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 sub-strings that match the regular expression

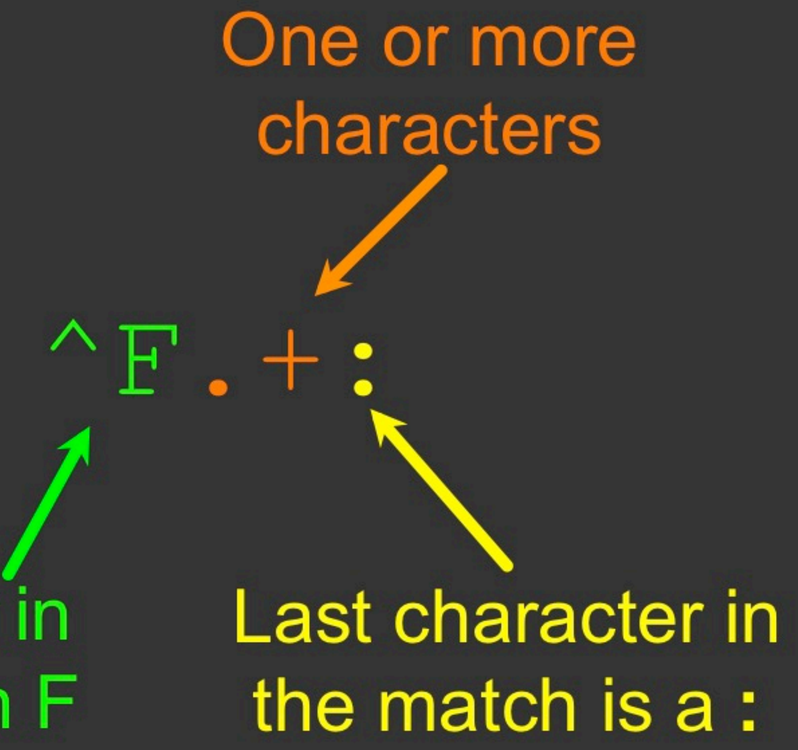
```
>>> import re
>>> x = 'My 2 favorite numbers are 19 and 42'
>>> y = re.findall('[0-9]+',x)
>>> print(y)
['2', '19', '42']
>>> y = re.findall('[AEIOU]+',x)
>>> print(y)
[]
```

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:' ?



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:']
```

One or more characters but not greedy

^F.+?:

First character in the match is an F

Last character in the match is a :

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+)
```


```
>>> 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']
```

```
'@([^ ]*)'
```

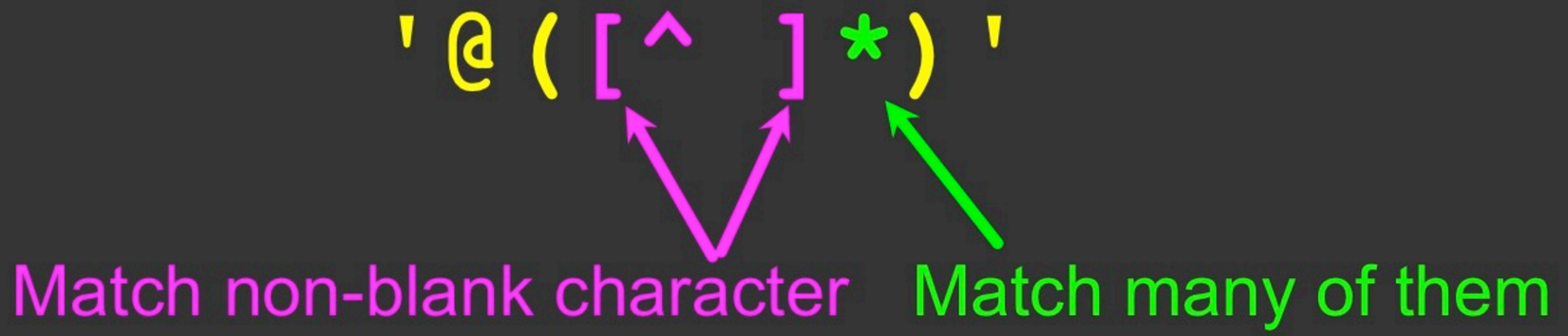
Look through the string until you find an at sign

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']
```



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']
```

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

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

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

Initial Development: Charles Severance, University of Michigan School of Information

… Insert new Contributors and Translations here

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