Regular Expressions

aka REGEX


Regular Expressions

Regular Expressions
Introduction

- RE is a string that contains special symbols and characters to find and extract the information
- Operations:
  - ✓ Search
  - ✓ Match
  - ✓ Find
  - ✓ Split
- Also called as *regex*
- Module: re
  - This module contains the methods like
    - compile()
    - search()
    - match()
    - findall()
    - split()...
  - import re

Regular Expressions
Steps

- Step-1: Compile the RE

```
prog = re.compile(r'm\w\w')
```

- Step-2: Search the strings

```
str = "cat mat bat rat"

result = prog.search(str)
```

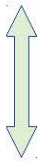
- Step-3: Display the result

```
print(result.group())
```

Regular Expressions

Example-1: search()

```
import re
str = 'man sun mop run'
result = re.search(r'm\w\w', str)
if result: #if result is not None
    print(result.group())
```



```
import re
str = 'man sun mop run'
prog = re.compile(r'm\w\w')
result = prog.search(str)
if result: #if result is not None
    print(result.group())
```

search(): Combination of compile and run

- Point: Returns only the first string matching the RE

Regular Expressions

Example-2: findall()

```
import re
str = 'man sun mop run'
result = re.findall(r'm\w\w', str)
print(result)
```

findall()
- Returns all the matching strings
- Returns in the form of the list

Regular Expressions

Example-3: match()

```
import re
str = 'man sun mop run'
result = re.match(r'm\w\w', str)
print(result.group())
```

match()
- Returns the string only if it is found in the begining of the string
- Returns None, if the string is not found

Regular Expressions

Example-4: match()

```
import re
str = 'sun man mop run'
result =  re.match(r'm\w\w', str)
print(result)
```

match()

- Returns None, since the string is not found

Regular Expressions

Example-5: split()

```
import re
str = 'This; is the: "Core" Python\'s Lecturer'
result = re.split(r'\w+', str)
print(result)
```

- split() - splits the RE
  - W : Split at non-alphanumeric character
  - + : Match 1 or more occurrences of characters

```
split()
- splits the string into pieces according to the given RE
```

Regular Expressions

Example-6: Find & Replace: sub()

```
import re
str = 'Kumbhmela will be conducted at Ahmedabad in India.'
res = re.sub(r'Ahmedabad', 'Allahabad', str)
print(res)
```

Syntax:

```
sub(RE, new, old)
```

RE: Sequence Characters

RE: sequence characters

- Match only one character in the string

Character	Description
\d	Represents any digit(0 - 9)
\D	Represents any non-digit
\s	Represents white space Ex: \t\n\r\f\v
\S	Represents non-white space character
\w	Represents any alphanumeric(A-Z, a-z, 0-9)
\W	Represents non-alphanumeric\b
\b	Represents a space around words
\A	Matches only at start of the string
\Z	Matches only at end of the string

RE: sequence characters

Example-1:

To match all words starting with 'a'

```
import re
str = 'an apple a day keeps the doctor away'
result = re.findall(r'a[\w]*', str)

# findall() returns a list, retrieve the elements from list
for word in result:
   print(word)
```

To match all words starting with 'a', not sub-words then RE will look like this

```
import re
str = 'an apple a day keeps the doctor away'
result = re.findall(r'\ba[\w]*\b', str)

# findall() returns a list, retrieve the elements from list
for word in result:
    print(word)
```

* Matches with 0 or more occurrences of the character

RE: sequence characters

Example-2:

To match all words starting with numeric digits

```
import re

str = 'The meeting will be conducted on 1st and 21st of every month'

result = re.findall(r'\d[\w]*', str)

#for word in result:

print(word)
```

* Matches with 0 or more occurrences of the character

RE: sequence characters

Example-3:

To retrieve all words having 5 characters

```
import re

str = 'one two three four five six seven 8 9 10'

result = re.findall(r'\b\w{5}\b', str)

print(result)
```

character	Description
\b	Matches only one space
\w	Matches any alpha numeric character
{5}	Repetition character

RE: sequence characters

Example-4: search()

To retrieve all words having 5 characters using search()

```
# search() will give the first matching word only.
import re
str = 'one two three four five six seven 8 9 10'
result = re.search(r'\b\w{5}', str)
```

character	Description
\b	Matches only one space
\w	Matches any alpha numeric character
{5}	Repetition character

RE: sequence characters

Example-5: findall()

To retrieve all words having 4 and above characters using findall()

```
import re
str = 'one two three four five six seven 8 9 10'
result = re.findall(r'\b\w{4,}\b', str)
print(result)
```

character	Description
\b	Matches only one space
\w	Matches any alpha numeric character
{4, }	Retrieve 4 or more characters

RE: sequence characters

Example-6: findall()

To retrieve all words having 3, 4, 5 characters using findall()

```
import re

str = 'one two three four five six seven 8 9 10'

result = re.findall(r'\b\w{3, 5}\b', str)

print(result)
```

character	Description
\b	Matches only one space
\w	Matches any alpha numeric character
{3, 5}	Retrieve 3, 4, 5 characters

RE: sequence characters

Example-7: findall()

To retrieve only single digit using findall()

```
import re

str = 'one two three four five six seven 8 9 10'

result = re.findall(r'\b\d\b', str)

print(result)
```

character	Description
\b	Matches only one space
\d	Matches only digit

RE: sequence characters

Example-7: findall()

To retrieve all words starts with 't' from the end of the string

```
import re

str = 'one two three one two three'

result = re.findall(r't{\w}*\z', str)

print(result)
```

character	Description
\z	Matches from end of the string
\w	Matches any alpha numeric character
t	Starting character is 't'


RE: Quantifiers

RE: Quantifiers

- Characters which represents more than 1 character to be matched in the string

Character	Description
+	1 or more repetitions of the preceding regexp
*	0 or more repetitions of the preceding regexp
?	0 or 1 repetitions of the preceding regexp
{m}	Exactly m occurrences
{m, n}	From m to n. m defaults to 0 n defaults to infinity

RE: Quantifiers

Example-1:

To retrieve phone number of a person

```
import re

str = 'Tomy: 9706612345'

res = re.serach(r'\d+', str)

print(res.group())
```

character	Description
\d	Matches from any digit
+	1 or more repetitions of the preceding regexp

RE: Quantifiers

Example-2:

To retrieve only name

```
import re

str = 'Tomy: 9706612345'

res = re.serach(r'\D+', str)

print(res.group())
```

character	Description
\D	Matches from any non-digit
+	1 or more repetitions of the preceding regexp

RE: Quantifiers

Example-3:

To retrieve all words starting with “an” or “ak”

```
import re

str = 'anil akhil anant arun arati arundhati abhijit ankur'

res = re.findall(r'a[nk][\w]*', str)

print(res)
```

RE: Quantifiers

Example-4:

To retrieve DoB from a string

```
import re

str = 'Vijay 20 1-5-2001, Rohit 21 22-10-1990, Sita 22 15-09-2000'

res = re.findall(r'\d{2}-\d{2}-\d{4}', str)

print(res)
```

RE	Description
\d{2}-\d{2}-\d{4}	Retrieves only numeric digits in the format of 2digits-2digits-4digits


RE: Special Character

RE: Special Characters

Character	Description
\	Escape special character nature
.	Matches any character except new line
^	Matches begining of the string
$	Matches ending of a string
[...]	Denotes a set of possible characters Ex: [6b-d] matches any characters 6, b, c, d
[^...]	Matches every character except the ones inside brackets Ex: [^a-c6] matches any character except a, b, c or 6
(...)	Matches the RE inside the parentheses and the result can be captured
R | S	matches either regex R or regex S

RE: Special Characters

Example-1:

To search whether a given string is starting with 'He' or not

```
import re

str = "Hello World"

res = re.search(r"^He", str)

if res:

    print("String starts with 'He'")

else

   print("String does not start with 'He'")
```

RE	Description
"^He"	Search from the begining

RE: Special Characters

Example-2:

To search whether a given string is starting with 'He' or not from the end

```
import re

str = "Hello World"

res = re.search(r"World$", str)

if res:

    print("String ends with 'World'")

else

    print("String does not end with 'World'")
```

RE	Description
"World$"	Search from the end

RE: Special Characters
Example-3:

To search whether a given string is starting with 'World' or not from the end by ignoring the case

```
import re

str = "Hello World"

res = re.search(r"world$", str, re.IGNORECASE)

if res:

    print("String ends with 'world'")

else:

    print("String does not end with 'world'")
```

RE	Description
"World$"	Search from the end
re.IGNORECASE	Ignore the case

re.IGNORECASE

RE: Special Characters

Example-4:

To retrieve the timings am or pm

```
import re

str = 'The meeting may be at 8am or 9am or 4pm or 5pm.'

res = re.findall(r'\dam|\dpm', str)

print(res)
```


RE: On Files

RE: On Files

Example-1:

To retrieve the emails from the file

```
import re

# open file for reading

f = open('mails.txt', 'r')


# repeat for each line of the file

for line in f:




    res = re.findall(r'\s+@\S+', line)


# display if there ara some elements in result
    print(res)

if len(res)>0:

# close the file

f.close()
```

RE: On Files

Example-2:

To retrieve the data and write to another file

```
# Open the files
f1 = open('salaries.txt', 'r')
f1 = open('newfile.txt', 'w')


# repeat for each line of the file f1
for line in fi:
    res1 = re.search(r'\d{4}', line) # exptract id no from f1
    res2 = re.search(r'\d{4,}.\d{2}', line) # extract salary from f1
    print(res1.group(), res2.group()) # display them
    f2.write(res1.group()+"\t") # write id no into f2
    f2.write(res2.group()+"\n") # write salary into f2


# close the files
f1.close()
f2.close()
```

RE: On HTML Files

RE: On HTML Files

Example-1:

To retrieve info from the HTML file

Step-1:

import urllib.request	Import this module
f = urllib.request.urlopen(r'file_path') Ex: f = urllib.request.urlopen(r'www.sample.html')	
urllib.request	Module name
urlopen	To open the html files
file:/--/--	Protocol to open the local files
sample.html	Under home DIR, under Python sub-DIR the sample.html file is present

RE: On HTML Files

Example-1:

Step-2: read and decode

text = f.read()	To read the file content
str = text.decode()	Since the HTML file contains the information in the byte strings

Step-3: Apply RE

```
r'<td>\w+</td>\s<td>(\w+)<\td>\s<td>(\d\d.\d\d)<\td>'
```