



INTRODUCTION TO PYTHON



Python Programming Language

Python is a high-level, general purpose programming language, its design emphasises code readability with the use of significant indentation.

Python is dynamically typed and garbage-collected.

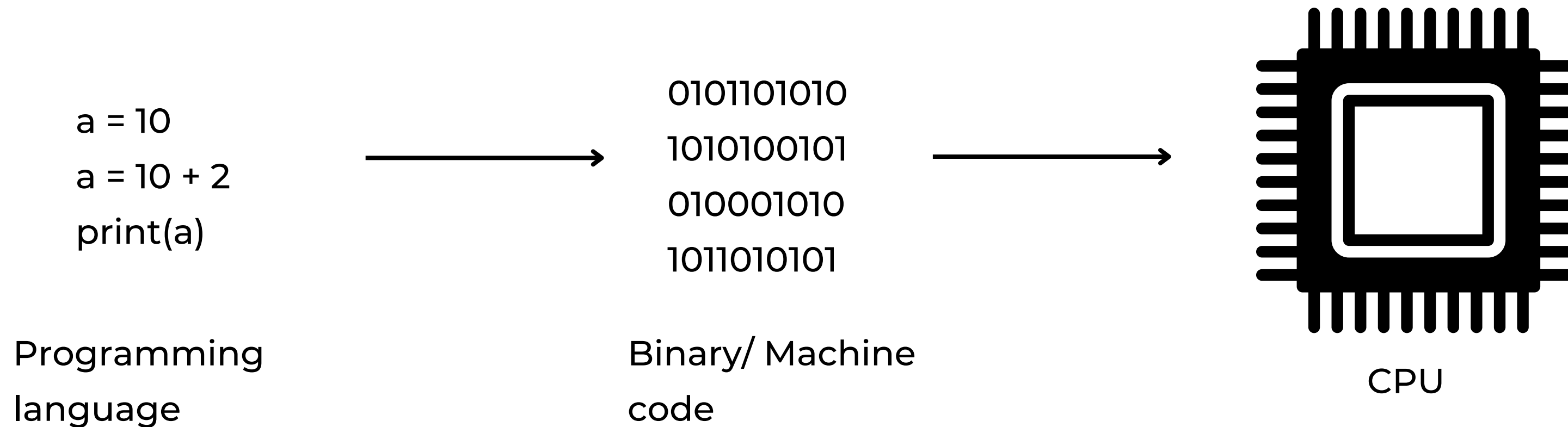


**LET'S DECODE
THIS STATEMENT**



Python is a high level programming language

High level programming language: A programming language with strong abstraction from details of computer.



Writing a program using machine code is extremely difficult for programmers.

Hence programmers who write machine code use a more readable format such as decimal, octal or hexadecimal.

Here is an example of a hexadecimal representation of 32 bit x86 machine code.

```
8B542408 83FA0077 06B80000 0000C383 FA027706 B8010000 00C353BB  
01000000 B9010000 008D0419 83FA0376 078BD989 C14AEBF1 5BC3
```

The above format, although better than 0's and 1's is still difficult to use.

Hence, assembly language was introduced which provided one abstraction level on top of machine code.

Assembly Language

To reduce the difficulty of writing machine code, assembly language was introduced.

Assembly language provided one abstraction level on top of machine code.

This is what Assembly code looks like:

```
_fib:
    movl $1, %eax
    xorl %ebx, %ebx
.fib_loop:
    cmpl $1, %edi
    jbe .fib_done
    movl %eax, %ecx
    addl %ebx, %eax
    movl %ecx, %ebx
    subl $1, %edi
    jmp .fib_loop
.fib_done:
    ret
```

More readable than machine code.

Had to directly work with hardware features of the processor i.e its registers.

Assembly language was still difficult, hence another layer of abstraction was added on top of it and a more human readable language like the C programming language was introduced.

C Programming Language

This is what a C program looked like:

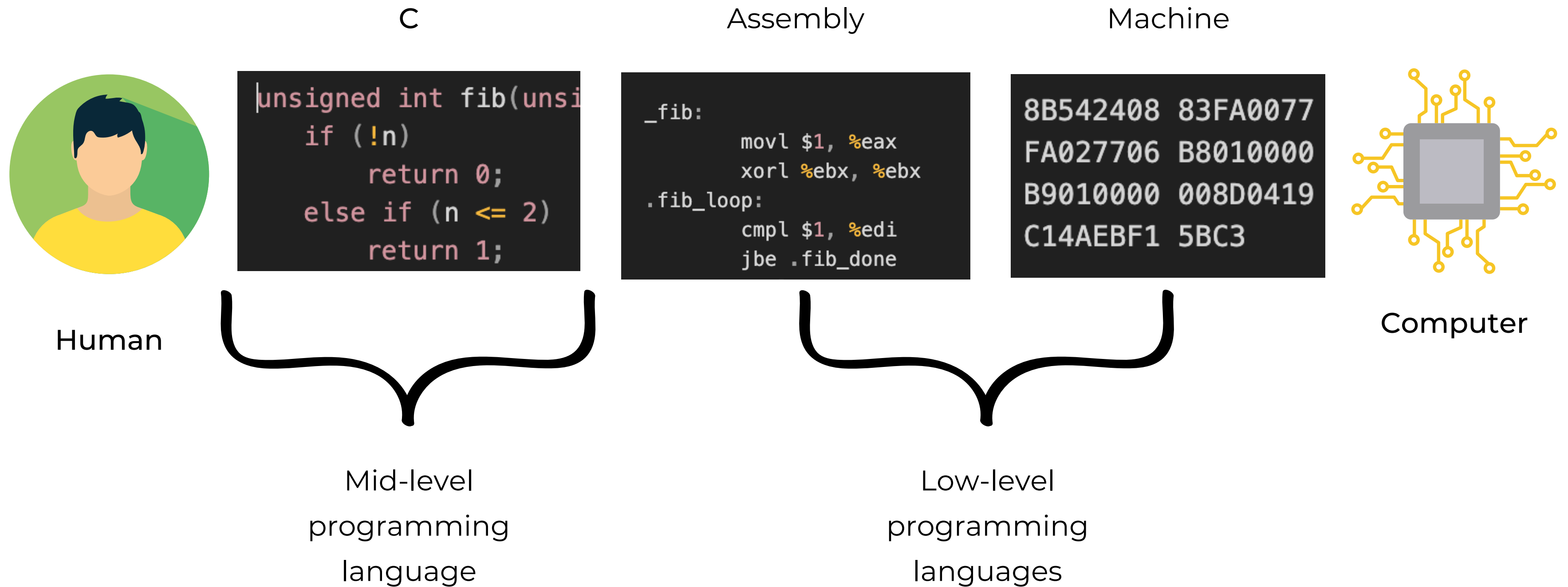
```
unsigned int fib(unsigned int n) {  
    if (!n)  
        return 0;  
    else if (n <= 2)  
        return 1;  
    else {  
        unsigned int a, c;  
        for (a = c = 1; ; --n) {  
            c += a;  
            if (n <= 2) return c;  
            a = c - a;  
        }  
    }  
}
```

Easy to use and more readable compared to machine code.

Programmers do not have to deal CPU with registers directly.

Human readable, uses regular words and characters.

Levels of programming language



Python: High level language

Python is a high-level language because its syntax is more human readable compared to C.

```
1 #!/usr/bin/python
2
3 print "Hello, World!";
4
```

"Hello, World!" program
in Python

```
1 #include <stdio.h>
2
3 int main()
4 {
5     printf("Hello, World! \n");
6     return 0;
7 }
8
```

"Hello, World!" program
in C

Python is a general purpose language

A programming language used for building software in a wide variety of application domains.

Python is a GPL because it can be used to write desktop software, create web applications data science, ML etc.

As opposed to general purpose programming language, we also have domain specific programming languages(DSL) as well like SQL.

DSL are used within a specific area, i.e sql can only be used for querying relational database and nothing else.

Python emphasises code readability

Python gives special importance to code readability.

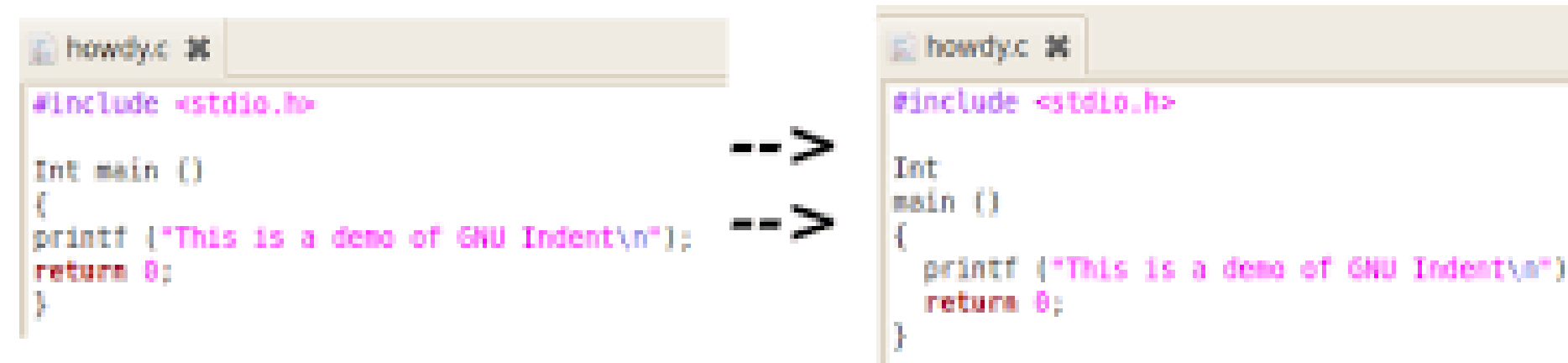
One of the most readable programming languages.

Easy to use, easy to maintain.

Python uses significant indentation

Indentation means having space at the beginning of line of code.

This is what indented v/s non-indented code looks like:



The image shows two side-by-side code editors, both titled 'howdy.c'. The left editor shows C code with significant indentation: the opening curly brace of the main function is on the same line as the function signature, and the body lines are indented. The right editor shows the same code but with the opening curly brace on a separate line, making the code less readable. Two arrows point from the left editor to the right one, indicating a transformation or comparison.

```
howdy.c  如何  
#include <stdio.h>  
  
int main ()  
{  
    printf ("This is a demo of GNU Indent\n");  
    return 0;  
}
```

-->
-->

```
howdy.c  如何  
#include <stdio.h>  
  
int  
main ()  
{  
    printf ("This is a demo of GNU Indent\n");  
    return 0;  
}
```

Makes code more readable.

in programming languages like C,C++ and Java indentation is used for code readability and formatting.

in Python, indentation is the part of syntax.

In Python, indentation is used to indicate a block of code.

Python & Java code blocks comparision

```
for (int i = 0; i < 5; i++) {  
    System.out.println(i);  
}
```

For loop in Java

```
for i in range(1, 11):  
    print(i)
```

For loop in Python

Python is dynamically typed

While declaring a variable in C, we need to define the type of variable.

Example: `int a = 10.`

The type of that variable cannot be changed during execution of code.

Python is a dynamically typed language.

We don't have to declare the type while creating any variable.

Also due to this, a variable can have different type at different times during execution.

In dynamic typing, the type of variable is decided at runtime.

Python is garbage collected

When you write code, you typically need to use data and this data needs to be saved into memory.

Example, let's say when you create a variable and store a value in it, we are essentially saving some data at a memory location.

When the program is done using or working with this data, the memory location is still not freed.

The programmer has to manually free up those spaces/ memory locations which were previously allocated.

This is another headache for programmers.

Garbage collection

Garbage collection is a process of automatic memory management.

Garbage collector reclaims memory which was allotted by the program but now is no longer used.

Python is garbage collected, which means as programmers we do not have to worry about freeing up or reclaiming allotted and unused memory.

We as programmers do not have to manually de-allocate the memory.

