

Q. What are Python's applications in real-world projects?

A. Here are some real-world applications of Python across different domains.

Data Science and machine learning -

Python dominates this field due to powerful libraries such

* NumPy, Pandas → Data manipulation & analysis

* Matplotlib, Seaborn, Plotly → Data visualization

* scikit-learn, TensorFlow, PyTorch → machine learning & deep learning.

Use Cases -

* Predictive analysis

* Fraud detection

* Image and speech recognition

* Recommender systems (like Netflix or Amazon)

Web Development -

Python is used to build, secure and scalable web applications

using frameworks like -

Django, Flask, FastAPI

use cases -

* Social networking sites

* E-commerce platforms

* APIs and microservices

ex.

Instagram, Pinterest and Spotify use Python in their backend.

Automation and scripting -

Python is perfect for automating repetitive tasks.

use cases -

* file and folder organizations

* Web scraping (with BeautifulSoup, Scrapy)

* Data entry automation

* Sending emails, generating reports or testing software.

Data Analysis and visualization -

Analysts use Python to process large datasets and draw

insights



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Example

```
x = 42    # x is an Integer
print(type(x)) # <class 'int'>

x = 3.14   # Now x is a float
print(type(x)) # <class 'float'>

x = "Python" # Now x is a string
print(type(x)) # <class 'str'>
```

Python allows the flexibility.

In statically typed language like C++ or Java, you must declare the variable type before using it.

Java

```
int x = 30;
```

```
x = "Hello"; // X Error - Can't assign a string to an int variable
```

Key points about Dynamic typing.

Feature

TYPE checking
variable type
flexibility

Description

Done at runtime, not compile time
Determined by the value assigned
Same variable can hold different data types
at different times.

Risk

Can lead to runtime errors if type
assumptions are wrong.

End of use

Ex - off pit fall -

```
x = 5
y = "3"
```

```
print(x+y) # X Type error - unsupported for +: 'int' and 'str'
```

TERM

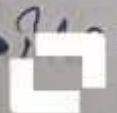
Meaning

Dynamically typed

variable types are determined at runtime
flexible, concise, and quick to write.

Advantage

Possible runtime type errors



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Professional Standard -
 following PEP8 shows professionalism and familiarity with Python's ecosystem.

Most open-source and corporate Python projects adhere to it.

5. Tool Support -

Tools like flake8, black and pylint automatically check or format your code according to PEP8.

Some key PEP8 Guidelines.

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Naming Conventions	- functions & variables - lower-case-with-underscores - classes - Camel case - constants - ALL-CAPS	—
spaces	Avoid extra spaces inside Parenthesis, brackets, or braces	<input checked="" type="checkbox"/> <code>my-list = [1, 2, 3]</code> <input type="checkbox"/> <code>my-list = [1, 2, 3]</code>
Comments	write clear, concise comments that explain why, not what	<code># Use binary search for efficiency.</code>

Without vs With PEP8

Without PEP8 ☐ -

```
def add(x,y): return (x+y)
```

With PEP8 ☒ -

```
def add(x,y):
    return x+y
```

ex

As per

Definition

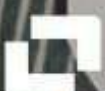
Importance

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Python Style guide (PEP8)

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flake8, black, pylint



Benefit clean, professional, maintainable code

Q - Who developed Python and in which year was it released?

A - Python was developed by Guido van Rossum, a Dutch programmer, in the late 1980's.

He started working on Python in Dec 1989 at CWI (Centrum Wiskunde & Informatica) in the Netherlands, as a hobby project during his Christmas holidays.

The first official release, Python 0.9.0, was made public in February 1991.

Detail

Developer

Country

Started

First Release

Organization

Inspiration

Name origin

Information

Guido van Rossum

Netherlands

December 1989

Feb 1991 (Python 0.9.0)

CWI (Centrum Wiskunde & Informatica)

ABC language (also developed in CWI)

From the British comedy group "Monty Python".

Q. What do you mean by "Dynamically typed" in Python?

A. In Python, the term "Dynamically typed" means that you don't need to declare the data type of variable when you create it - the Python interpreter automatically determines the type at runtime (while the program is running).

In simple terms:
when you write

`x = 10`

Python automatically knows that `x` is integer
later if you do:

`x = "Hello"`

Python changes the type of `x` to a string - without any error type declaration.

So, the type of variable in Python depends on the value currently assigned to it, not on how it was first defined.

* Increase flexibility and reduces code length.

Strong Community Support-

* Millions of Developers contribute tutorials, open-source projects, and help on platforms like stack overflow.

* makes learning and Problem Solving much easier.

Ideas for Rapid Prototyping-

Because of its simplicity and wide library support, Python allows you to build prototypes quickly - a huge advantage for startups and research work.

Used everywhere

* Web Development

* Data Science and AI

* Automation

* Game Development

* Cybersecurity

* IOT (Internet of Things)

Feature

Easy syntax

Large libraries

Cross-Platform

Versatile

Active Community

Why it matters

Great for Beginners

Saves development time

web, AI, Data etc. Runs Anywhere

web, AI, Data etc.

Plenty of learning resources

Q. What is the difference between Python 2 & Python 3?

A. Especially since many older projects were originally written in Python 2.

Feature

Python 2

Python 3

Release year

2000

2008

Current status

No longer supported
(as on Jan 1, 2020)

Actively developed and maintained

Print statement

print("Hello") (Statement)

print("Hello") function

Integer Division

5/2 = 2 (Integer division)

5/2 = 2.5 (True division)

Unicode handling

Text is stored as

Text is stored as unicode by default - better for internationalization.

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Use Cases-

- Business Intelligence Dashboards
- Stock market trend analysis
- Customer behavior analytics

Libraries:- pandas, numpy, matplotlib, Power BI Python Integration -
Game Development -

Though not as common as C++ for big titles, Python is used for smaller games and prototypes.

Frameworks: PyGame, Panda 3D

Use Cases-

- Educational or Indie game development
- Game scripting and AI logic.

Software Development & Prototyping-

Python helps developers quickly build and test software.

Use Cases-

- Desktop applications (using Tkinter, PyQt)
- Command-line tools
- Cross-platform utilities.

Scientific Computing & Research-

Python is heavily used in research because of its precision and flexibility.

Libraries- SciPy, SymPy, Jupyter Notebooks.

Use Cases-

- Simulations and modelling
- Bioinformatics
- Space and Physics research (used by NASA)

Cloud Computing & DevOps -

Python is often used to manage infrastructure and cloud services.

Use Cases-

- Cloud Automation (with Boto3 for AWS)
- Continuous Integration (Deployment (CI/CD) Pipelines
- Monitoring and logging systems.

Cyber Security-

Python is used to build and analyze security tools.

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Input function	raw-Input() for strings, Input() for eval	Input() always returns a string
Iterators	methods like .keys(), .values() returns lists	They return iterators (more memory efficient)
Error handling	except exception, e:	except exception as e:
Syntax		
Libraries	many old libraries were built for Python 2	Modern libraries only support Python 3
Print without Parenthesis	Allowed	Not Allowed
Range/xRange	xrange() used for efficiency like xrange() - efficiency by default.	range() between

ex

Python code 2 -

Print "Hello, world!"

Print 5/2

Output -

Hello, world!

2

Python code 3 -

print("Hello, world!")

print 5/2

Output -

Hello, world!

2.5

- * Python 3 is the future (and present) of Python
- * Python 2 is obsolete and should not be used for new projects.
- * Almost all modern libraries, frameworks and tools only support Python 3.

Python 2

Legacy, No support

ASCII default

Print statement

5/2 → 2

older syntax

Python 3

Actively maintained

Unicode default

print() function

5/2 → 2.5

Cleaner, modern syntax



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Q. What is the difference between a Compiler and an Interpreter and which does Python use?

A. Compiler vs Interpreter

Feature	Compiler
Execution	Translate the entire source code into machine code before running it.
Output	creates an executable (eg- .exe).

Speed	Faster during execution (because code is precompiled)
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Error Detection	Detects and reports all errors at once after compilation
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Examples	C, C++, Java (compiled to bytecode)
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Interpreter
Translates & executes the Python program line by line.
Doesn't create a separate executable file
Slower, since it translates code each time it runs.
Stops immediately code when it encounters an error.
Python, JavaScript, Ruby-

What does Python use -

Python is Interpreted, but technically it uses both a Compiler and an Interpreter.

1. Compiler Phase:

* Python first compiles your `.py` source code to bytecode (a lower-level, platform-independent code).

* The byte code is stored in `.pyc` files (inside the `__pycache__` folder)

2. Interpreter Phase:

Then, the Python virtual machine (PVM) interprets this bytecode and executes it line by line. So, we often say:

Python is an interpreted language, but it uses an internal bytecode compiler before interpretation.

Python compiles source code to bytecode, then interprets that bytecode at runtime using the Python virtual machine (PVM).



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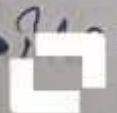
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