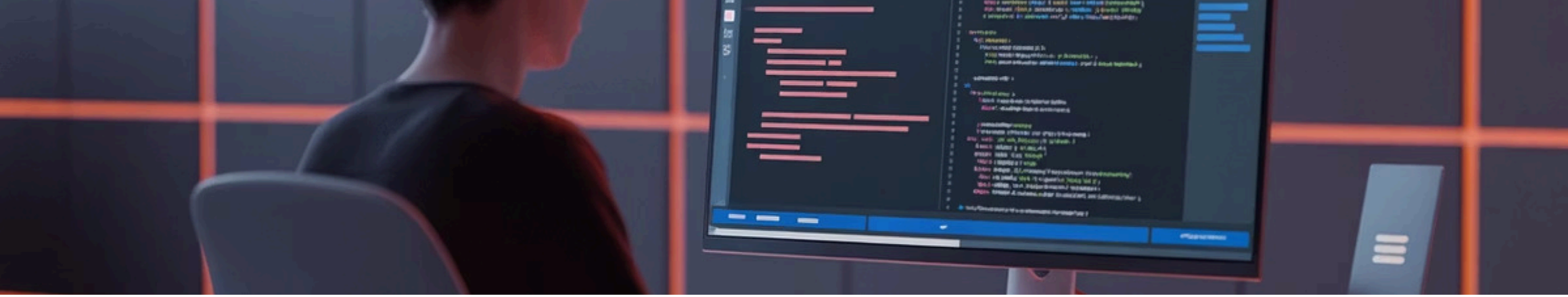
What is TypeScript?

TypeScript enhances JavaScript by adding optional static typing, allowing developers to define variable types explicitly. The TypeScript compiler then converts this code into plain JavaScript that can run in any browser or JavaScript environment.

This compilation step is where TypeScript shines - it helps catch errors before your code ever reaches runtime, significantly improving code quality and developer experience.





Why Use TypeScript?

Early Error Detection

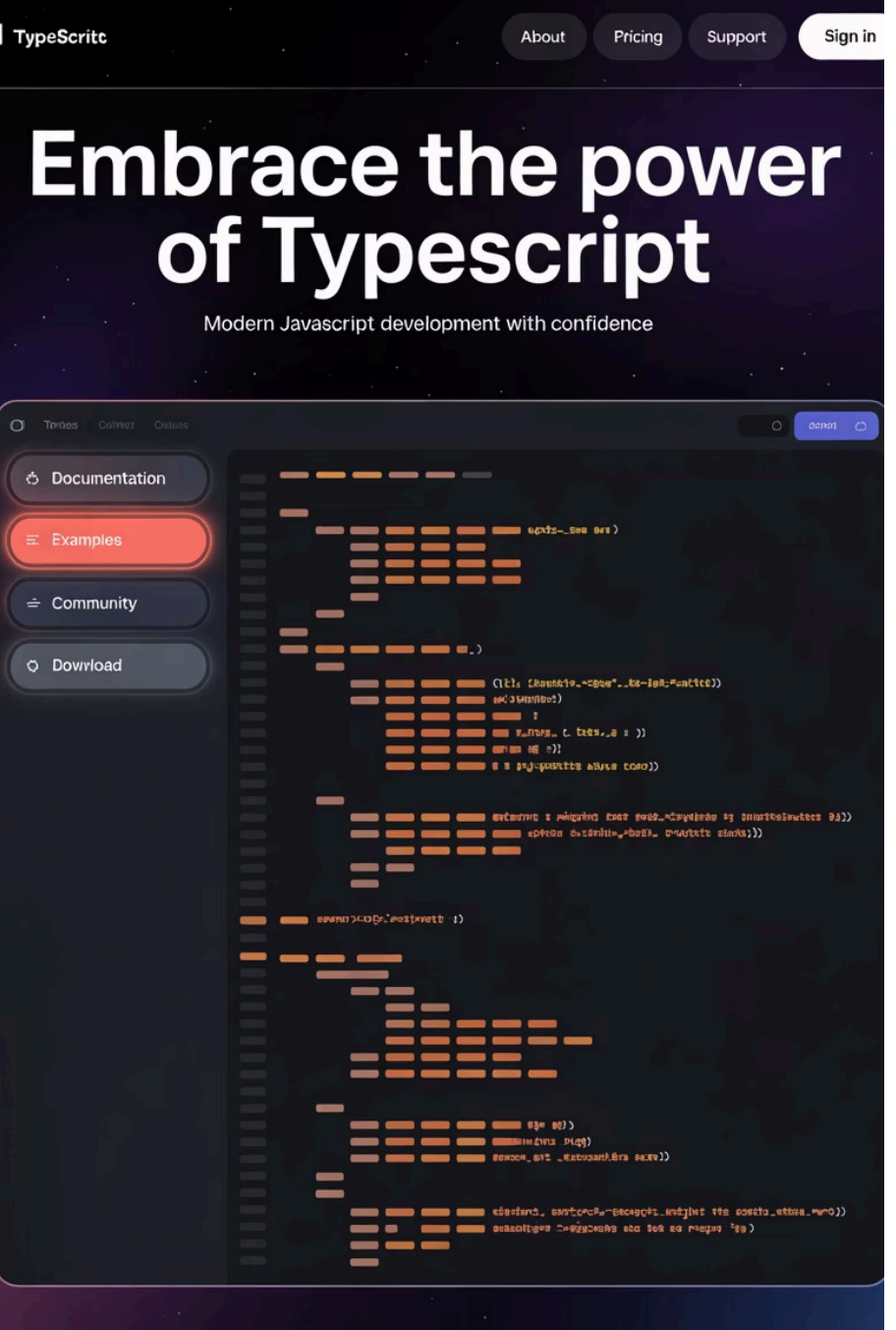
TypeScript catches type-related errors during development rather than at runtime, reducing bugs in production and saving valuable debugging time.

Enhanced Editor Support

Enjoy rich IDE features like intelligent code completion, inline documentation, and powerful refactoring tools that make development faster and more efficient.

Better Scalability

TypeScript's type system makes code more maintainable and easier to understand, especially as projects grow in size and complexity.



Key Features

Optional Static Typing

Define variables with specific types (string, number, boolean, etc.) to prevent type-related errors and improve code clarity.

Interfaces

Create clear data contracts that define the shape of objects, making code more predictable and self-documenting.

Modern JavaScript Support

Leverage the latest ECMAScript features while ensuring compatibility with older browsers through TypeScript's compilation process.

TypeScript vs. JavaScript

Feature	JavaScript	TypeScript
Static Typing	No	Yes (optional)
Error Checking	At runtime	At compile time
Interfaces	No	Yes
ES6+ Features	Partial	Full

TypeScript provides significant advantages for large-scale applications while maintaining JavaScript's flexibility.

Example: Basic TypeScript Syntax

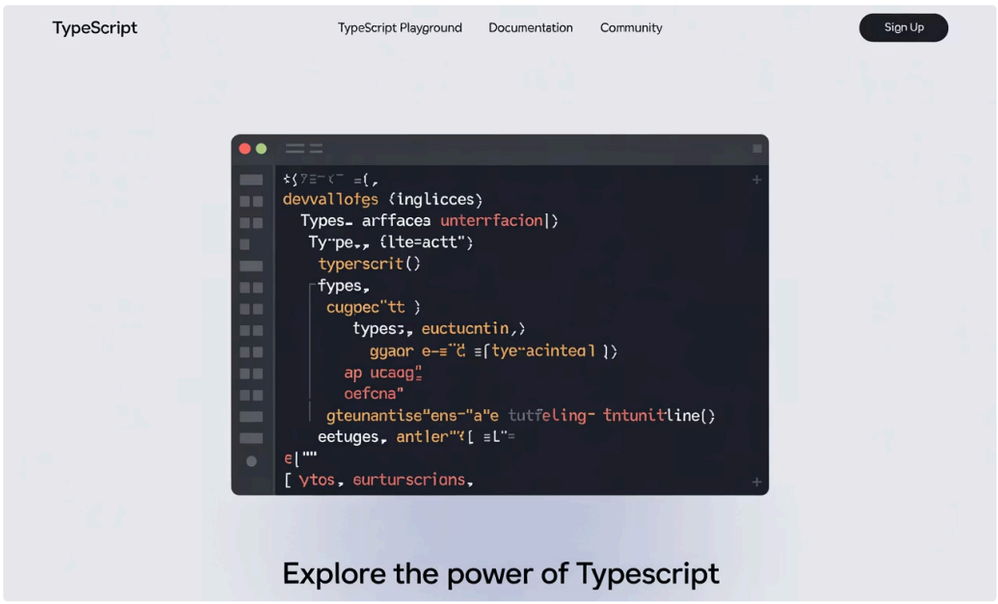
Variable Declarations with Types

```
// String type annotation
let name: string = "TypeScript";

// Number type annotation
let version: number = 4.5;

// Function with parameter types
// and return type
function greet(name: string): string {
  return `Hello, ${name}!`;
}

// Interface definition
interface User {
  id: number;
  name: string;
  isActive: boolean;
}
```



TypeScript's syntax builds on JavaScript, adding type annotations after variable names using colons. This example demonstrates basic type usage that helps prevent common programming errors.