

Matching and Extracting Data

- `re.search()` returns a True/False depending on whether the string matches the regular expression
- If we actually want the matching strings to be extracted, we use `re.findall()`

`[0-9]+`



One or more digits

```
>>> import re
>>> x = 'My 2 favorite numbers are 19 and 42'
>>> y = re.findall('[0-9]+', x)
>>> print(y)
['2', '19', '42']
```

Matching and Extracting Data

When we use `re.findall()`, it returns a list of zero or more substrings that match the regular expression

```
>>> import re
>>> x = 'My 2 favorite numbers are 19 and 42'
>>> y = re.findall('[0-9]+', x)
>>> print(y)
['2', '19', '42']
>>> y = re.findall('[AEIOU]+', x)
>>> print(y)
[]
```

Warning: Greedy Matching

The **repeat** characters (***** and **+**) push **outward** in both directions (greedy) to match the largest possible string

```
>>> import re
>>> x = 'From: Using the : character'
>>> y = re.findall('^F.+:', x)
>>> print(y)
['From: Using the :']
```

Why not 'From:' ?

First character in
the match is an F

One or more
characters

Last character in
the match is a :



Non-Greedy Matching

Not all regular expression repeat codes are greedy!
If you add a **?** character, the + and * chill out a bit...

```
>>> import re
>>> x = 'From: Using the : character'
>>> y = re.findall('^F.+?:', x)
>>> print(y)
['From:']
```

First character in
the match is an F

One or more
characters but
not greedy

Last character in
the match is a :

^ F . + ? :



Advanced RegEx...

Fine-Tuning String Extraction

You can refine the match for `re.findall()` and separately determine which portion of the match is to be extracted by using parentheses

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

```
>>> y = re.findall('\S+@\S+', x)
>>> print(y)
['stephen.marquard@uct.ac.za']
```

`\S+@\S+`

At least one
non-
whitespace
character

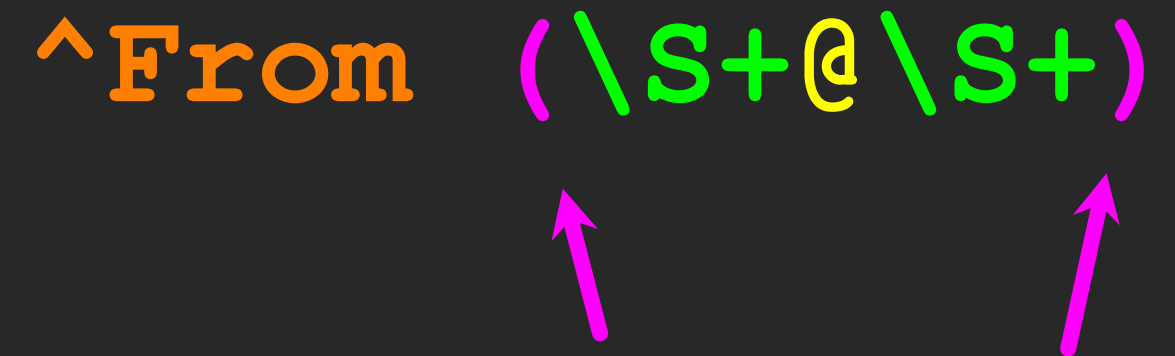
Fine-Tuning String Extraction

Parentheses are not part of the match - but they tell where to **start** and **stop** what string to extract

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

```
>>> y = re.findall('\S+@\S+', x)
>>> print(y)
['stephen.marquard@uct.ac.za']
>>> y = re.findall('^From (\S+@\S+)', x)
>>> print(y)
['stephen.marquard@uct.ac.za']
```

^From (\S+@\S+)

The diagram shows the regex pattern `^From (\S+@\S+)` with the word `From` in orange and the rest in green. Two purple arrows point upwards to the opening parenthesis `(` and the closing parenthesis `)`, indicating that the match for the email address is contained within these parentheses.

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

21 ↓ 31 ↓

```
>>> 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
```

Extracting a host
name - using find
and string slicing

The Double Split Pattern

Sometimes we split a line one way, and then grab one of the pieces of the line and split that piece again

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

```
words = line.split()
email = words[1]
pieces = email.split('@')
print(pieces[1])
```

```
stephen.marquard@uct.ac.za
['stephen.marquard', 'uct.ac.za']
'uct.ac.za'
```

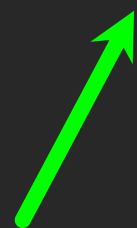
The Regex Version

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

```
import re
lin = 'From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008'
y = re.findall('@([ ^ ]*)', lin)
print(y)
```

```
['uct.ac.za']
```

'@([^]*)'



Look through the string until you find an at sign

The Regex Version

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

```
import re
lin = 'From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008'
y = re.findall('@([ ^ ]*)', lin)
print(y)
```

['uct.ac.za']

'@([^]*)'

Match non-blank character Match many of them



The Regex Version

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

```
import re
lin = 'From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008'
y = re.findall('@([^\s]*)', lin)
print(y)
```

```
['uct.ac.za']
```

'@([^\s]*)'

Extract the non-blank characters

Even Cooler Regex Version

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

```
import re
lin = 'From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008'
y = re.findall('^From .*@([ ^]*)', lin)
print(y)
```

```
['uct.ac.za']
```

'^From .*@([^]*)'

A green arrow points from the text 'Starting at the beginning of the line' to the '^' character in the regex pattern. A magenta arrow points from the text 'look for the string 'From'' to the 'From' text in the regex pattern.

Starting at the beginning of the line, look for the string 'From'

Even Cooler Regex Version

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

```
import re
lin = 'From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008'
y = re.findall('^From .*@([ ^]*)', lin)
print(y)
```

['uct.ac.za']

'^From .*@([^]*)'



Skip a bunch of characters, looking for an at sign

Even Cooler Regex Version

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

```
import re
lin = 'From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008'
y = re.findall('^From .*@([ ^]*)', lin)
print(y)
```

['uct.ac.za']

'^From .*@([^]*)'



Start extracting

Even Cooler Regex Version

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

```
import re
lin = 'From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008'
y = re.findall('^From .*@([ ^]*)', lin)
print(y)
```

['uct.ac.za']

'^From .*@([^]*)'

Match non-blank character Match many of them

Even Cooler Regex Version

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

```
import re
lin = 'From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008'
y = re.findall('^From .*@([ ^ ]*)', lin)
print(y)
```

['uct.ac.za']

'^From .*@([^]+)'



Stop extracting

Spam Confidence

```
import re
hand = open('mbox-short.txt')
numlist = list()
for line in hand:
    line = line.rstrip()
    stuff = re.findall('^X-DSPAM-Confidence: ([0-9.]+)', line)
    if len(stuff) != 1 : continue
    num = float(stuff[0])
    numlist.append(num)
print('Maximum: ', max(numlist))
```

X-DSPAM-Confidence: 0.8475

python ds.py

Maximum: 0.9907

Escape Character

If you want a special regular expression character to just behave **normally** (most of the time) you prefix it with `'\'`

```
>>> import re
>>> x = 'We just received $10.00 for cookies.'
>>> y = re.findall('\$[0-9.]+', x)
>>> print(y)
['$10.00']
```

At least one
or more



`\$[0-9.]+`

A real dollar sign



A digit or period



Summary

- Regular expressions are a cryptic but powerful language for matching strings and extracting elements from those strings
- Regular expressions have special characters that indicate intent



Acknowledgements / Contributions



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... Insert new Contributors and Translations here

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