Improve Your Code with Type Checking

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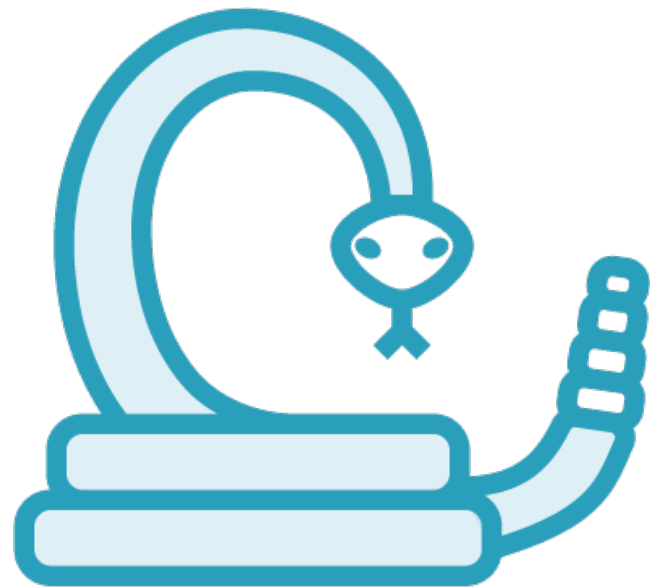
Overview

Static typing in Python

- Type hints
- Gentle introduction
- Why?

Not: type theory

Not: generics, custom types, etc.

Static vs. Dynamic Typing

Static typing (Java, C#, ...)
- Type declarations in code
- Variable types
- Function argument types
- Can be checked statically (compile-time)

Dynamic typing (Python)
- No type information in code
- Type errors happen at runtime

Demo

Static vs. dynamic typing
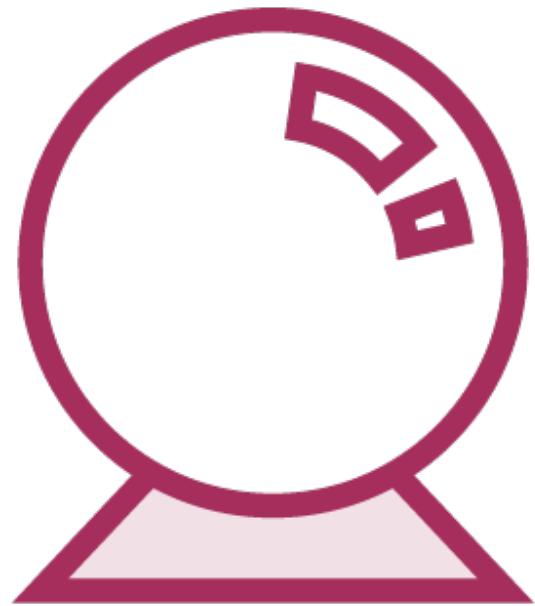
Static Typing in Python

Type hints

- Optionally add type information

Ignored by Python interpreter

- Running gives the same results

- Can call functions with incorrect argument types

- Can get runtime type errors

Static Typing in Python

Added in Python 3.5

– Still changing

Mypy

– Command line checker

– Standard implementation

Why?

Correctness

Documentation

IDE Support

Function Hints

```python
# Two int arguments, return a float

def plus(num1: int, num2: int) -> float:

    return num1 + num2



# Add default value for an argument after the type
annotation

def f(num1: int, my_float: float = 3.5) -> float:

    return num1 + my_float
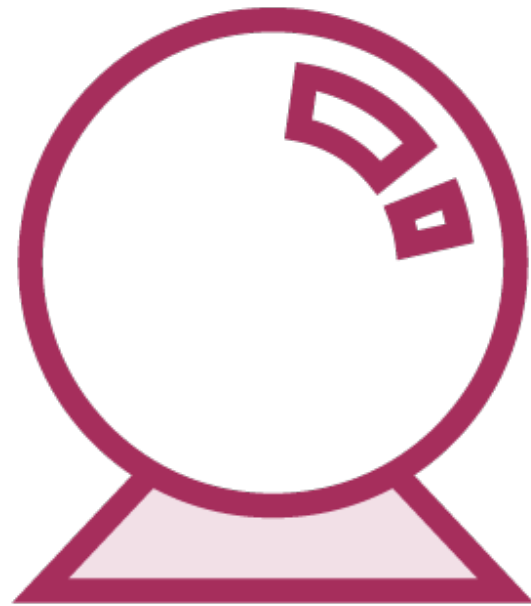```

# Variable Hints

```python
# Declare the type of a variable
age: int = 1


# In Python 3.5 and earlier use a comment
age = 1   # type: int
```

Static Typing in Python: Why?

Find bugs at compile-time

Easier maintenance
- Type hints document your code
- Improved IDE support

Better program design

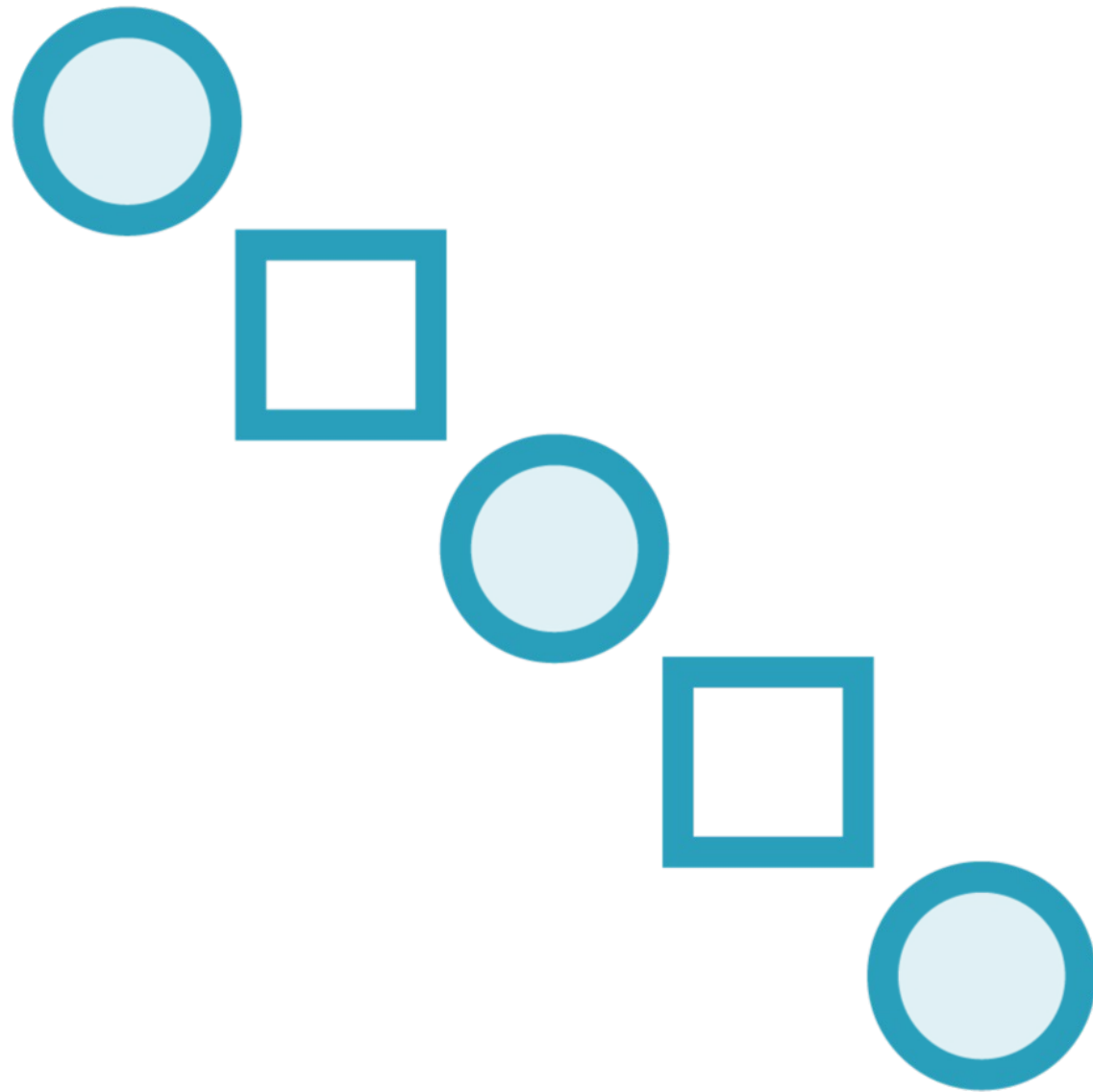**But: no need to use it always**

Demo

Applying type hints in a project

Classes are Types

Built-in classes

- int, float, str, bool, etc.
- list, dict, tuple, etc.

Classes you wrote

Classes you import
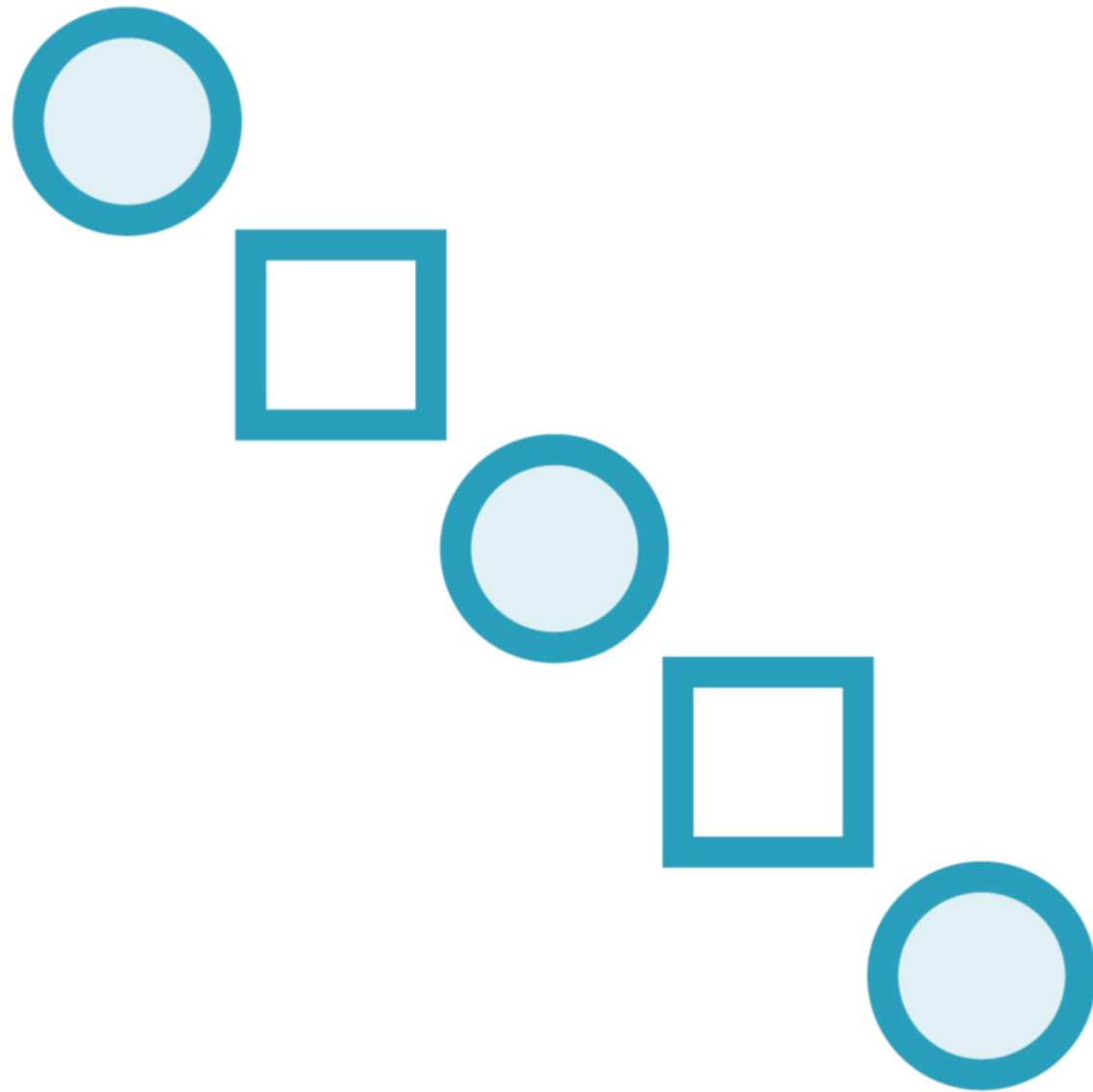
But: not all types are classes!

Demo

Applying type hints in a project

- Collections
- Union
- Any

Some Types Are Not Classes

Union

    – int | str.   Union[int, str]

    – float | None   Optional[float]

Any

Demo

Mypy

- Command line type checker

Summary

Gentle intro into type hints

Adding simple type hints

Static type checking with mypy/Pycharm

Prevent errors

Improve maintainability