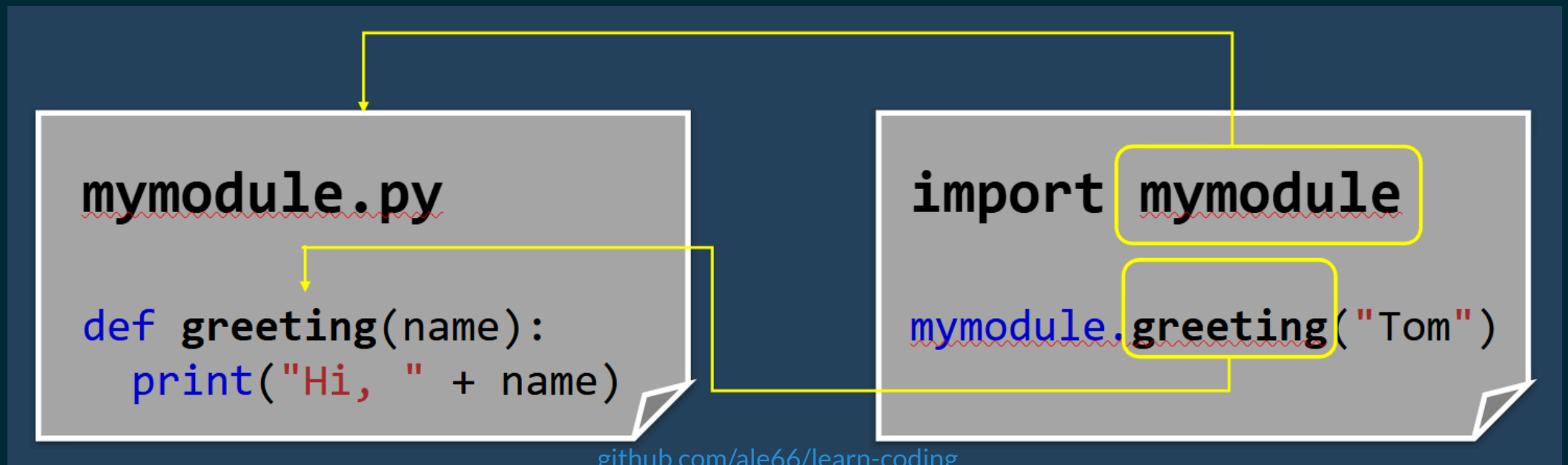# LEARN CODING

ale66

PYTHON MODULES

- functions allow to write a coherent, reusable code in isolation

- a *module* allows writing a coherent, reusable set of functions in isolation

- a module is a `.py` file that sits either locally or in designated locations controlled by the Python interpreter

- `pip` manages the designated locations and installs new modules

- an inclusion mechanism makes functions from a module file be listed in the *function space* of the program

```
mymodule.py

def greeting(name):
    print("Hi, " + name)
```

```
import mymodule

mymodule.greeting("Tom")
```

github.com/ale66/learn-coding

USEFUL PYTHON MODULES

MATH

```
1  import math
2
3  mynum = 10
4
5  # This will print 3.16
6  print(math.sqrt(mynum))
```

9.2. math — Mathematical functions

This module is always available. It provides access to the mathematical functions defined by the C standard.

These functions cannot be used with complex numbers; use the functions of the same name from the cmath module if you require support for comple numbers and those which don't is made since most users do not want to learn quite as much mathematics as required to understand complex numb detection of the unexpected complex number used as a parameter, so that the programmer can determine how and why it was generated in the first pla

The following functions are provided by this module. Except when explicitly noted otherwise, all return values are floats.

9.2.1. Number-theoretic and representation functions

math.**ceil**(x)
    Return the ceiling of x as a float, the smallest integer value greater than or equal to x.

math.**copysign**(x, y)
    Return x with the sign of y. On a platform that supports signed zeros, copysign(1.0, -0.0) returns -1.0.

    New in version 2.6.

math.**fabs**(x)
    Return the absolute value of x.

math.**factorial**(x)
    Return x factorial. Raises ValueError if x is not integral or is negative.

    New in version 2.6.

math.**floor**(x)
    Return the floor of x as a float, the largest integer value less than or equal to x.

math.**fmod**(x, y)
    Return fmod(x, y), as defined by the platform C library. Note that the Python expression x % y may not return the same result. The intent of th precision) equal to x - n*y for some integer n such that the result has the same sign as x and magnitude less than abs(y). Python's x % y returns a float arguments. For example, fmod(-1e-100, 1e100) is -1e-100, but the result of Python's -1e-100 % 1e100 is 1e100-1e-100, which cannot be represented function fmod() is generally preferred when working with floats, while Python's x % y is preferred when working with integers.

math.**frexp**(x)
    Return the mantissa and exponent of x as the pair (m, e). m is a float and e is an integer such that x == m * 2**e exactly. If x is zero, returns (0.0, representation of a float in a portable way.

math.**fsum**(iterable)
    Return an accurate floating point sum of values in the iterable. Avoids loss of precision by tracking multiple intermediate partial sums:

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RE

Support text parsing an manipulation

Example: find UK cell phone numbers, e.g., +44-7-449-001020, in a text

```python
1   import re
2
3   PATTERN = r'+44-7-\d{3}-\d{6}'
4
5   my_text = "..."
6
7   phone = re.search(PATTERN, my_text)
8
9   if phone:
10      print("First phone no.:", phone.group())
```

CSV

Useful to import data files into our variables

Examples are in the 'files' lecture

RANDOM NUMBERS

- Why we need random numbers?

  - Testing!

  - Generating test datasets

- Aside from obvious applications like gambling or creating unpredictable scenarios in a computer game, randomness is important for Cryptography

- Cryptography requires numbers that attackers *can't guess*

RANDOM NUMBERS (CONT.)

Are only pseudo-random

all languages have a dedicated module: crucial in several activities

Python implements Mersenne twisters; numpy has PCG64

```python
1  import random
2
3  # what does it print?
4  my_random_num = random.randint(1, 10)
5
6  print(my_random_num)
7  print(my_random_num)
8  print(my_random_num)
```

```python
1  import random
2
3  r1, r2, r3 = random.randint(1, 10), random.randint(1, 10), random.randint(1, 10)
4
5  print(r1)
6  print(r2)
7  print(r3)
```

```python
1  import random
2
3  alist = list()
4
5  for i in range(10):
6
7    alist.append(random.randint(1, 10))
8
9    print(alist)
10
11 [7, 3, 6, 6, 7, 5, 3, 3, 5, 5]
```

THE RANDOM MODULE

```python
 1  from random import *
 2
 3  # Generate a pseudo-random number between 0 and 1
 4  print(random())
 5
 6  # Pick a random number between 1 and 100
 7  print(randint(1, 100))
 8
 9  # Shuffle the list items
10  items = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
11  print(shuffle(items))
12
13  # Pick 4 random items from the list
14  print(sample(items, 4))
```

SEEDING RANDOM GENERATORS

- sometimes the pseudo-random sequence should be repeated for debuggin or validation

- The seed value is important in cyber-security to pseudo-randomly generate a strong secret encryption key.

- by re-using a custom seed value, we can initialize the strong pseudo-random number generator the way we want.

```python
 1  import random
 2
 3  random.seed(1)
 4
 5  alist = list() # or []
 6
 7  for i in range(10):
 8      alist.append(random.randint(1, 10))
 9
10  print(alist)
11  [3, 10, 2, 5, 2, 8, 8, 8, 7, 4]
```

This always prints the same sequence

```
 1  random.seed(1)
 2
 3  alist = list() # or []
 4
 5  for i in range(10):
 6      alist.append(random.randint(1, 10))
 7
 8  print(alist)
 9  #-------------
10  random.seed(2)
11
12  # empty out the list
13  alist = list()
14
15  for i in range(10):
16      alist.append(random.randint(1, 10))
17
18  print(alist)
```