Applied Text Mining in Python

Regular Expressions

Processing Free-text

```
>>> text10 = '"Ethics are built right into the ideals and
objectives of the United Nations" #UNSG @ NY Society for Ethical
Culture bit.ly/2guVelr @UN @UN_Women'
>>> text11 = text10.split(' ')
>>> text11
['"Ethics', 'are', 'built', 'right', 'into', 'the', 'ideals',
'and', 'objectives', 'of', 'the', 'United', 'Nations"', '#UNSG',
'@', 'NY', 'Society', 'for', 'Ethical', 'Culture', 'bit.ly/
2guVelr', '@UN', '@UN_Women']
```

- **How do you find all Hashtags? Callouts?**

Finding Specific Words

- **Hashtags**

```
>>> [w for w in text11 if w.startswith('#')]
['#UNSG']
```

- **Callouts**

```
>>> [w for w in text11 if w.startswith('@')]
['@', '@UN', '@UN_Women']
```

Finding patterns with regular expressions

- Callouts are more than just tokens beginning with '@'

  @UN_Spokesperson @katyperry @coursera

- Match *something* after '@'
  - Alphabets
  - Numbers
  - Special symbols like '_'

@[A-Za-z0-9_]+

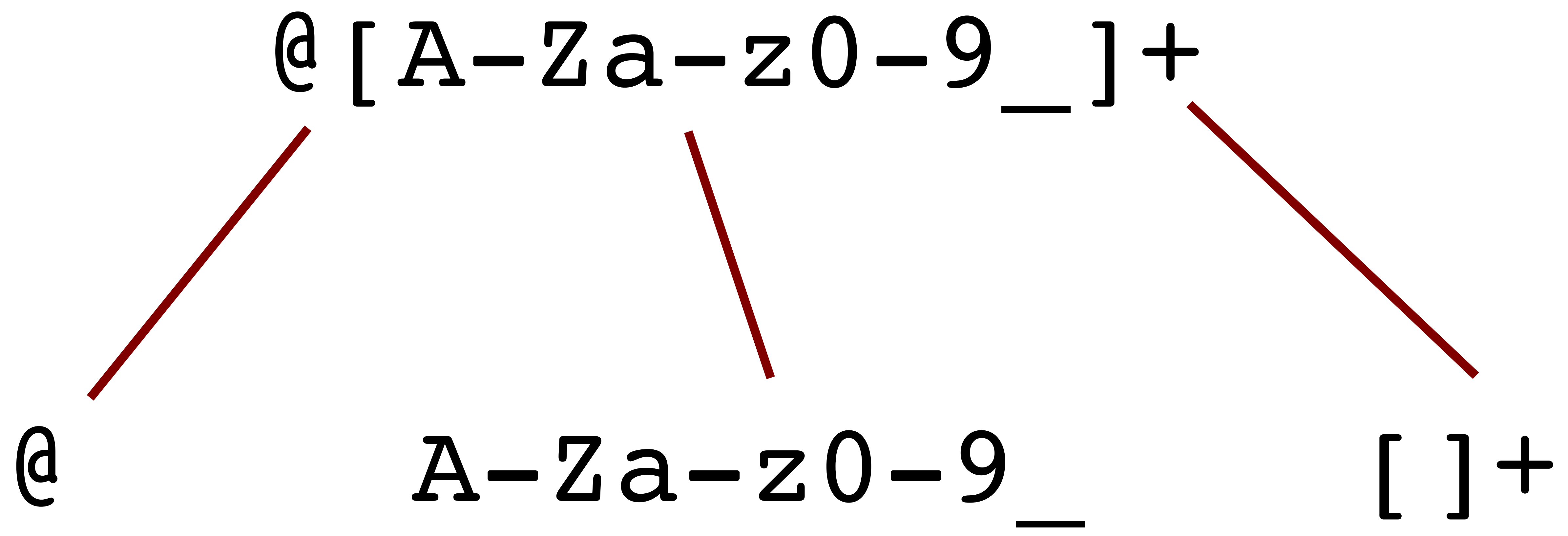
Let’s try it out!

```
>>> text10 = ‘”Ethics are built right into the ideals and objectives of the
United Nations” #UNSG @ NY Society for Ethical Culture bit.ly/2guVelr @UN
@UN_Women’
>>> text11 = text10.split(' ')
>>> [w for w in text11 if w.startswith('@')]
['@', '@UN', '@UN_Women']
```

Import regular expressions first!

```
>>> import re
>>> [w for w in text11 if re.search('@[A-Za-z0-9_]+', w)]
['@UN', '@UN_Women']
```

Parsing the callout regular expression



- starts with `@`
- followed by any alphabet (upper or lower case), digit, or underscore
- that repeats at least once, but any number of times

Meta-characters: Character matches

`.`	: wildcard, matches a single character
`^`	: start of a string
`$`	: end of a string
`[ ]`	: matches one of the set of characters within `[ ]`
`[a-z]`	: matches one of the range of characters `a`, `b`, …, `z`
`[^abc]`	: matches a character that is not `a`, `b`, or, `c`
`a|b`	: matches either `a` or `b`, where `a` and `b` are strings
`( )`	: Scoping for operators
`\`	: Escape character for special characters (`\t`, `\n`, `\b`)

Meta-characters: Character symbols

`\b` : Matches word boundary

`\d` : Any digit, equivalent to `[0-9]`

`\D` : Any non-digit, equivalent to `[^0-9]`

`\s` : Any whitespace, equivalent to `[ \t\n\r\f\v]`

`\S` : Any non-whitespace, equivalent to `[^ \t\n\r\f\v]`

`\w` : Alphanumeric character, equivalent to `[a-zA-Z0-9_]`

`\W` : Non-alphanumeric, equivalent to `[^a-zA-Z0-9_]`

Meta-characters: Repetitions

`*`	: matches zero or more occurrences
`+`	: matches one or more occurrences
`?`	: matches zero or one occurrences
`{n}`	: exactly `n` repetitions, `n`≥ 0
`{n,}`	: at least `n` repetitions
`{,n}`	: at most `n` repetitions
`{m,n}`	: at least `m` and at most `n` repetitions

Recall the callout regular expression

```
>>> text10 = '"Ethics are built right into the ideals and
objectives of the United Nations" #UNSG @ NY Society for Ethical
Culture bit.ly/2guVelr @UN @UN_Women'
>>> text11 = text10.split(' ')

>>> [w for w in text11 if re.search('@[A-Za-z0-9_]+', w)]
['@UN', '@UN_Women']

>>> [w for w in text11 if re.search('@\w+', w)]
['@UN', '@UN_Women']
```

Let’s look at some more examples!

- Finding specific characters

```
>>> text12 = ‘ouagadougou’

>>> re.findall(r'[aeiou]', text12)
['o', 'u', 'a', 'a', 'o', 'u', 'o', 'u']

>>> re.findall(r'[^aeiou]', text12)
['g', 'd', 'g’]
```

Case study: Regular expression for Dates

- Date variations for 23rd October 2002

```
23-10-2002
23/10/2002
23/10/02
10/23/2002
23 Oct 2002
23 October 2002
Oct 23, 2002
October 23, 2002
```

```
\d{2}[/-]\d{2}[/-]\d{4}
```

Regular Expression for Dates (contd.)

```
>>> dateStr = '23-10-2002\n23/10/2002\n23/10/02\n10/23/2002\n23 Oct 2002\n23
October 2002\nOct 23, 2002\nOctober 23, 2002\n’

>>> re.findall(r'\d{2}[/-]\d{2}[/-]\d{4}', dateStr)
['23-10-2002', '23/10/2002', '10/23/2002']

>>> re.findall(r'\d{2}[/-]\d{2}[/-]\d{2,4}', dateStr)
['23-10-2002', '23/10/2002', '23/10/02', '10/23/2002']

>>> re.findall(r'\d{1,2}[/-]\d{1,2}[/-]\d{2,4}', dateStr)
['23-10-2002', '23/10/2002', '23/10/02', '10/23/2002']
```

```
23-10-2002
23/10/2002
23/10/02
10/23/2002
```

Regex for Dates (contd.)

```
23 Oct 2002
23 October 2002
Oct 23, 2002
October 23, 2002
```

```
>>> re.findall(r'\d{2} (Jan|Feb|Mar|Apr|May|Jun|Jul|Aug|Sep|Oct|Nov|Dec)
\d{4}', dateStr)
['Oct']
```

```
>>> re.findall(r'\d{2} (?:Jan|Feb|Mar|Apr|May|Jun|Jul|Aug|Sep|Oct|Nov|Dec)
\d{4}', dateStr)
['23 Oct 2002']
```

```
>>> re.findall(r'\d{2} (?:Jan|Feb|Mar|Apr|May|Jun|Jul|Aug|Sep|Oct|Nov|Dec)[a-
z]* \d{4}', dateStr)
['23 Oct 2002', '23 October 2002']
```

Regex for Dates (contd.)

```
23 Oct 2002
23 October 2002
Oct 23, 2002
October 23, 2002
```

```
>>> re.findall(r'(?:\d{2} )?(?:Jan|Feb|Mar|Apr|May|Jun|Jul|Aug|Sep|Oct|Nov|
Dec)[a-z]* (?:\d{2}, )?\d{4}', dateStr)
['23 Oct 2002', '23 October 2002', 'Oct 23, 2002', 'October 23, 2002']

>>> re.findall(r'(?:\d{1,2} )?(?:Jan|Feb|Mar|Apr|May|Jun|Jul|Aug|Sep|Oct|Nov|
Dec)[a-z]* (?:\d{1,2}, )?\d{4}', dateStr)
['23 Oct 2002', '23 October 2002', 'Oct 23, 2002', 'October 23, 2002']
```

Take Home Concepts

- What are regular expressions?
- Regular expression meta-characters
- Building a regular expression to identify dates