

	Static Optimization	Dynamic Optimization
Definition	Optimization at compile-time or before execution	Optimization at runtime
Goal	Improve program performance by analyzing code and data structures	Improve program performance by monitoring execution and adapting to changing behavior
Techniques	Code transformations, data structure optimization, loop unrolling	JIT compilation, profiling, adaptive optimization
Advantage	No additional runtime overhead, can apply optimizations that can be determined in advance	Can adapt to changing program behavior and data characteristics
Disadvantage	Unable to adapt to changing program behavior and data characteristics	Additional runtime overhead, may not be effective in all cases
Best Use Cases	Well-understood program behavior and data characteristics	Uncertain or changing program behavior and data characteristics

Summary:

Static optimization is useful when the program's behavior and data characteristics are well-understood and unlikely to change, while dynamic optimization is useful when the program's behavior and data characteristics are uncertain or likely to change. Both techniques are important for improving program performance and should be used as appropriate for the specific program and its requirements.

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