Strings

Premanand S
AP / SENSE / VIT-C

String Data Type

- A string is a sequence of characters
- A string literal uses quotes 'Hello' or "Hello"
- For strings, + means “concatenate”
- When a string contains numbers, it is still a string
- We can convert numbers in a string into a number using int()

```
>>> str1 = "Hello"
>>> str2 = 'there'
>>> bob = str1 + str2
>>> print(bob)
Hellothere
>>> str3 = '123'
>>> str3 = str3 + 1
Traceback (most recent call
last):  File "<stdin>", line 1,
in <module>
TypeError: cannot concatenate
'str' and 'int' objects
>>> x = int(str3) + 1
>>> print(x)
124
>>>
```

Reading and Converting

- We prefer to read data in using strings and then parse and convert the data as we need
- This gives us more control over error situations and/or bad user input
- Input numbers must be converted from strings

```
>>> name = input('Enter:')
Enter:Chuck
>>> print(name)
Chuck
>>> apple = input('Enter:')
Enter:100
>>> x = apple - 10
Traceback (most recent call
last):  File "<stdin>", line 1,
in <module>
TypeError: unsupported operand
type(s) for -: 'str' and 'int'
>>> x = int(apple) - 10
>>> print(x)
90
```

Looking Inside Strings

- We can get at any single character in a string using an index specified in square brackets
- The index value must be an integer and starts at zero
- The index value can be an expression that is computed

b	a	n	a	n	a
0	1	2	3	4	5

```
>>> fruit = 'banana'
>>> letter = fruit[1]
>>> print(letter)
a
>>> x = 3
>>> w = fruit[x - 1]
>>> print(w)
n
```

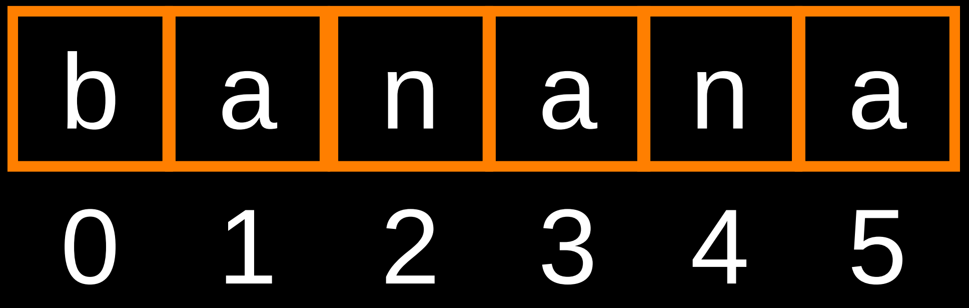
A Character Too Far

- You will get a python error if you attempt to index beyond the end of a string
- So be careful when constructing index values and slices

```
>>> zot = 'abc'
>>> print(zot[5])
Traceback (most recent call
last):  File "<stdin>", line
1, in <module>
IndexError: string index out
of range
>>>
```

Strings Have Length

The built-in function len gives us the length of a string

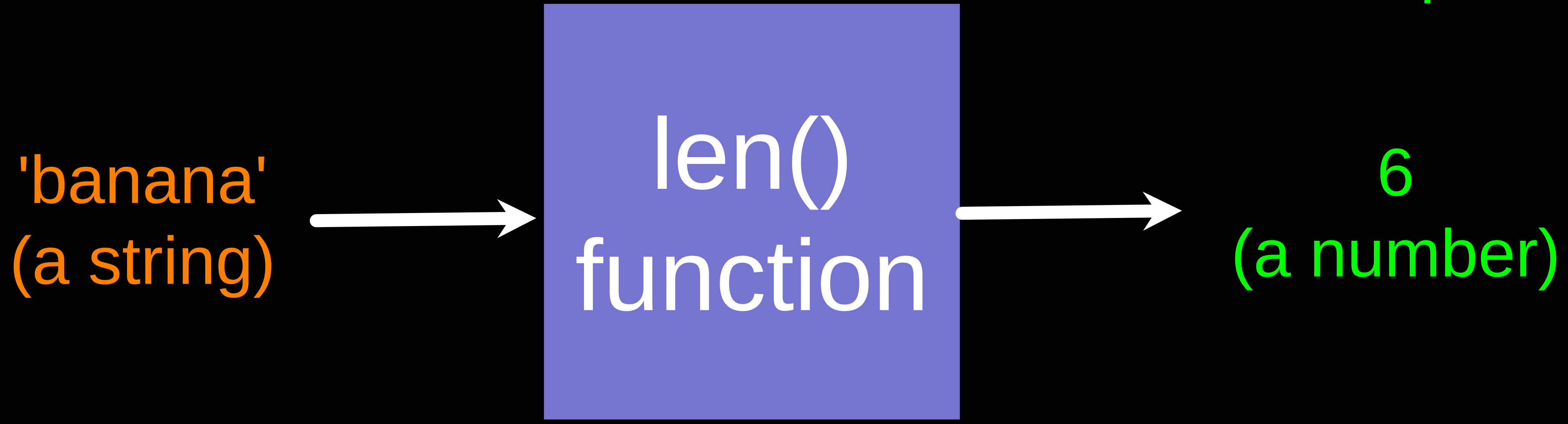


```
>>> fruit = 'banana'
>>> print(len(fruit))
6
```

len Function

```
>>> fruit = 'banana'
>>> x = len(fruit)
>>> print(x)
6
```

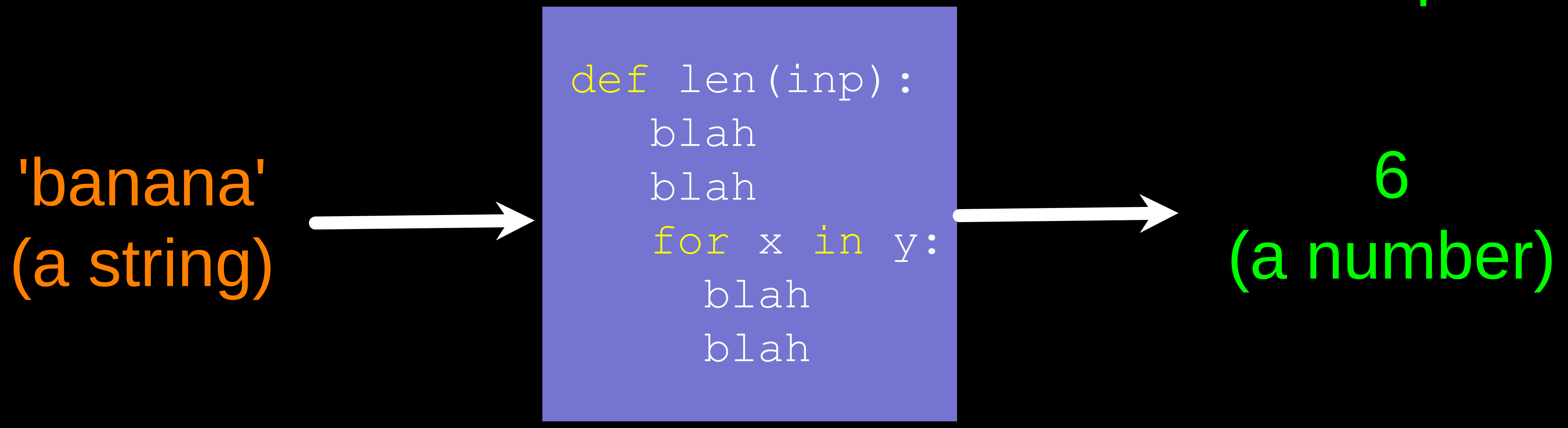
A function is some stored code that we use. A function takes some input and produces an output.



len Function

```
>>> fruit = 'banana'
>>> x = len(fruit)
>>> print(x)
6
```

A function is some stored code that we use. A function takes some input and produces an output.



```
def len(inp):
   blah
   blah
   for x in y:
      blah
      blah
```

Looping Through Strings

Using a while statement, an iteration variable, and the len function, we can construct a loop to look at each of the letters in a string individually

```
fruit = 'banana'
index = 0
while index < len(fruit):
    letter = fruit[index]
    print(index, letter)
    index = index + 1
```

```
0 b
1 a
2 n
3 a
4 n
5 a
```

Looping Through Strings

- A definite loop using a for statement is much more elegant
- The iteration variable is completely taken care of by the for loop

```
fruit = 'banana'
for letter in fruit:
    print(letter)
```

```
b
a
n
a
n
a
```

Looping Through Strings

- A definite loop using a for statement is much more elegant
- The iteration variable is completely taken care of by the for loop

```
fruit = 'banana'
for letter in fruit :
    print(letter)
```

```
index = 0
while index < len(fruit) :
    letter = fruit[index]
    print(letter)
    index = index + 1
```

```
b
a
n
a
n
a
```

Looping and Counting

This is a simple loop that loops through each letter in a string and counts the number of times the loop encounters the 'a' character

```
word = 'banana'
count = 0
for letter in word :
    if letter == 'a' :
        count = count + 1
print(count)
```

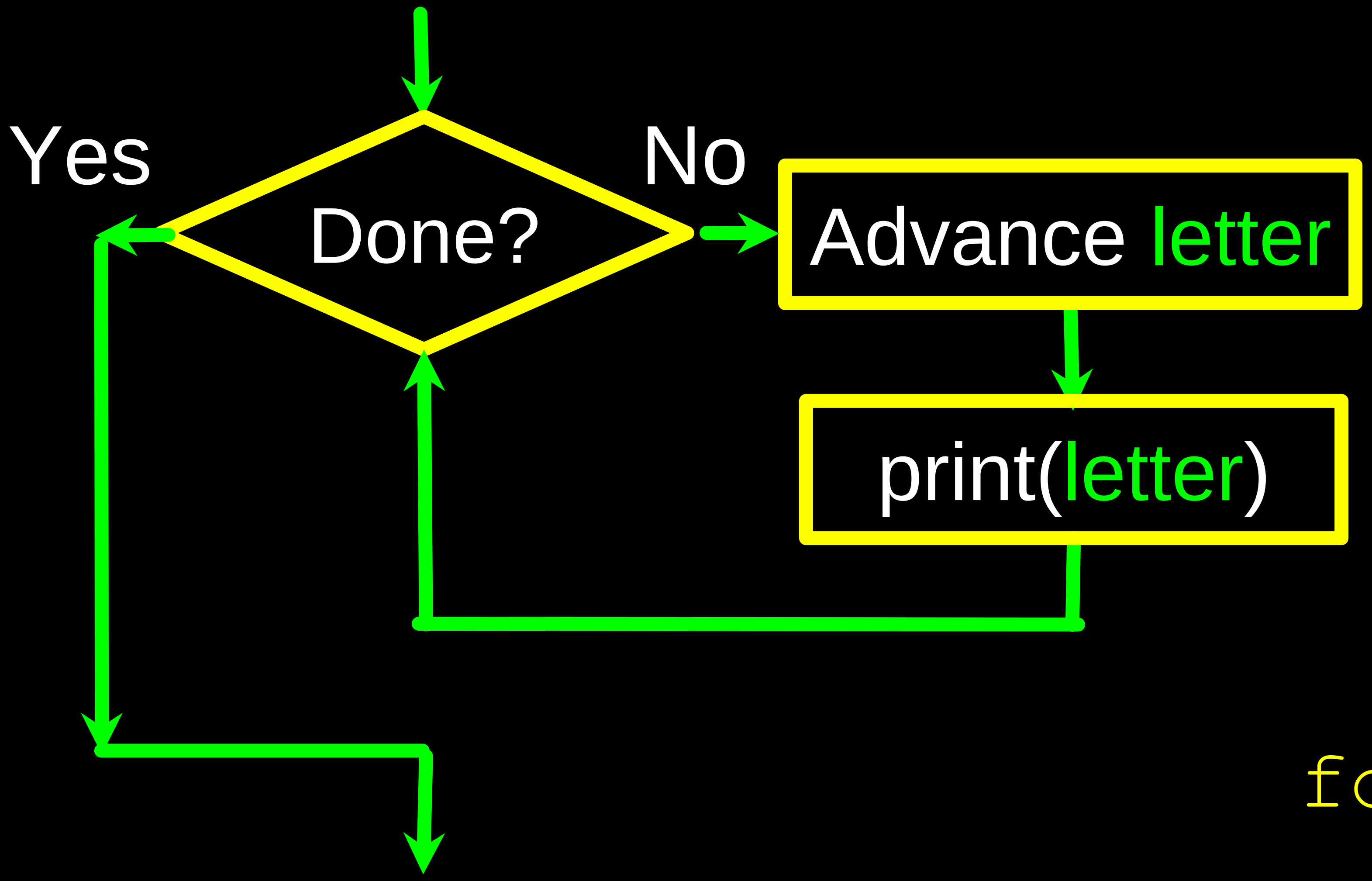
Looking Deeper into in

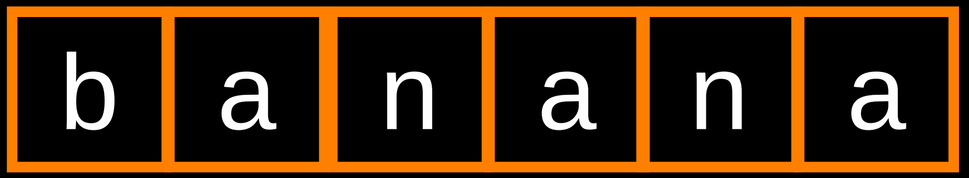
- The iteration variable “iterates” through the sequence (ordered set)
- The block (body) of code is executed once for each value in the sequence
- The iteration variable moves through all of the values in the sequence

Iteration variable

Six-character string

```
for letter in 'banana' :
    print(letter)
```



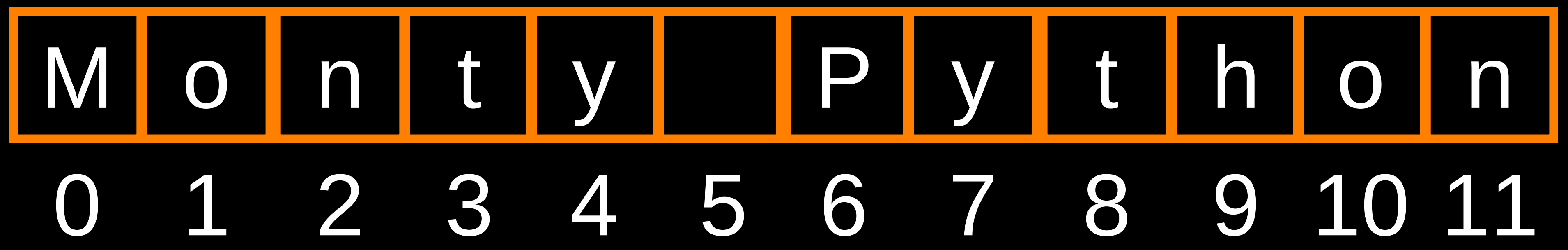


```
for letter in 'banana' :
    print(letter)
```

The iteration variable “iterates” through the string and the block (body) of code is executed once for each value in the sequence

More String Operations

Slicing Strings



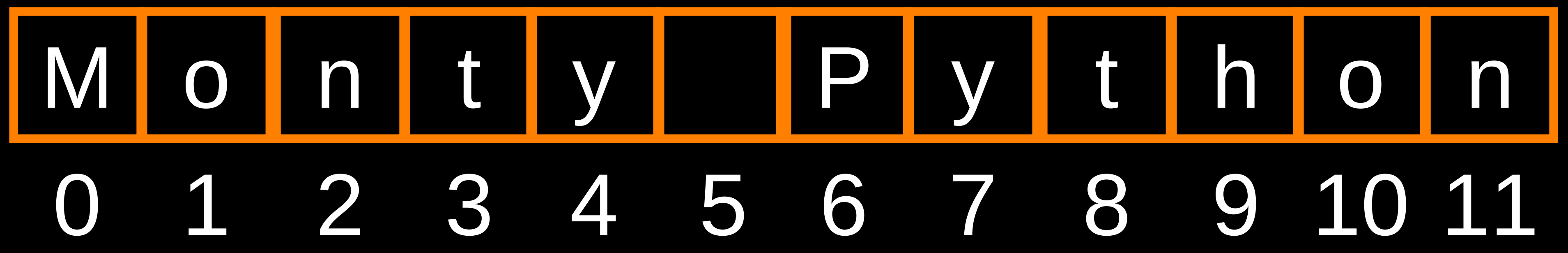
- We can also look at any continuous section of a string using a colon operator

- The second number is one beyond the end of the slice - “up to but not including”

- If the second number is beyond the end of the string, it stops at the end

```
>>> s = 'Monty Python'
>>> print(s[0:4])
Mont
>>> print(s[6:7])
P
>>> print(s[6:20])
Python
```

Slicing Strings



If we leave off the first number or the last number of the slice, it is assumed to be the beginning or end of the string respectively

```
>>> s = 'Monty Python'
>>> print(s[:2])
Mo
>>> print(s[8:])
thon
>>> print(s[:])
Monty Python
```

String Concatenation

When the `+` operator is applied to strings, it means "concatenation"

```
>>> a = 'Hello'
>>> b = a + 'There'
>>> print(b)
HelloThere
>>> c = a + ' ' + 'There'
>>> print(c)
Hello There
>>>
```

Using in as a Logical Operator

- The in keyword can also be used to check to see if one string is “in” another string
- The in expression is a logical expression that returns True or False and can be used in an if statement

```
>>> fruit = 'banana'
>>> 'n' in fruit
True
>>> 'm' in fruit
False
>>> 'nan' in fruit
True
>>> if 'a' in fruit :
...     print('Found it!')
...
Found it!
>>>
```

String Comparison

```
if word == 'banana':
    print('All right, bananas.')

if word < 'banana':
    print('Your word,' + word + ', comes before banana.')
elif word > 'banana':
    print('Your word,' + word + ', comes after banana.')
else:
    print('All right, bananas.')
```

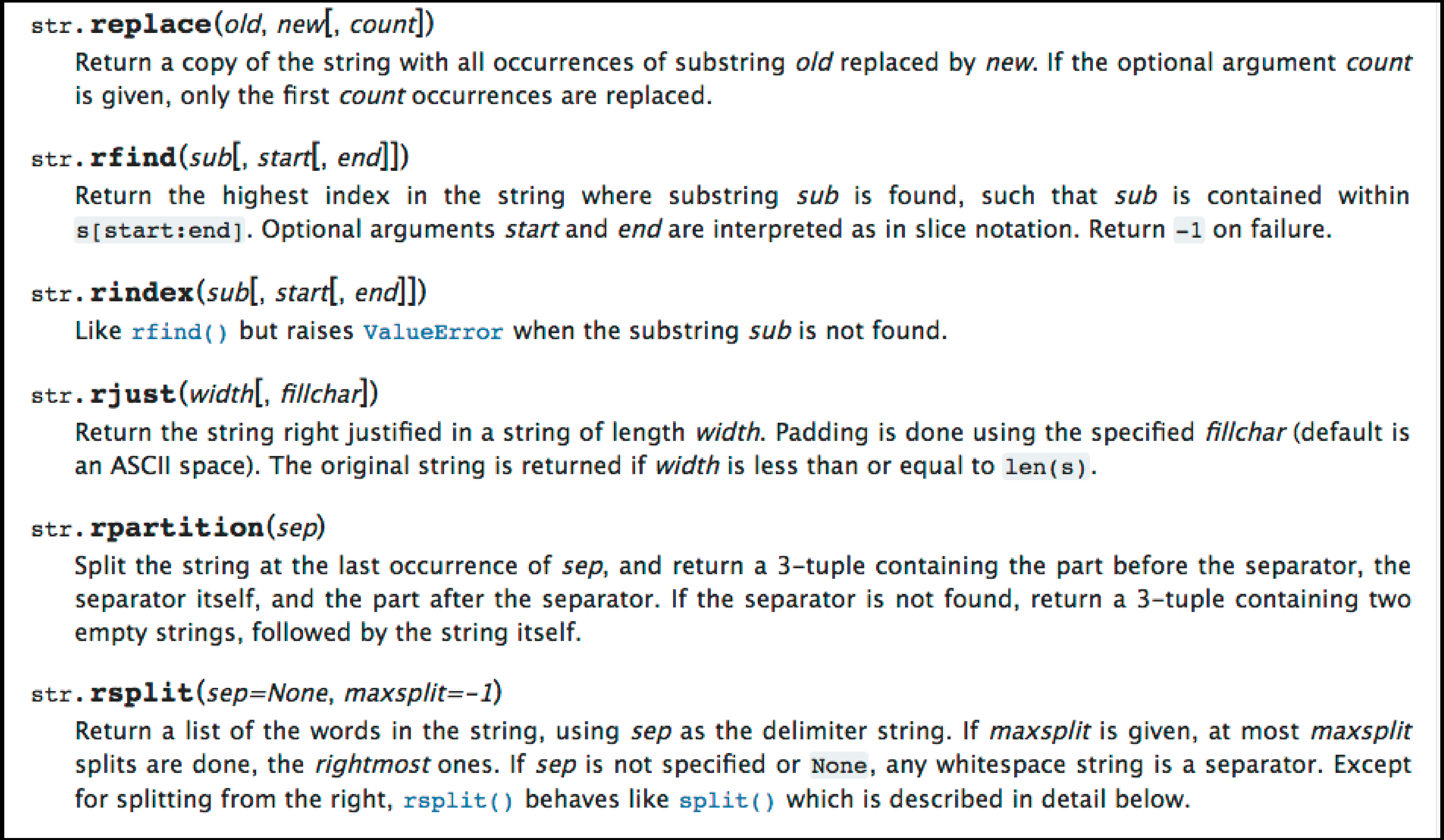
String Library

- Python has a number of string functions which are in the string library
- These functions are already built into every string - we invoke them by appending the function to the string variable
- These functions do not modify the original string, instead they return a new string that has been altered

```
>>> greet = 'Hello Bob'
>>> zap = greet.lower()
>>> print(zap)
hello bob
>>> print(greet)
Hello Bob
>>> print('Hi There'.lower())
hi there
>>>
```

```
>>> stuff = 'Hello world'
>>> type(stuff)
<class 'str'>
>>> dir(stuff)
['capitalize', 'casefold', 'center', 'count', 'encode',
'endswith', 'expandtabs', 'find', 'format', 'format_map',
'index', 'isalnum', 'isalpha', 'isdecimal', 'isdigit',
'isidentifier', 'islower', 'isnumeric', 'isprintable', 'isspace',
'istitle', 'isupper', 'join', 'ljust', 'lower', 'lstrip',
'maketrans', 'partition', 'replace', 'rfind', 'rindex', 'rjust',
'rpartition', 'rsplit', 'rstrip', 'split', 'splitlines',
'startswith', 'strip', 'swapcase', 'title', 'translate', 'upper',
'zfill']
```

https://docs.python.org/3/library/stdtypes.html#string-methods



`str.`**`replace`**(*old*, *new*[, *count*])

Return a copy of the string with all occurrences of substring *old* replaced by *new*. If the optional argument *count* is given, only the first *count* occurrences are replaced.

`str.`**`rfind`**(*sub*[, *start*[, *end*]])

Return the highest index in the string where substring *sub* is found, such that *sub* is contained within `s[start:end]`. Optional arguments *start* and *end* are interpreted as in slice notation. Return `-1` on failure.

`str.`**`rindex`**(*sub*[, *start*[, *end*]])

Like `rfind()` but raises `ValueError` when the substring *sub* is not found.

`str.`**`rjust`**(*width*[, *fillchar*])

Return the string right justified in a string of length *width*. Padding is done using the specified *fillchar* (default is an ASCII space). The original string is returned if *width* is less than or equal to `len(s)`.

`str.`**`rpartition`**(*sep*)

Split the string at the last occurrence of *sep*, and return a 3-tuple containing the part before the separator, the separator itself, and the part after the separator. If the separator is not found, return a 3-tuple containing two empty strings, followed by the string itself.

`str.`**`rsplit`**(*sep=None*, *maxsplit=-1*)

Return a list of the words in the string, using *sep* as the delimiter string. If *maxsplit* is given, at most *maxsplit* splits are done, the *rightmost* ones. If *sep* is not specified or `None`, any whitespace string is a separator. Except for splitting from the right, `rsplit()` behaves like `split()` which is described in detail below.

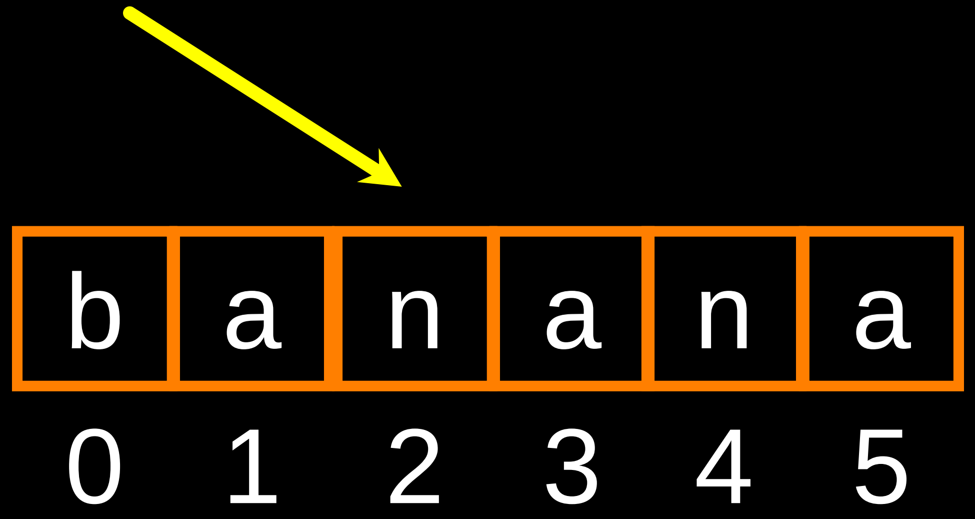
String Library

```
str.capitalize()
str.center(width[, fillchar])
str.endswith(suffix[, start[, end]])
str.find(sub[, start[, end]])
str.lstrip([chars])
```

```
str.replace(old, new[, count])
str.lower()
str.rstrip([chars])
str.strip([chars])
str.upper()
```

Searching a String

- We use the find() function to search for a substring within another string
- find() finds the first occurrence of the substring
- If the substring is not found, find() returns -1
- Remember that string position starts at zero



```
>>> fruit = 'banana'
>>> pos = fruit.find('na')
>>> print(pos)
2
>>> aa = fruit.find('z')
>>> print(aa)
-1
```

Making everything UPPER CASE

- You can make a copy of a string in lower case or upper case
- Often when we are searching for a string using find() we first convert the string to lower case so we can search a string regardless of case

```
>>> greet = 'Hello Bob'
>>> nnn = greet.upper()
>>> print(nnn)
HELLO BOB
>>> www = greet.lower()
>>> print(www)
hello bob
>>>
```

Search and Replace

- The replace() function is like a “search and replace” operation in a word processor

- It replaces all occurrences of the search string with the replacement string

```
>>> greet = 'Hello Bob'
>>> nstr = greet.replace('Bob','Jane')
>>> print(nstr)
Hello Jane
>>> nstr = greet.replace('o','X')
>>> print(nstr)
HellX BXb
>>>
```

Stripping Whitespace

- Sometimes we want to take a string and remove whitespace at the beginning and/or end
- lstrip() and rstrip() remove whitespace at the left or right
- strip() removes both beginning and ending whitespace

```
>>> greet = '   Hello Bob  '
>>> greet.lstrip()
'Hello Bob  '
>>> greet.rstrip()
'   Hello Bob'
>>> greet.strip()
'Hello Bob'
>>>
```

Prefixes

```
>>> line = 'Please have a nice day'
>>> line.startswith('Please')
True
>>> line.startswith('p')
False
```

Parsing and Extracting

$$\overset{21}{\downarrow} \qquad \overset{31}{\downarrow}$$

```
From stephen.marquard@uct.ac.za Sat Jan  5 09:14:16 2008
```

```
>>> data = 'From stephen.marquard@uct.ac.za Sat Jan  5 09:14:16 2008'
>>> atpos = data.find('@')
>>> print(atpos)
21
>>> sppos = data.find(' ',atpos)
>>> print(sppos)
31
>>> host = data[atpos+1 : sppos]
>>> print(host)
uct.ac.za
```

Two Kinds of Strings

```
Python 2.7.10
>>> x = '이광춘'
>>> type(x)
<type 'str'>
>>> x = u'이광춘'
>>> type(x)
<type 'unicode'>
>>>
```

```
Python 3.5.1
>>> x = '이광춘'
>>> type(x)
<class 'str'>
>>> x = u'이광춘'
>>> type(x)
<class 'str'>
>>>
```

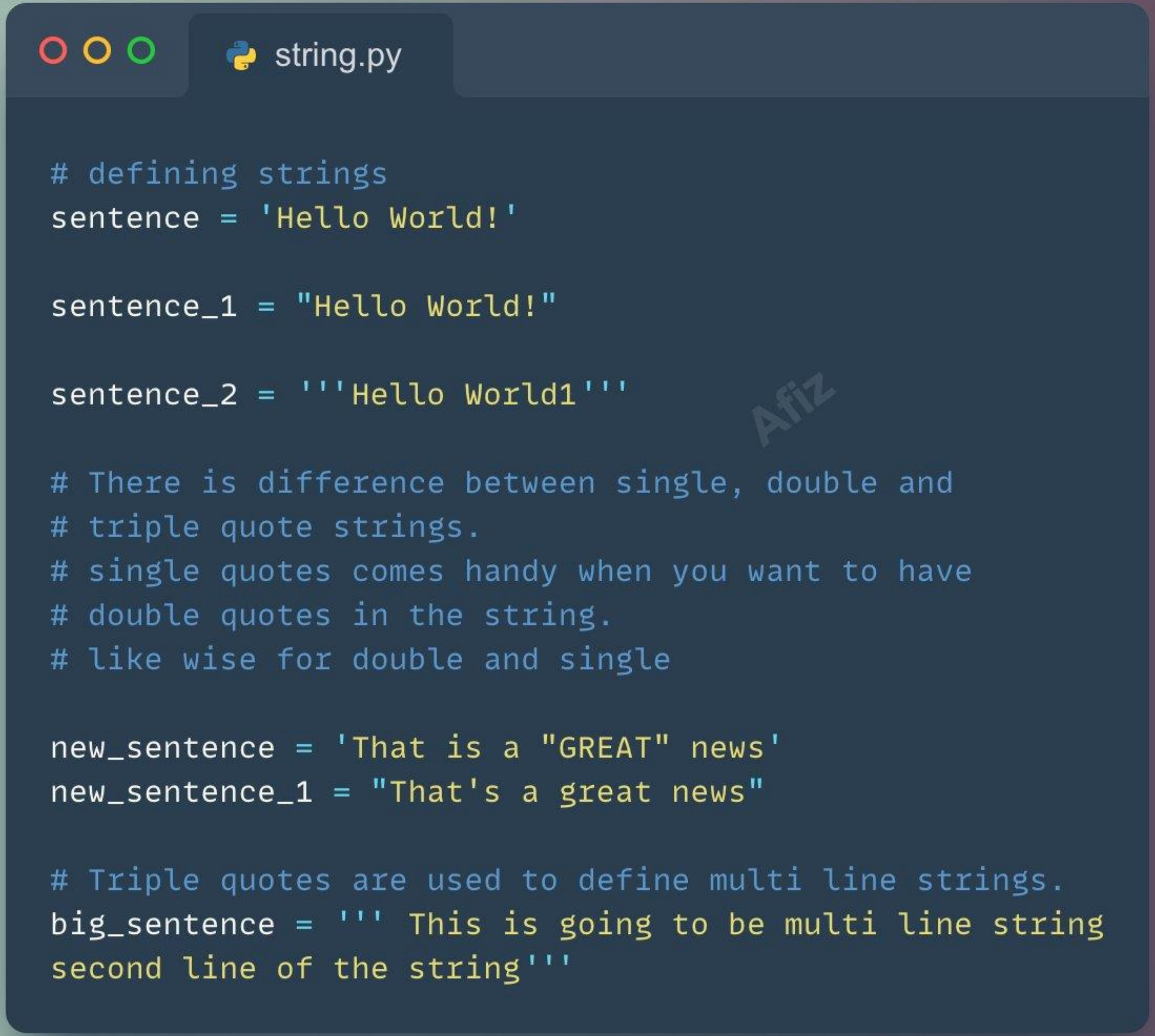
In Python 3, all strings are Unicode

Summary

- String type
- Read/Convert
- Indexing strings []
- Slicing strings [2:4]
- Looping through strings with for and while
- Concatenating strings with +
- String operations
- String library
- String comparisons
- Searching in strings
- Replacing text
- Stripping white space

Strings in Python

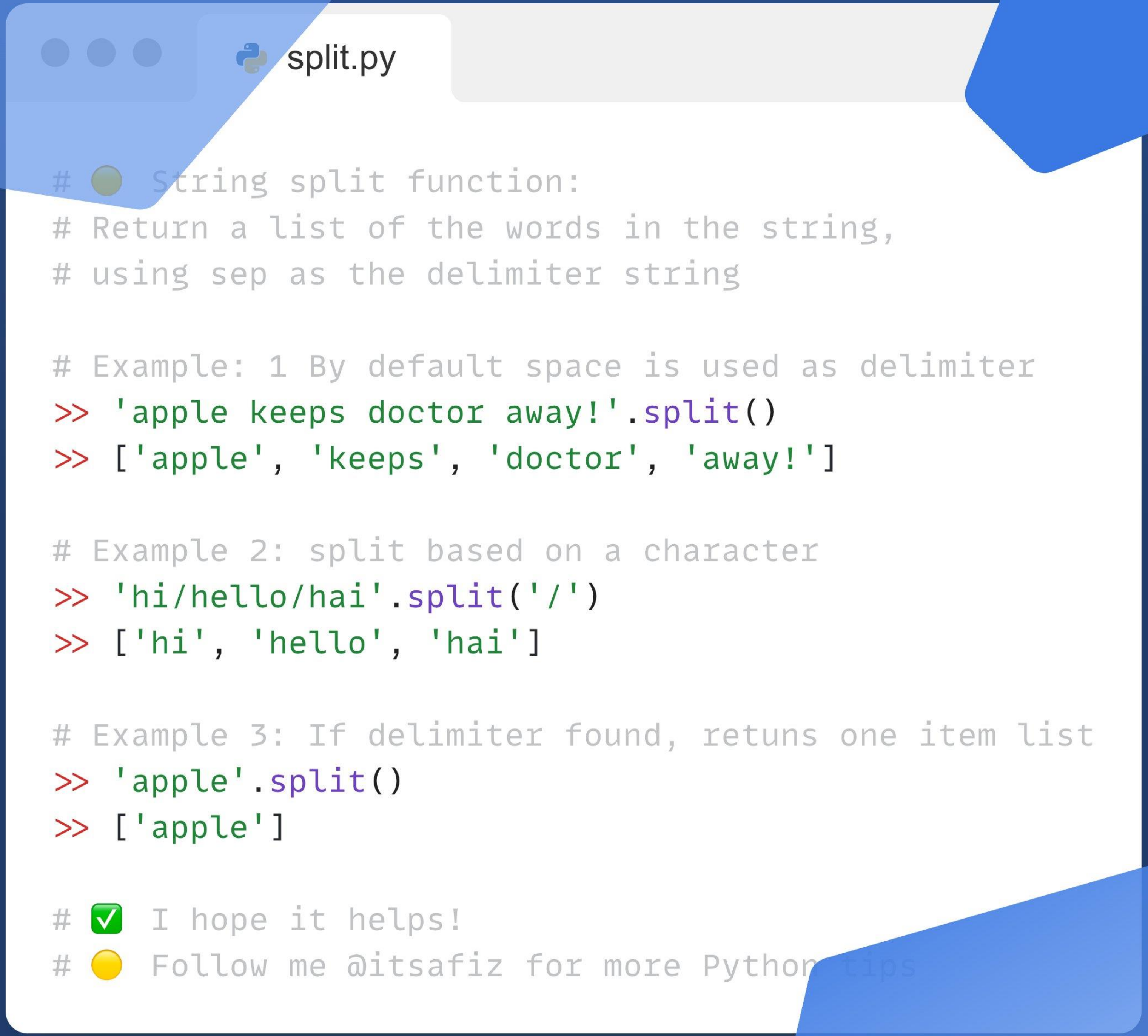
String is a sequence of characters. In Python single, double, and triple quotes are used to define strings. Example 👇



string.py

```python
# defining strings
sentence = 'Hello World!'

sentence_1 = "Hello World!"

sentence_2 = '''Hello World1'''

# There is difference between single, double and
# triple quote strings.
# single quotes comes handy when you want to have
# double quotes in the string.
# like wise for double and single

new_sentence = 'That is a "GREAT" news'
new_sentence_1 = "That's a great news"

# Triple quotes are used to define multi line strings.
big_sentence = ''' This is going to be multi line string
second line of the string'''
```

split in Python



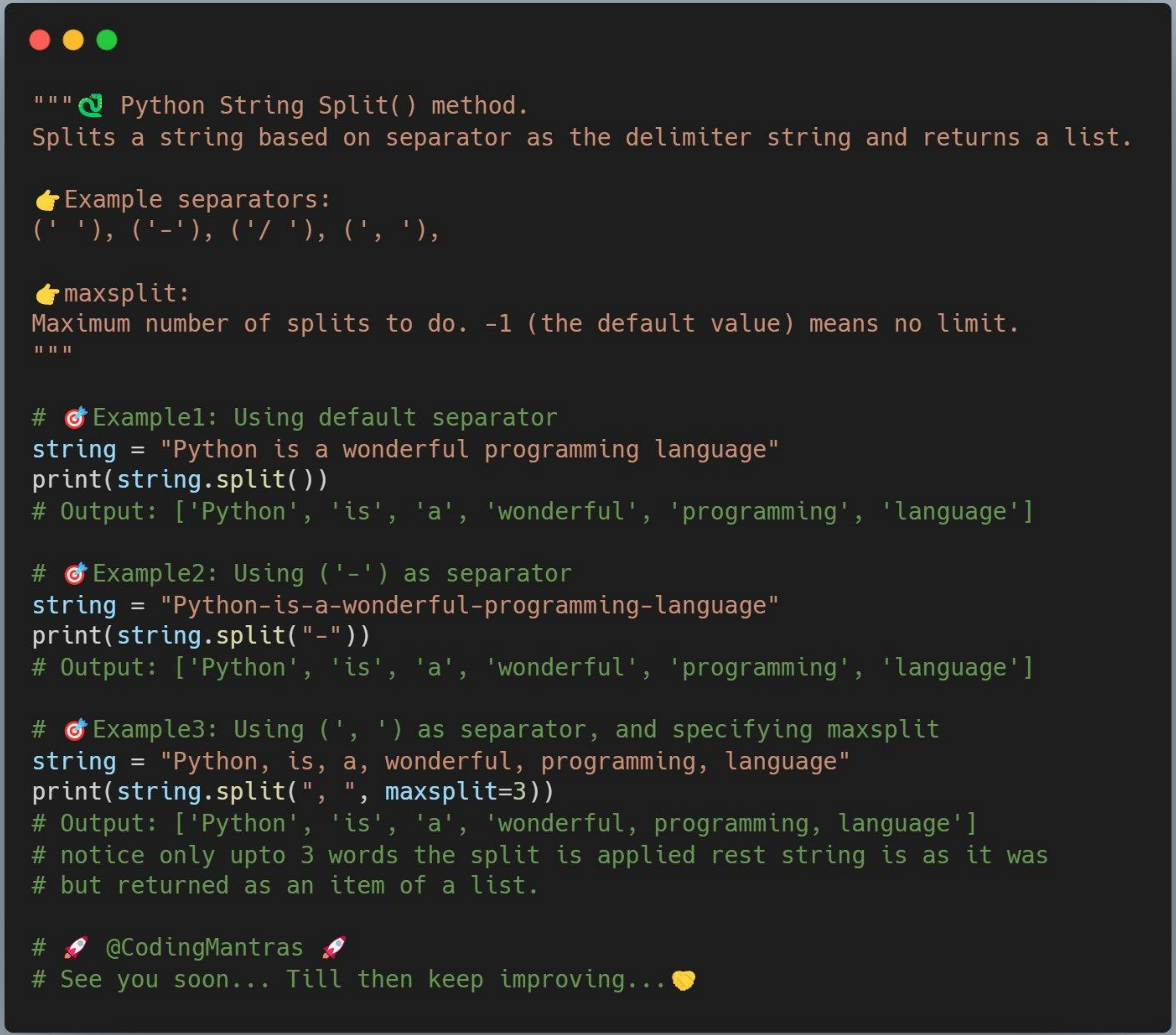
split.py

```
# 🟢 String split function:
# Return a list of the words in the string,
# using sep as the delimiter string

# Example: 1 By default space is used as delimiter
>> 'apple keeps doctor away!'.split()
>> ['apple', 'keeps', 'doctor', 'away!']

# Example 2: split based on a character
>> 'hi/hello/hai'.split('/')
>> ['hi', 'hello', 'hai']

# Example 3: If delimiter found, retuns one item list
>> 'apple'.split()
>> ['apple']

# ✅ I hope it helps!
# 🟡 Follow me @itsafiz for more Python tips
```

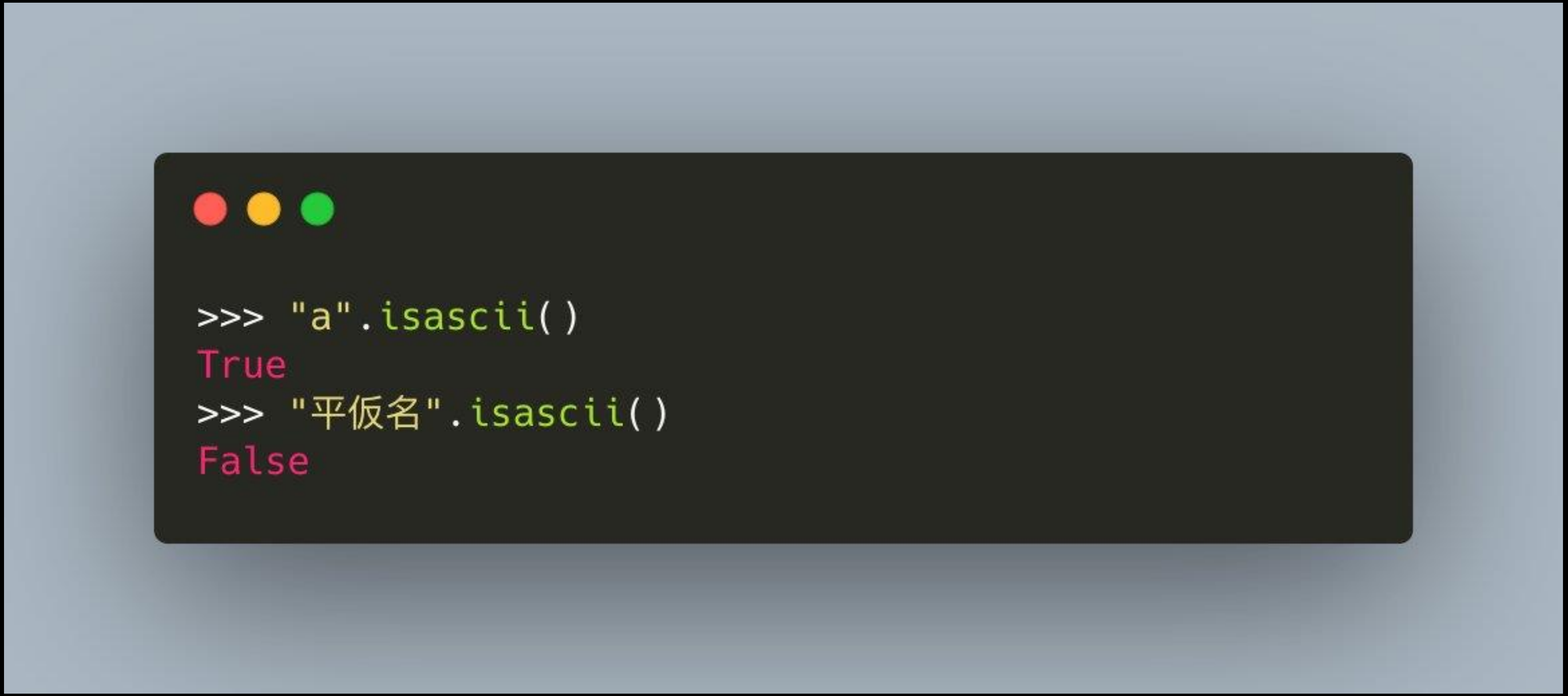
Afiz ⚡

@itsafiz

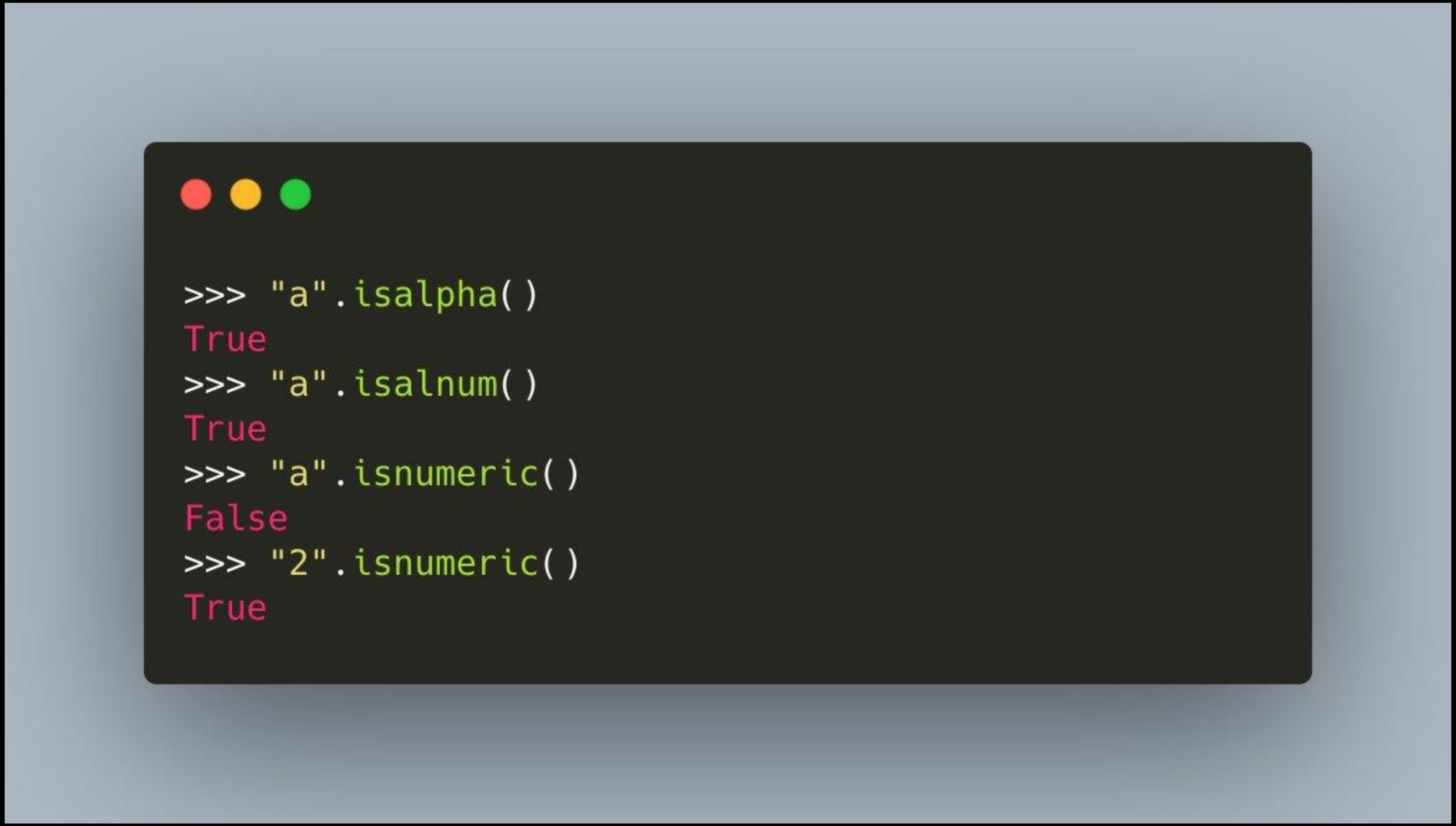
snappify.io



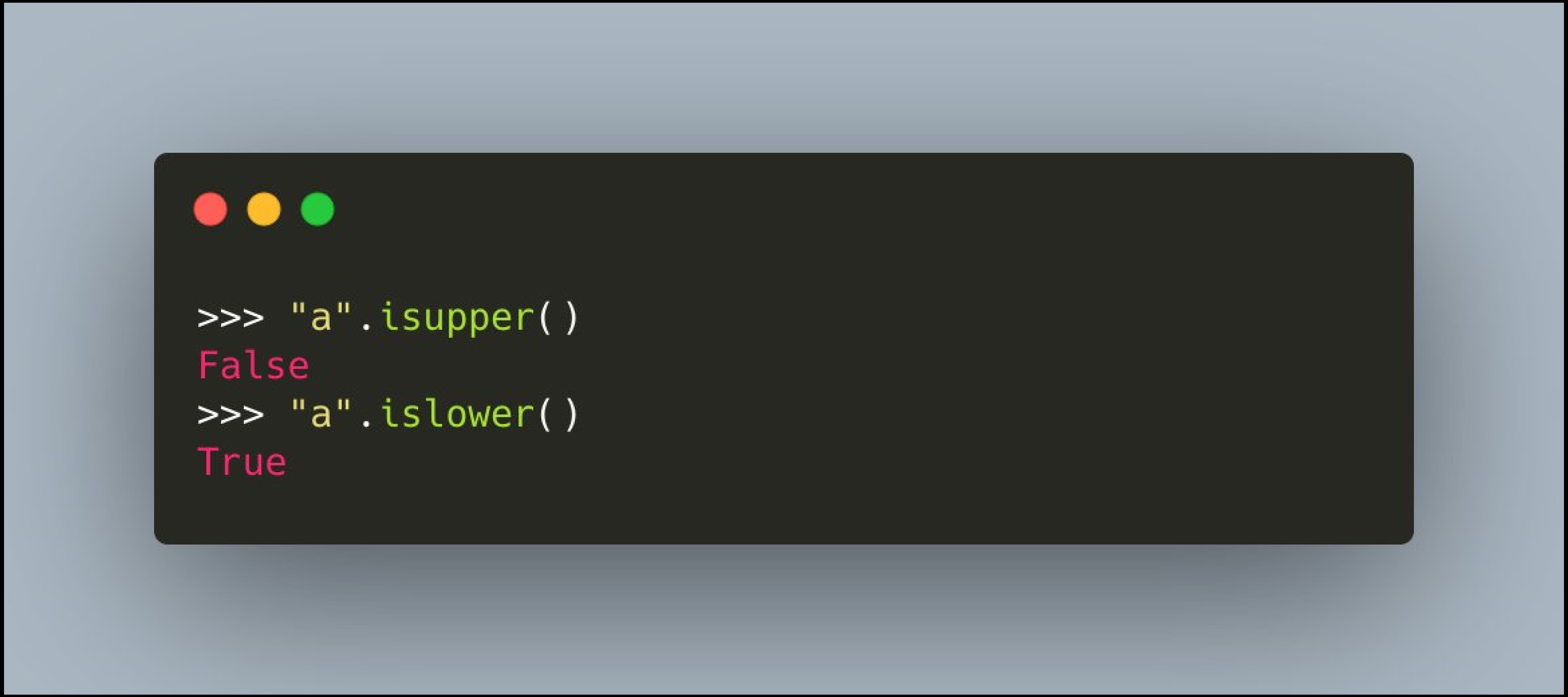
```python
"""🐍 Python String Split() method.
Splits a string based on separator as the delimiter string and returns a list.

👉Example separators:
(' '), ('-'), ('/ '), (', '),

👉maxsplit:
Maximum number of splits to do. -1 (the default value) means no limit.
"""

# 🎯Example1: Using default separator
string = "Python is a wonderful programming language"
print(string.split())
# Output: ['Python', 'is', 'a', 'wonderful', 'programming', 'language']

# 🎯Example2: Using ('-') as separator
string = "Python-is-a-wonderful-programming-language"
print(string.split("-"))
# Output: ['Python', 'is', 'a', 'wonderful', 'programming', 'language']

# 🎯Example3: Using (', ') as separator, and specifying maxsplit
string = "Python, is, a, wonderful, programming, language"
print(string.split(", ", maxsplit=3))
# Output: ['Python', 'is', 'a', 'wonderful, programming, language']
# notice only upto 3 words the split is applied rest string is as it was
# but returned as an item of a list.

# 🚀 @CodingMantras 🚀
# See you soon... Till then keep improving...🤝
```



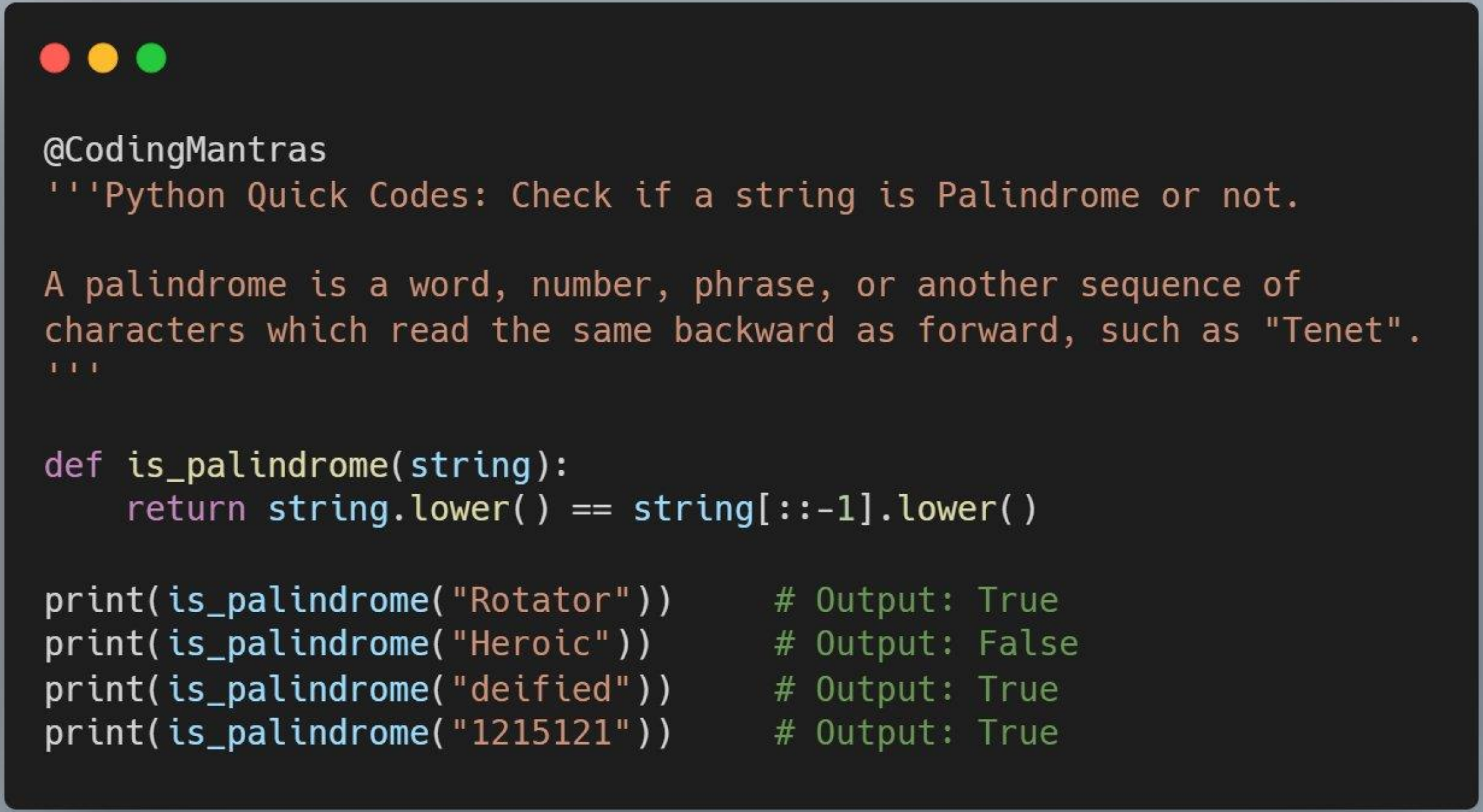
```
>>> "a".isascii()
True
>>> "平仮名".isascii()
False
```



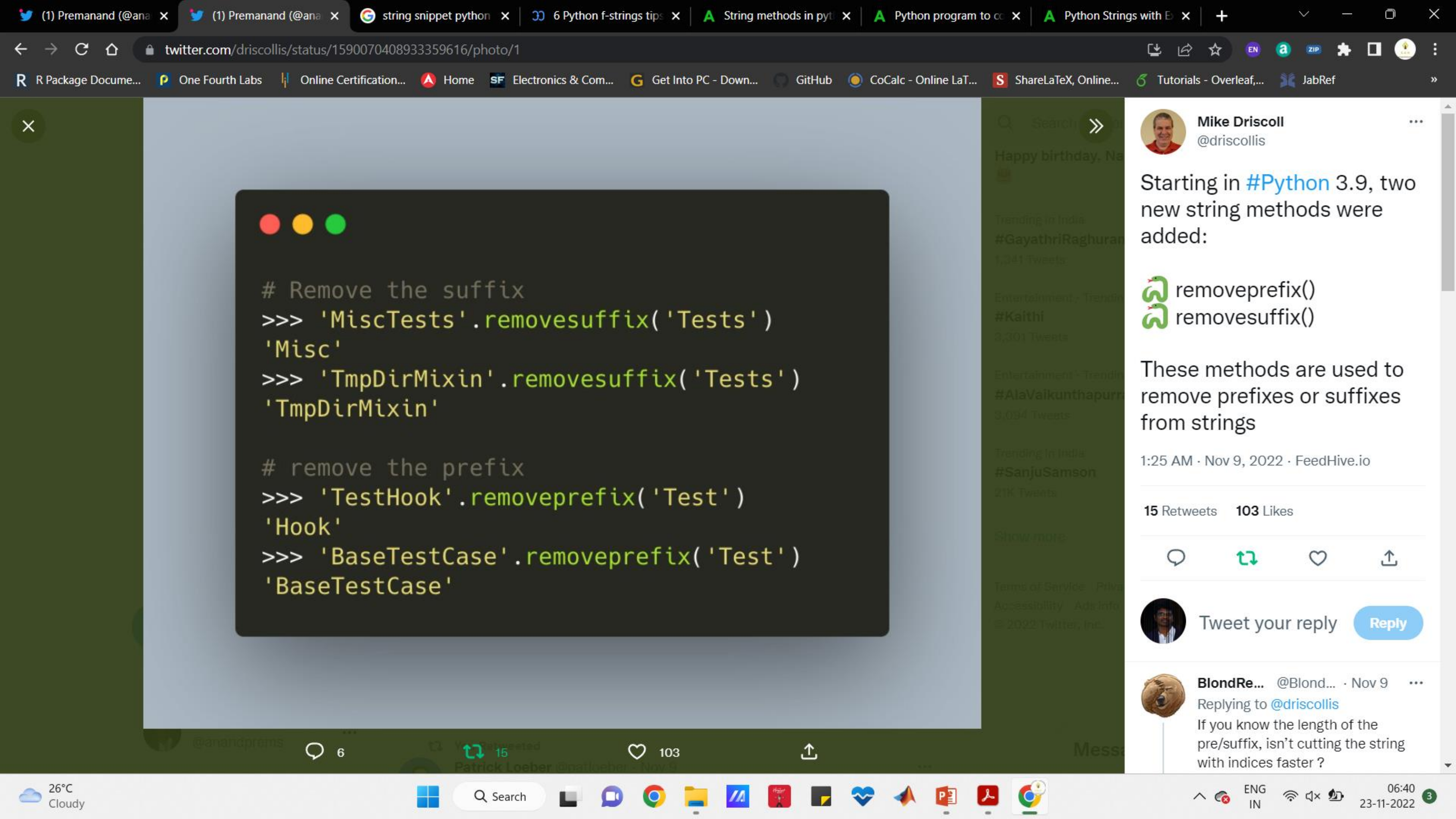
```
>>> "a".isalpha()
True
>>> "a".isalnum()
True
>>> "a".isnumeric()
False
>>> "2".isnumeric()
True
```



```
>>> "a".isupper()
False
>>> "a".islower()
True
```



```
@CodingMantras
'''Python Quick Codes: Check if a string is Palindrome or not.

A palindrome is a word, number, phrase, or another sequence of
characters which read the same backward as forward, such as "Tenet".
'''

def is_palindrome(string):
    return string.lower() == string[::-1].lower()

print(is_palindrome("Rotator"))     # Output: True
print(is_palindrome("Heroic"))      # Output: False
print(is_palindrome("deified"))     # Output: True
print(is_palindrome("1215121"))     # Output: True
```



```
# Remove the suffix
>>> 'MiscTests'.removesuffix('Tests')
'Misc'
>>> 'TmpDirMixin'.removesuffix('Tests')
'TmpDirMixin'

# remove the prefix
>>> 'TestHook'.removeprefix('Test')
'Hook'
>>> 'BaseTestCase'.removeprefix('Test')
'BaseTestCase'
```

Mike Driscoll
@driscollis

Starting in #Python 3.9, two new string methods were added:

removeprefix()
removesuffix()

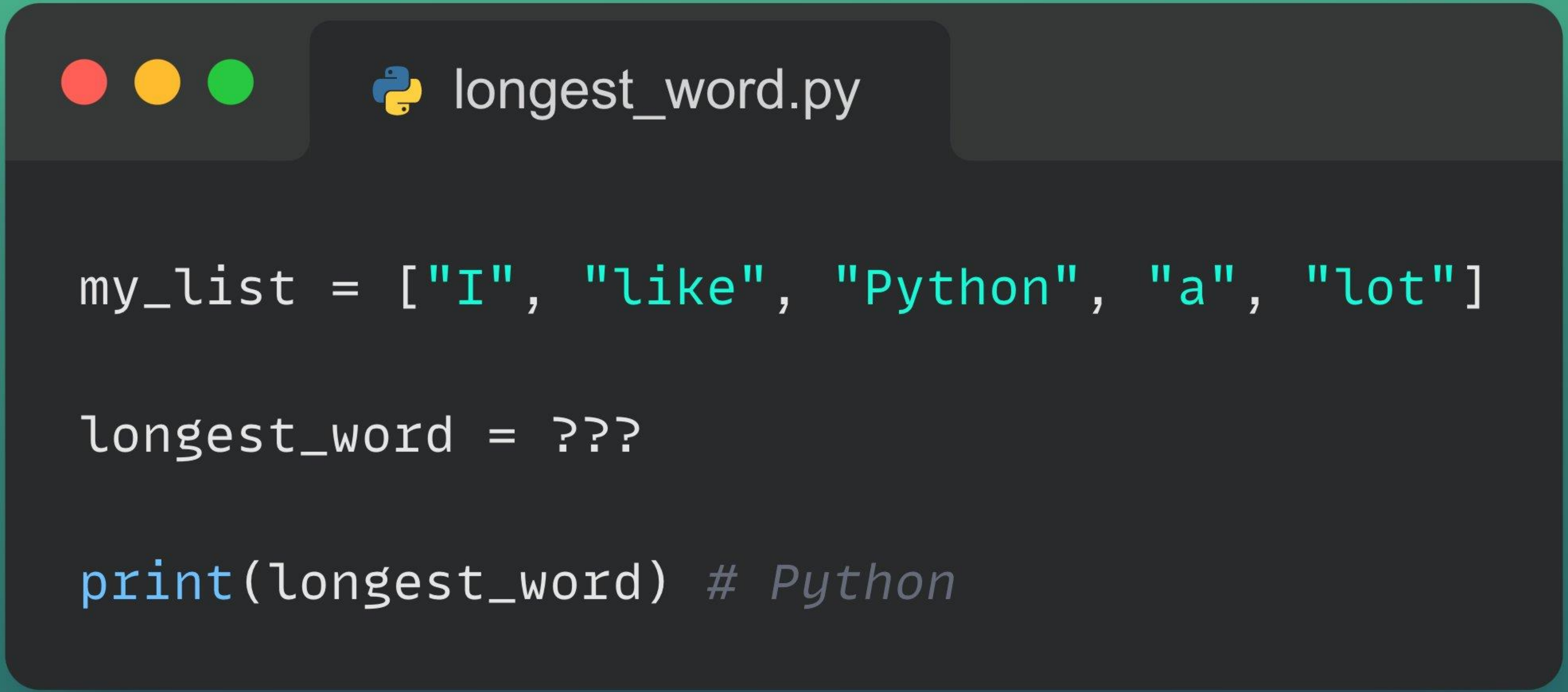
These methods are used to remove prefixes or suffixes from strings

1:25 AM · Nov 9, 2022 · FeedHive.io

15 Retweets 103 Likes

Tweet your reply Reply

BlondRe... @Blond... · Nov 9
Replying to @driscollis
If you know the length of the pre/suffix, isn't cutting the string with indices faster ?

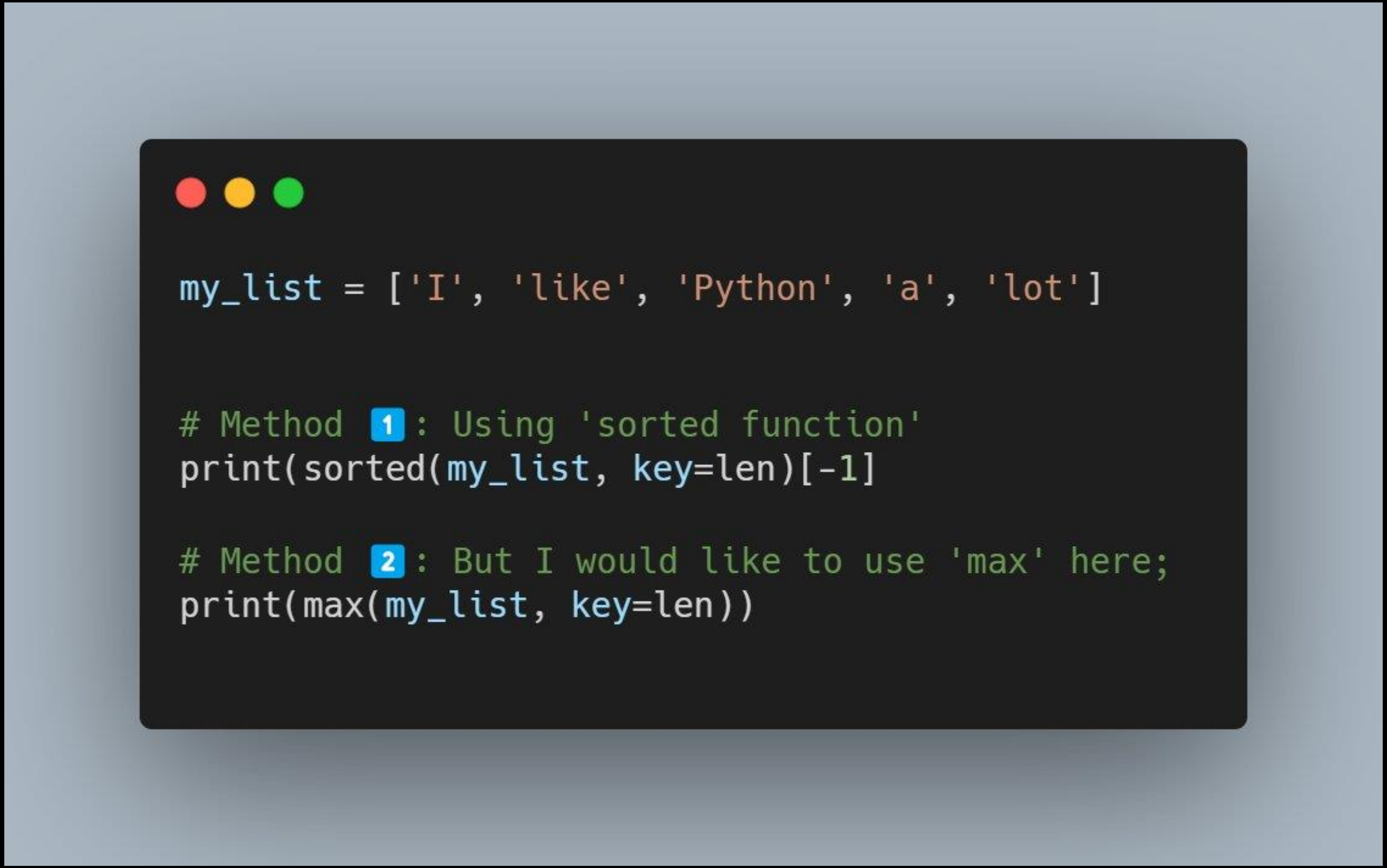

longest_word.py

```python
my_list = ["I", "like", "Python", "a", "lot"]

longest_word = ???

print(longest_word) # Python
```

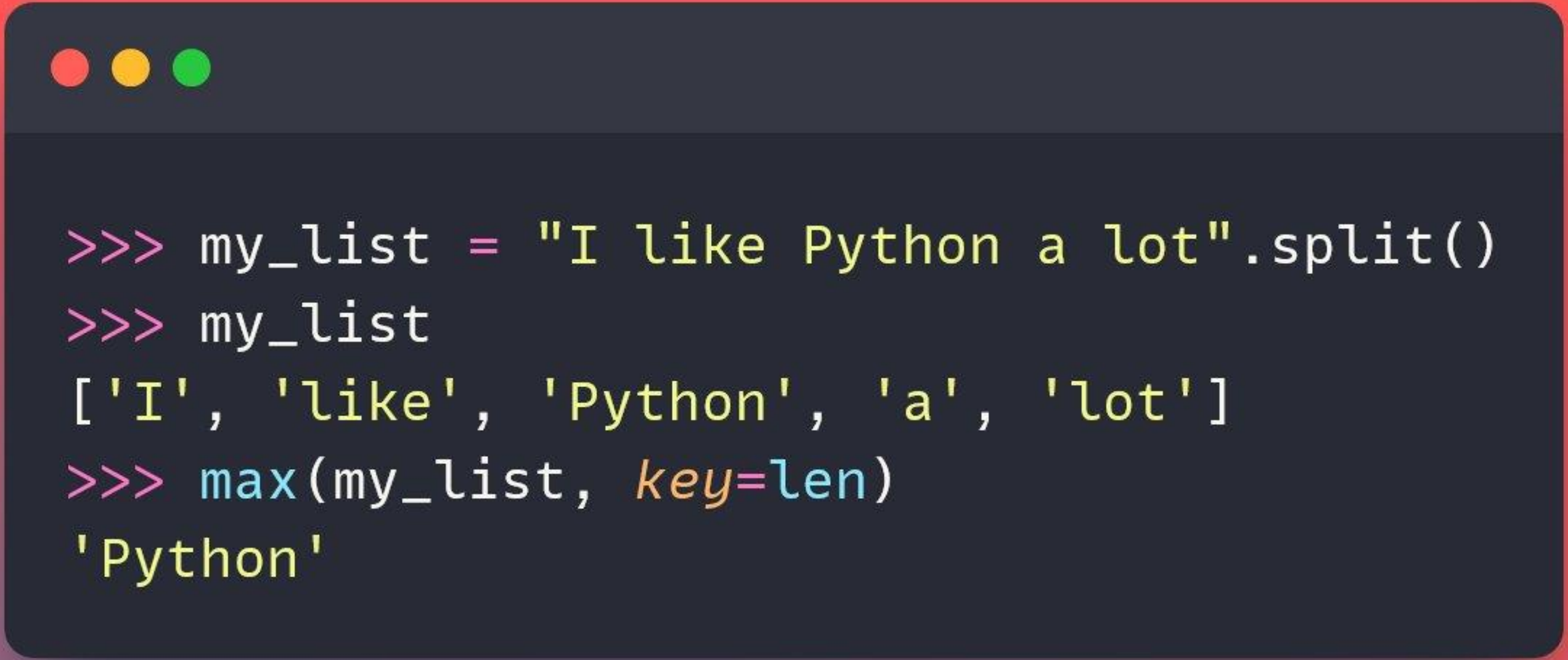
Patrick Loeber

@python_engineer

snappify.io



```python
my_list = ['I', 'like', 'Python', 'a', 'lot']


# Method 1️⃣: Using 'sorted function'
print(sorted(my_list, key=len)[-1]

# Method 2️⃣: But I would like to use 'max' here;
print(max(my_list, key=len))
```



```
>>> my_list = "I like Python a lot".split()
>>> my_list
['I', 'like', 'Python', 'a', 'lot']
>>> max(my_list, key=len)
'Python'
```

Rodrigo

@mathsppblog