

The Butterfly

machine code,  
assembly

**"native"**  
C, C++,  
Fortran

**"managed"**  
Java, C#,  
Scala

**"interpreted"**  
Python, R,  
Javascript

regex, JSON,  
config files...

fast, powerful, "close to the metal"

flexible, dynamic, convenient

Human-readable source  
compiles directly into  
CPU instructions.

- nothing exists at runtime but functions, bytes, and the OS
- OS sees your.exe

Source compiles to generic  
bytecode that another process  
(JVM or .NET) interprets.

- garbage collected
- dynamically optimized
- OS sees  
java -jar your.jar

Managed runtime steps  
through source one line  
at a time.

- no distinction between compile-time and runtime
- OS sees  
python your.py

