Regular Expressions

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Roadmap

My the end of this class you should . . .

- Give examples of what you use regular expressions for
- Write regular expressions to find (linguistic) patterns
- Do simple counting using NLTK
- Play around with Python interpreter
- Access corpora from NLTK

Outline

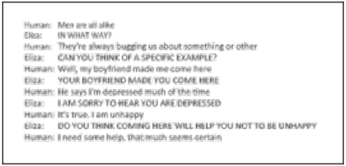
ELIZA

Regular Expression Syntax

Examples

Exercises

eliza: a cautionary tale



Human: Men are all alike
Eliza: IN WHAT WAY?
Human: They're always bugging us about something or other
Eliza: CAN YOU THINK OF A SPECIFIC EXAMPLE?
Human: Well, my boyfriend made me come here
Eliza: YOUR BOYFRIEND MADE YOU COME HERE
Human: He says I'm depressed much of the time
Eliza: I AM SORRY TO HEAR YOU ARE DEPRESSED
Human: It's true. I am unhappy
Eliza: DO YOU THINK COMING HERE WILL HELP YOU NOT TO BE UNHAPPY
Human: I need some help, that much seems certain

http://www.masswerk.at/elizabot/

- Claim: an electronic psychiatrist
- Is there anything interesting going on?

What are eliza's tricks?

I feel Y

How often do you feel Y?

I want Y

Suppose you got Y soon . . .

If Y

Do you think that it's likely that Y?

Other tricks

- Convert "my" to "your" in reply (and other pronouns)
- Randomly produce a change of subject if no rule matches: "tell me about your mother"

How do they do it?

- ELIZA is about finding patterns
- But users can type many different things
- We thus need a system for expressing many general patterns

How do they do it?

- ELIZA is about finding patterns
- But users can type many different things
- We thus need a system for expressing many general patterns
- Regular expressions

Wait a minute!

- Very stupid
- Brute-force

Wait a minute!

- Very elegant
- Low resource

Wait a minute!

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- Low resource
- But still require clever humans to write

Wait a minute!

- Very elegant
- Low resource
- But still require clever humans to write
- Even if you know regexps inside and out, it's important know how to apply them to language

Why in an NLP course?

- Searching for linguistic phenomena (does eat ever take the object "loss")?
- Creating features for supervised algorithms (HW4)
- Useful for morphology (next week)
- Thinking about regular expressions (nice tool) will help you think about finite state machines (theoretical framework)

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Symbols and Operators

Symbol	Meaning
[]	Set of characters
ˆ	Start of line / Negation
$	End of the line
|	Or
-	Range of Characters
+	At least one appearance
*	Any number of appearances
$\{N\}$	Exactly N appearances

Sets

\d	digits
\D	non-digits
\s	whitespace
\S	non-whitespace
\w	“words”
\W	non-“words”
\b	empty string at word start
.	any character except for newline

Sets

\d	digits	[0-9]
\D	non-digits	[^0-9]
\s	whitespace	[\t\n\r\f\v]
\S	non-whitespace	[^\t\n\r\f\v]
\w	“words”	[a-zA-Z0-9_]
\W	non-“words”	[^a-zA-Z0-9_]
\b	empty string at word start	\W\b\w
.	any character except for newline	b.d

Backreference

- If you enclose a subexpression in parents `(a.)`
- You can reference that expression again `\1` (for most recent)
- For less recent, the numbers increment `\2`, etc.

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Start and Stop

What does this RegEx do?

^I|.$

Start and Stop

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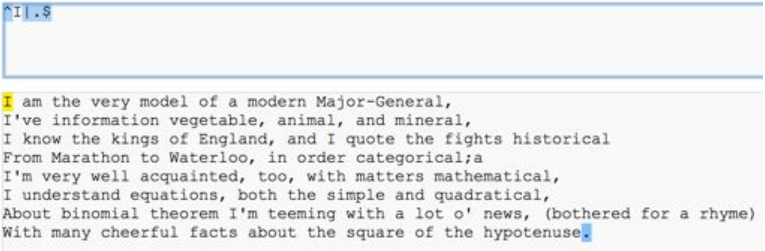

```
^I|.$
```

```
I am the very model of a modern Major-General,
I've information vegetable, animal, and mineral,
I know the kings of England, and I quote the fights historical
From Marathon to Waterloo, in order categorical;a
I'm very well acquainted, too, with matters mathematical,
I understand equations, both the simple and quadratical,
About binomial theorem I'm teeming with a lot o' news, (bothered for a rhyme)
With many cheerful facts about the square of the hypotenuse.
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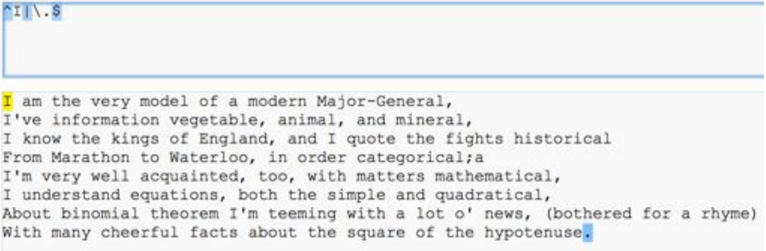

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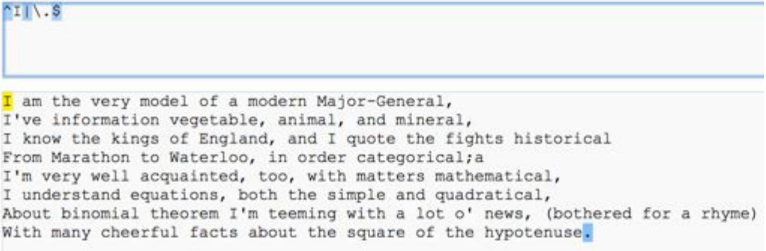

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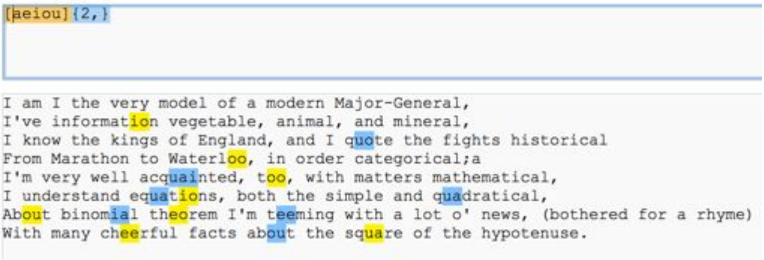

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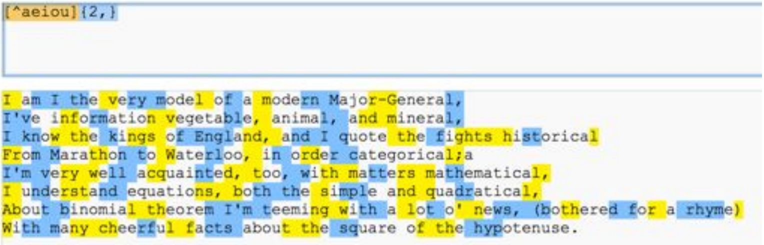

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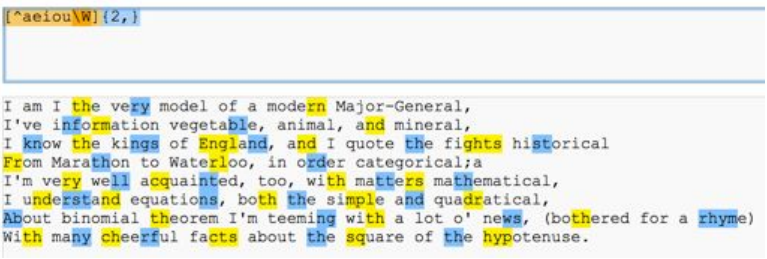

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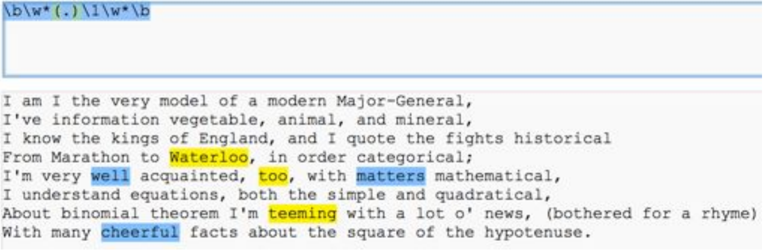

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Thou Must

Challenge

Find all examples of “thou ___t” in the bible; what are the most frequent?

- `nltk.corpus.gutenberg`
- `import re`
- `FreqDist`

Thou Must

Thou Must

```
thou_regexp = re.compile(r"[Tt]hou\s[\w]*t\s")
thou_count = FreqDist()
for ii in thou_regexp.findall(gutenberg.raw('
   bible-kjv.txt')):
    thou_count.inc(ii)
print("\n".join("%s:%i" % (x, thou_count[x])
   for x in thou_count.keys()[:10]))
```

Find a Street

Challenge

Find all examples of "Capital Word" Street in all of the Gutenberg text.

WHENEVER I LEARN A NEW SKILL I CONCOCT ELABORATE FANTASY SCENARIOS WHERE IT LETS ME SAVE THE DAY.
OH NO! THE KILLER MUST HAVE FOLLOWED HER ON VACATION!
BUT TO FIND THEM WE'D HAVE TO SEARCH THROUGH 200 MB OF EMAILS LOOKING FOR SOMETHING FORMATTED LIKE AN ADDRESS!
IT'S HOPELESS!
EVERYBODY STAND BACK.
I KNOW REGULAR EXPRESSIONS.
PERL
TAP TAP

Find a Street

Find a Street

```
street_regexp = re.compile(r"[A-Z]\w*\s[S]
   treet")
    for fileid in gutenberg.fileids():
        print(fileid, street_regexp.findall(
           gutenberg.raw(fileid)))
```

Repeated Words

Challenge

1. Find all examples of repeated words in all of Gutenberg.
2. Find all examples of repeated words separated by some other word in Gutenberg.

- `finditer`
- `group`
- Back references

Repeated Words

Repeated Words

```
repeat_regexp = re.compile(r’\b(\w+)\s(\1\b)+’
   )
for fileid in gutenberg.fileids():
    matches = list(repeat_regexp.finditer(
       gutenberg.raw(fileid)))
    print(fileid, [x.group(0) for x in matches
       ])
```

Repeated Words (with something in between)

Repeated Words (with something in between)

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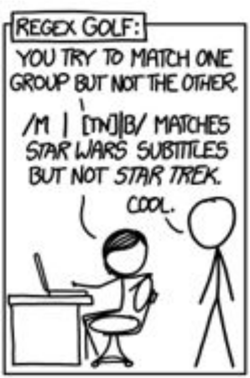
Regexp Golf


REGEX GOLF:
YOU TRY TO MATCH ONE GROUP BUT NOT THE OTHER.
/M | [TN]|B/ MATCHES STAR WARS SUBTITLES BUT NOT STAR TREK.
COOL.

Regexp Golf

Regexp	Matches	Doesn't Match
	afoot	Atlas
	tick	trickingly
	abac	beam
	undergrounder	hypergoddess
	civic	cinnabar
	unintelligibility	unregainable
	demos	rebirth

Skip: Abba, Prime

Regexp Golf

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`^[a-f]+$`	abac	beam
`(\w3).*\1`	undergrounder	hypergoddess
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`^([a-c][c-z]*|[d-m]+[m-z]*)$`	demos	rebirth

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Next time . . .

- We'll finally get to some linguistics (yay!)
- Look at morphology
- Quiz!