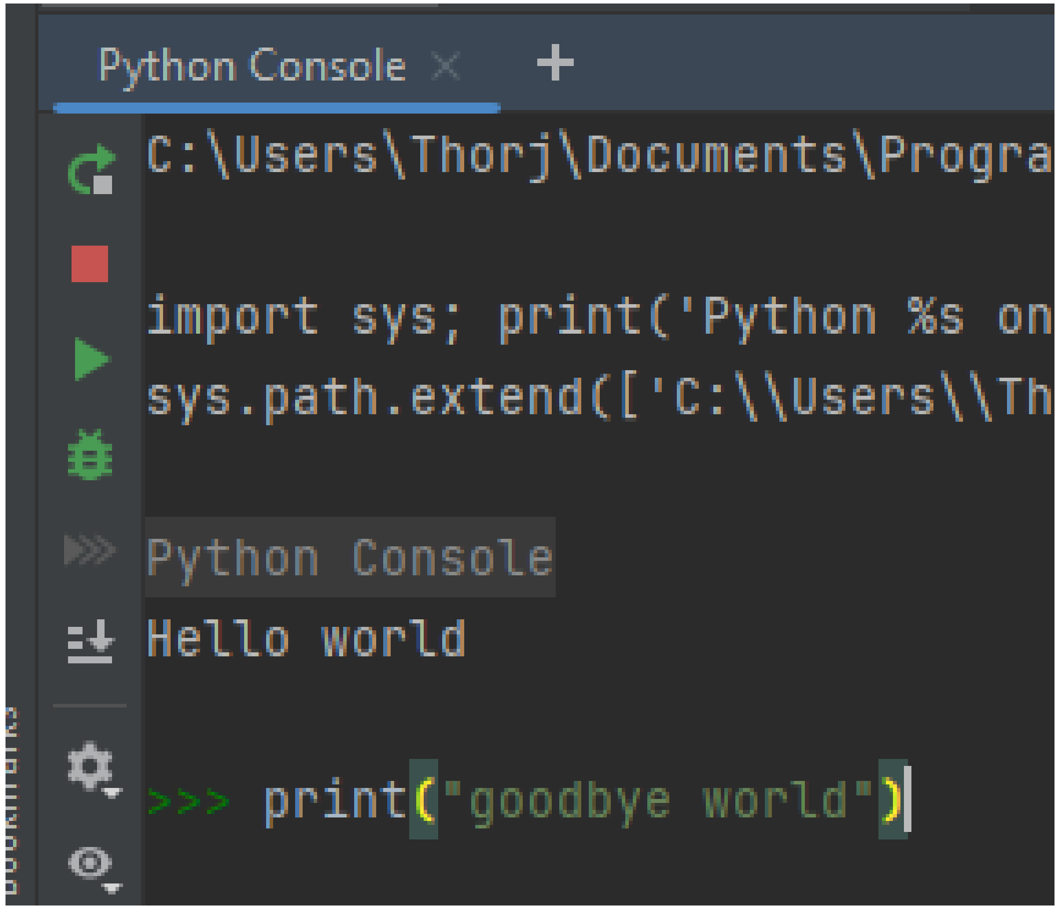
Introduction to Python

Please stay even if you know Python, we will be covering newer aspects like type hinting and we will do our best to be brief

What is Python

- A scripting language
  - Not compiled
  - No need for: static void main(string[] args)
- Built in REPL
  - Accessed by running python in the terminal with no commments
- Not the first choice if speed of execution is important
- Could be the first choice if development speed for small programs is important

The REPL?



```
C:\Users\Thorj\Documents\Progra

import sys; print('Python %s on
sys.path.extend(['C:\\Users\\Th

Python Console
Hello world

>>> print("goodbye world")
```

Installing Python

- Version 3.12
    - Best support for type hinting
    - Faster runtime performance than older versions
- https://www.python.org/downloads/

IDE

- PyCharm (with JetBrains student license)
  - https://www.jetbrains.com/community/education/#students

OR

- VSCode
  - https://code.visualstudio.com/
  - Extension
    - https://code.visualstudio.com/docs/languages/python

Virtual environment (Venv) PyCharm

- Ensures dependency isolation between projects
- https://docs.python.org/3/tutorial/venv.html

PyCharm

- Settings ->
- Python interpreter ->
- Add interpreter ->
- Local ->
- New virtual env

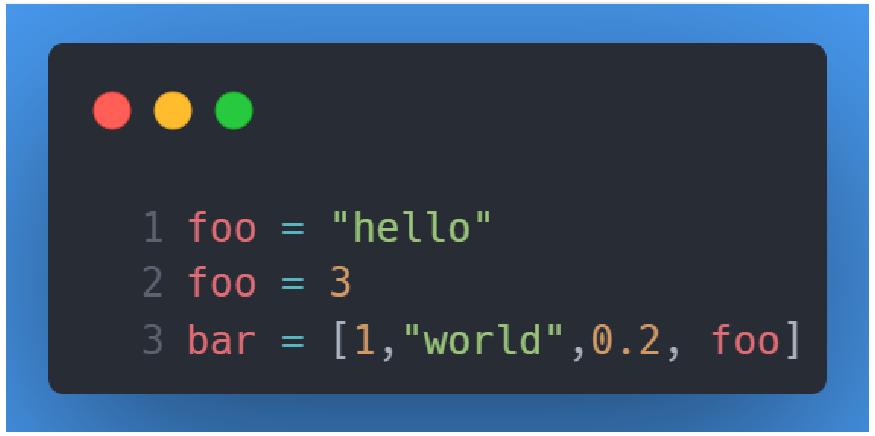
Virtual environment (Venv) VSCode

VSCode

- Cd into folder where you want python venv to be located.
- “python –m venv <name of virtual env>“

Variables

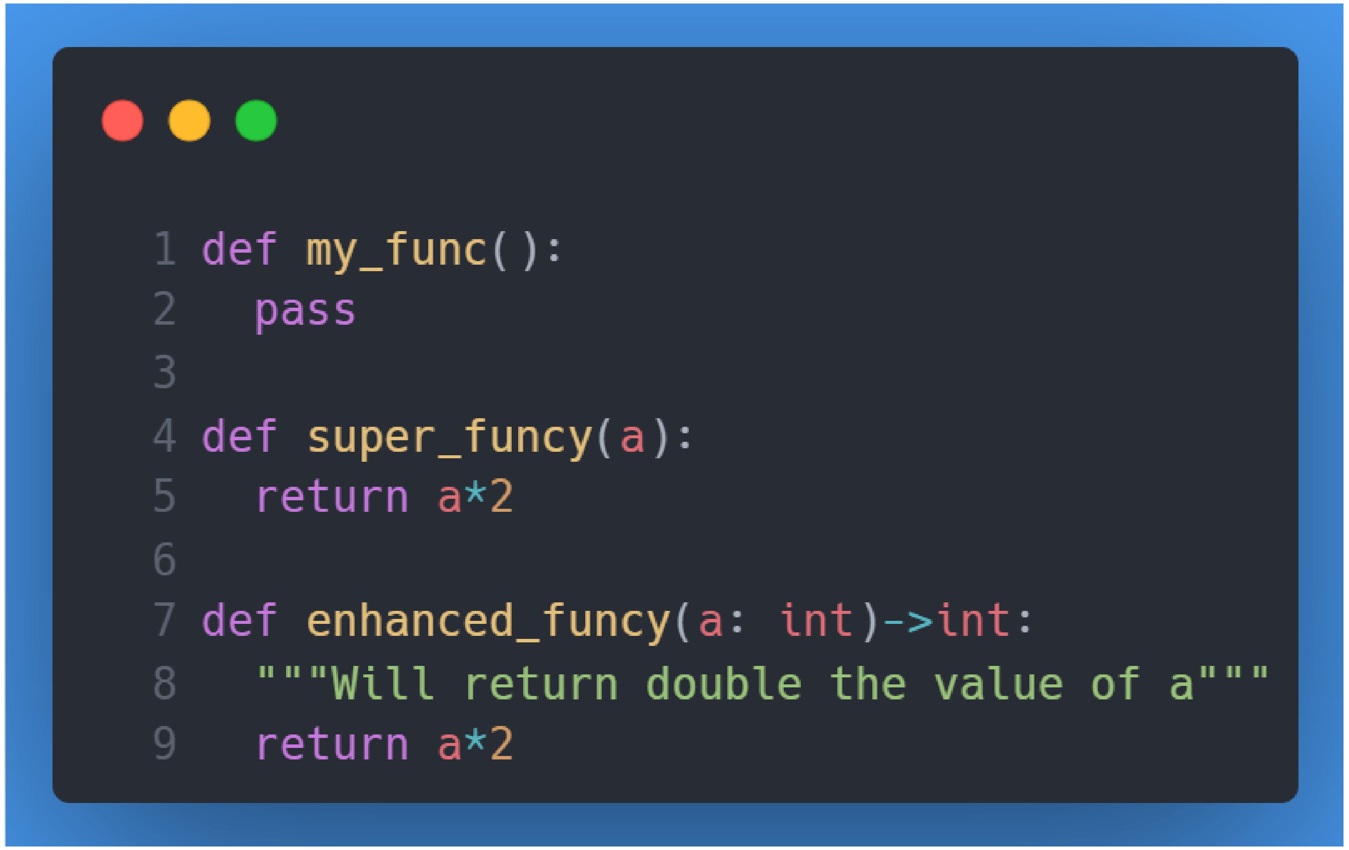
- Dynamic Typing
    - Decided based on assigned value
- No constants
- Functions can be assigned to variables and function names are variables



```
foo = "hello"
foo = 3
bar = [1,"world",0.2, foo]
```

Functions

- Example:



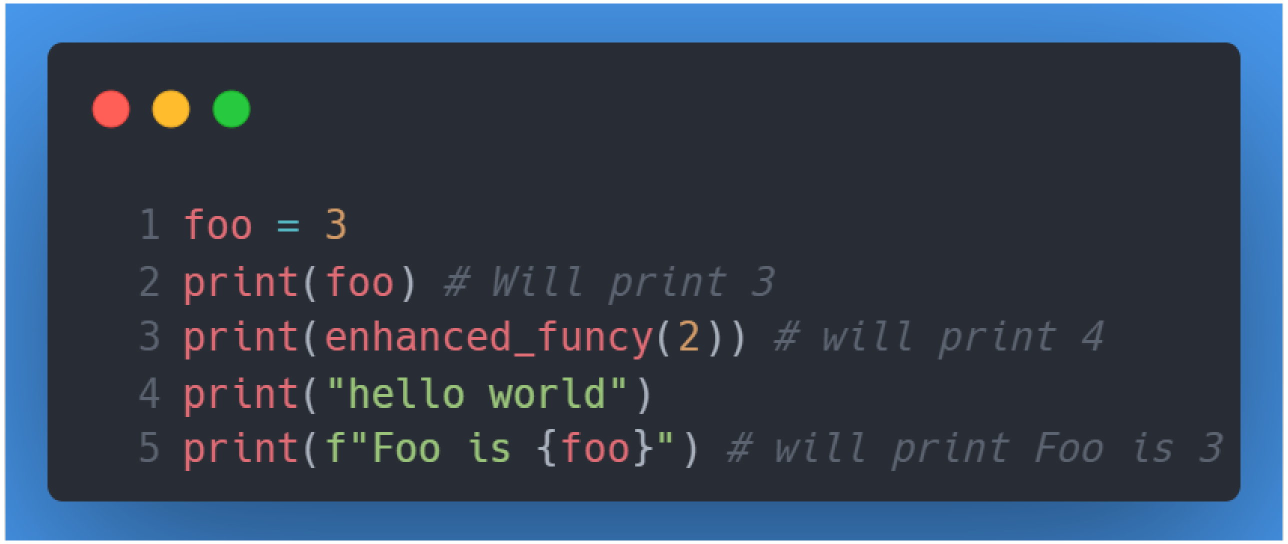
```python
def my_func():
  pass

def super_funcy(a):
  return a*2

def enhanced_funcy(a: int)->int:
  """Will return double the value of a"""
  return a*2
```

Printing

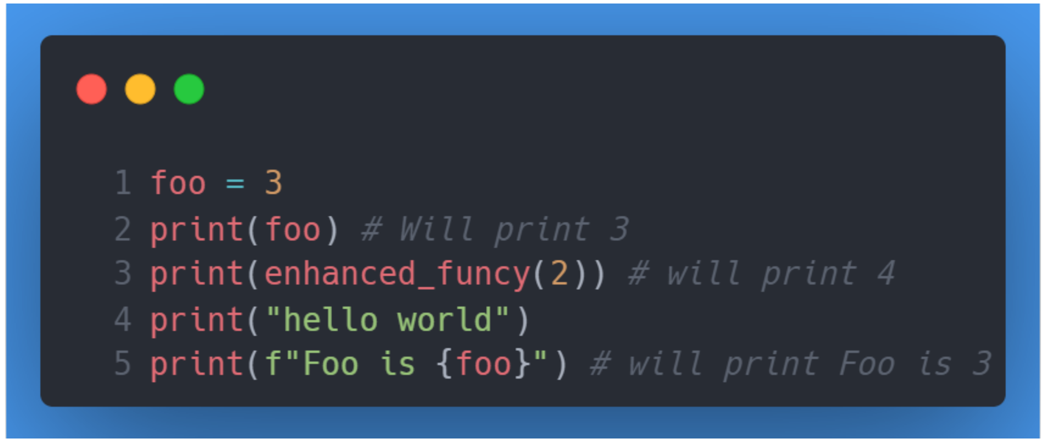
- The print function
- String formatting with f-strings
  - Dont use the old way
  - https://docs.python.org/3/tutorial/inputoutput.html



```python
foo = 3
print(foo) # Will print 3
print(enhanced_funcy(2)) # will print 4
print("hello world")
print(f"Foo is {foo}") # will print Foo is 3
```

Comments

- # single line comment
  - VsCode (Ctrl + K -> C/U)
- Function documentation using """
  - Can be accessed in pycharm using ctrl+q



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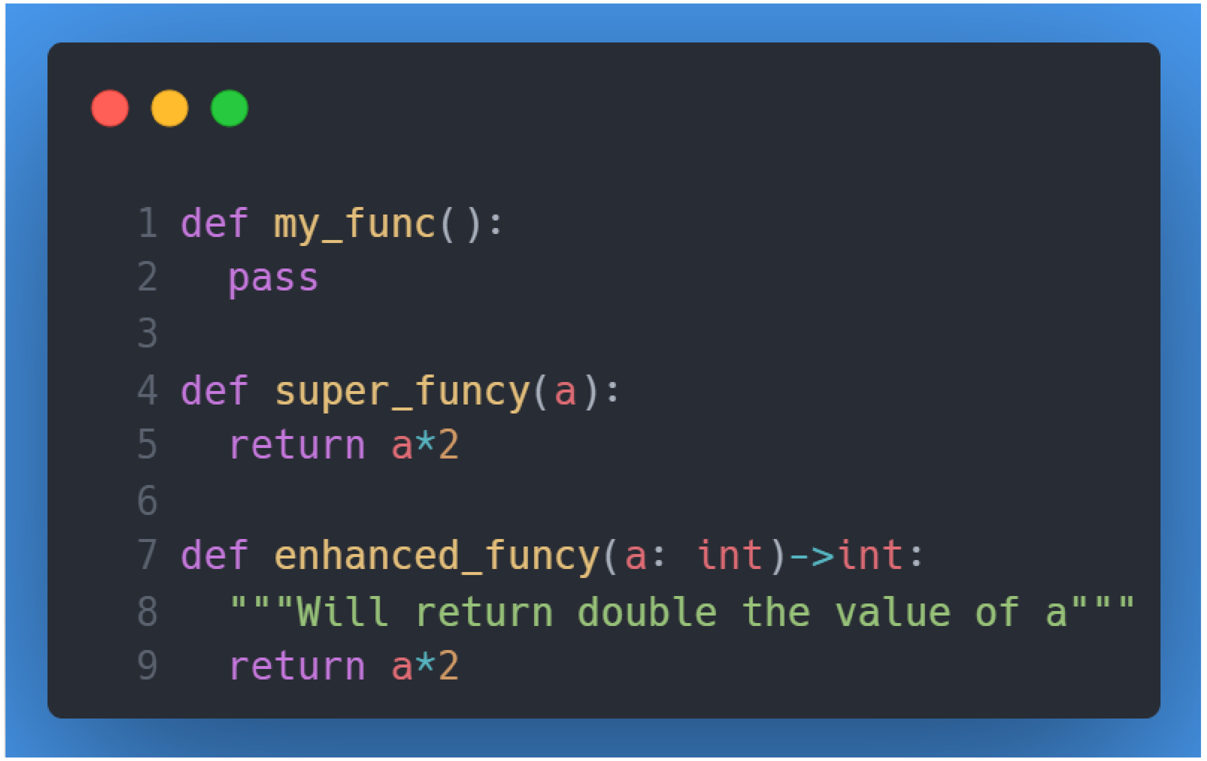

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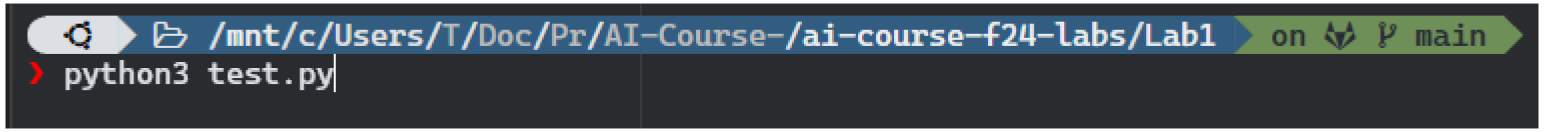
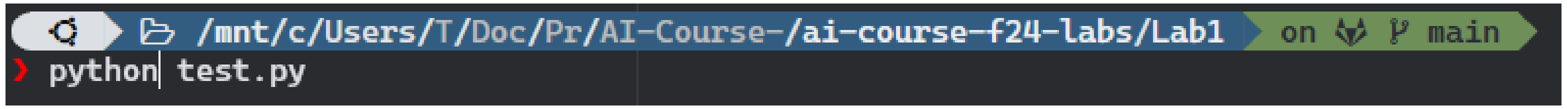
Running code

- In terminal: python <name of file>



```
 /mnt/c/Users/T/Doc/Pr/AI-Course-/ai-course-f24-labs/Lab1  on  main
❯ python3 test.py
```



```
 /mnt/c/Users/T/Doc/Pr/AI-Course-/ai-course-f24-labs/Lab1  on  main
❯ python test.py
```

Debugging

- Use the debugger. It is nice
- In pycharm add breakpoints then run using the bug icon
- VSCode ”Ctrl + Shift + D” choose debugger of choice

Data types

Int
- Python: ‘int’
- Java: ‘int’

Float
- Python: ‘float’
- Java: ‘float/double’

Boolean
- Python: ‘bool’
- Java: ‘boolean’

String
- Python: ‘str’
- Java: ‘String’

List
- Python: ‘list’
- Java: ‘ArrayList/LinkedList’

Tuple(immutable)
- Python: ‘tuple’
- Java: ‘Not comparable’

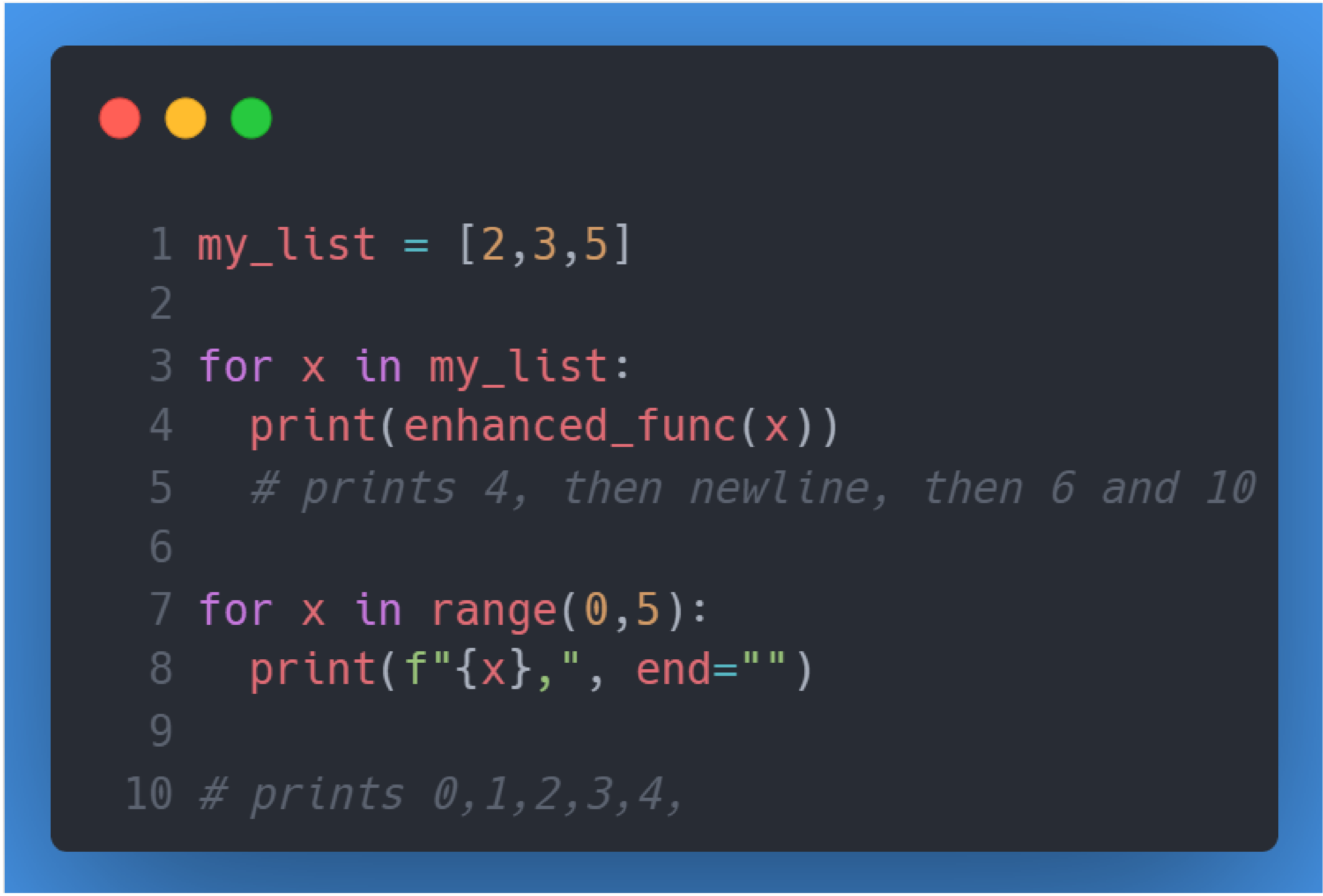
Dictionary
- Python: ‘dict’
- Java: ‘HashMap/Hashtable’

Set
- Python: ‘set’
- Java: ‘Set’

For more:
https://www.w3schools.com/python/python_datatypes.asp

loops

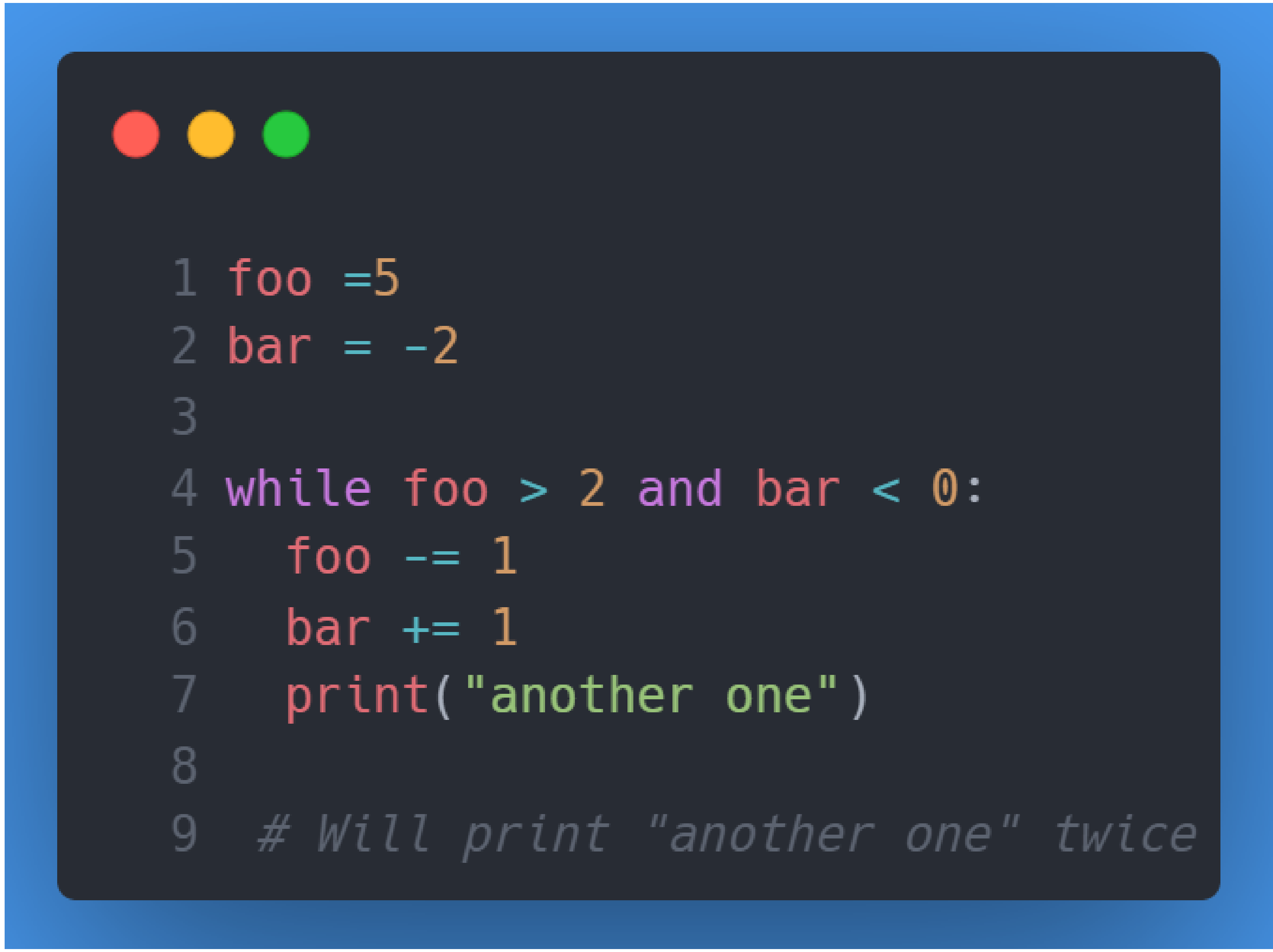
- For loop
  - The range function



```
my_list = [2,3,5]

for x in my_list:
  print(enhanced_func(x))
  # prints 4, then newline, then 6 and 10

for x in range(0,5):
  print(f"{x},", end="")

# prints 0,1,2,3,4,
```

loops

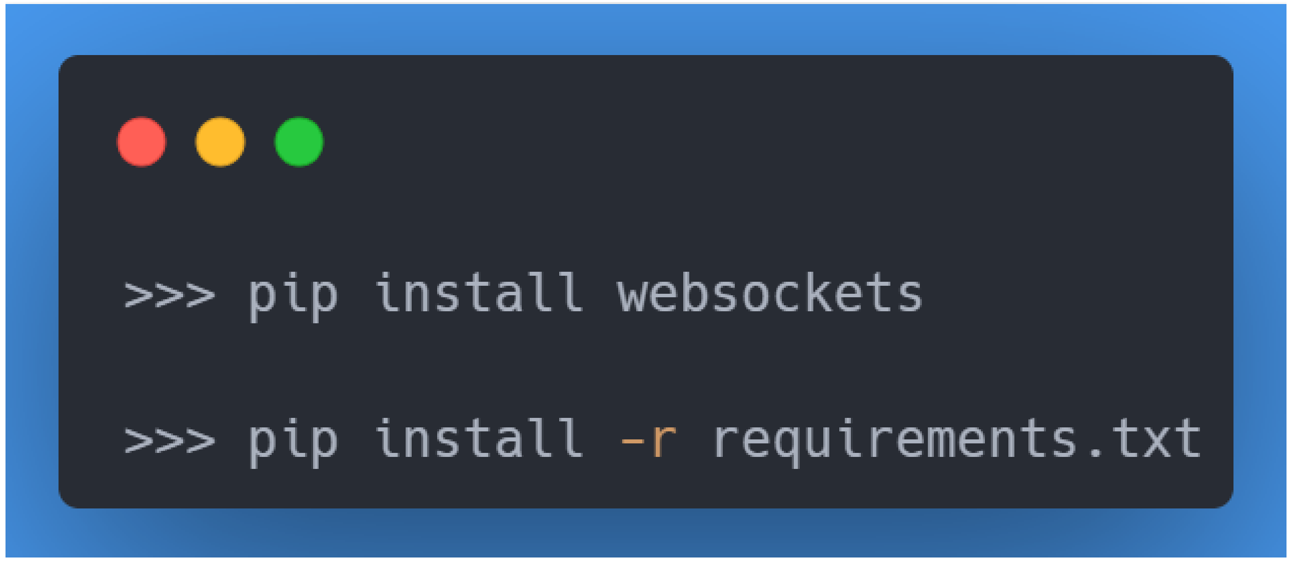
While loop



```python
foo =5
bar = -2

while foo > 2 and bar < 0:
  foo -= 1
  bar += 1
  print("another one")

 # Will print "another one" twice
```

Installing dependencies

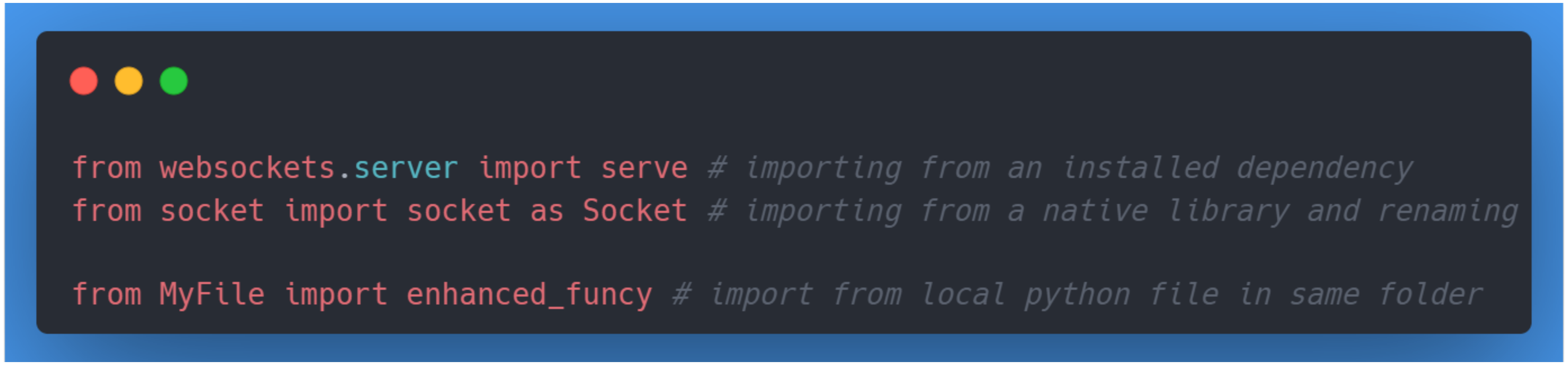
- Pip install <anything>
- Requirements.txt
  - https://learnpython.com/blog/python-requirements-file/
  - https://pip.pypa.io/en/stable/reference/requirements-file-format/



```
>>> pip install websockets

>>> pip install -r requirements.txt
```

Import dependencies

- Import from neighbouring files in the same directory
- Import dependencies that have been installed with pip



```
from websockets.server import serve # importing from an installed dependency
from socket import socket as Socket # importing from a native library and renaming

from MyFile import enhanced_funcy # import from local python file in same folder
```

Syntactic sugar

- Type hinting
  - https://docs.python.org/3/library/typing.html
  - More maintainable code and less headaches
- List comprehensions
  - https://docs.python.org/3/tutorial/datastructures.html
  - Concise creations of lists, that are also readable
- Ternary if statements
  - https://www.geeksforgeeks.org/ternary-operator-in-python/
  - Denser code
- Lambda functions
  - https://www.w3schools.com/python/python_lambda.asp
  - Anonymous functions

About readability

- PEP
  - The python standard for how to write this language
  - Includes things like using snake_case

- Type hint your code
  - We have done it, so you can too
  - Everyone will be better off from it

- Write docstrings for your functions

- Python as a language aims to be readable, by spelling out operations

And so much more

- Utilizing Python to its full extent is a much much longer course
- Some things we have not even grazed:
    - Classes
    - "magic" methods (__<something>__)
    - Inheritance
        - Including multiple inheritance
    - Async/await
        - Including asyncio
    - The GIL
    - Threads
    - Exception handling
        - Try
        - Except
    - The variable called __name__

Todays Exercises

- No mandatory assignments
  - But! The exam will contain questions that can only be answered after having solved the exercises

- The exercises are split into assignments and homework.
  - You are welcome to work on both while here, but we expect you to finish the assignments.
  - We dont expect you to finish both homework and assignments

- The assignments are in a separate pdf on itsLearning and alongside the code

- The code is shared through GitLab
  - https://gitlab.sdu.dk/ai-course-f24/ai-course-f24-labs
  - Fork the repo to get your own copy, but dont open pull requests unless to fix mistakes
  - Next week we will show how to get your repo updated with labs2 (dont create the folders on your own)