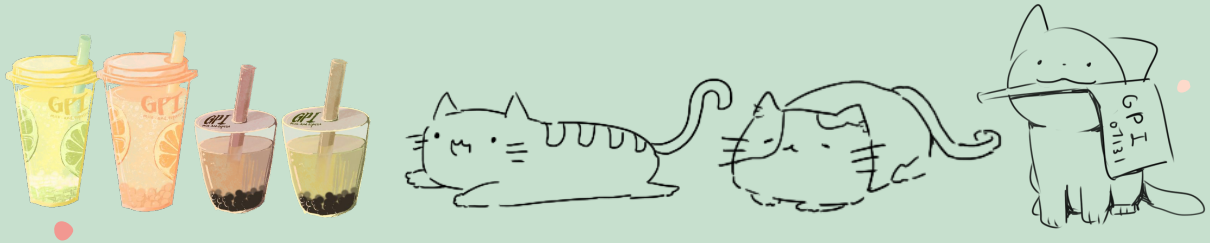
Lec 8 : ~~Boba~~ Regex and ~~Cat~~ Grep



F21 07131 GPI Lecture

Announcements

- Resume Review extratation this weekend! (3rd to last one 👀)
  Come in with a resume!!
- Collab part 2 grade should be out now!

Pet tax!

Globfield

Pregex

Igreprus

What we want to achieve	Glob/Range
Make a file for all 30 houses numbered 1 ~ 30	$ touch house{1..30}
Throw eggs to the houses 7131 to 7139, if it exists	$ ./throwEgg house713?
Send every person in scs 1x free boba voucher	$ ./sendFreeBobaVoucher *.scsPerson
... except Tom and Veronica	???? (impossible to do efficiently)
Vouchers for Tom and Veronica should allow for unlimited boba! We want something that will accept/match “”, “boba”, “bobaboba”, “bobabobaboba”... etc (boba only for now... not enough budget)	???? (impossible)

Glob's kinda useless ... Do we have something better?

Introducing ... REGEX!

- “Regular Expression”
  - Patterns that match against certain strings
  - Different from globs!
  - Compatible with many applications
- But why are they called regular expressions?
  - For interesting theoretical reasons (that you will learn later)
- Example (that we’ll dissect later)
  - (\d{3}-?){2}\d{4}

Example - boba shop phone numbers

- Multiple possible strings
  - 123-456-7890
  - 1234567890
  - 456-789-1234
- But the formats follow a few patterns
  - ###-###-####
  - ##########

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(\d{3}-?){2}\d{4}

Introducing ... REGEX!

- Normal characters
- Character classes
- Quantifiers
- Groups
- Other special expressions

Parts of a regular expression

- Normal characters
  - boba – matches "boba" 
- Character classes
  - [sml] – matches "s", "m", or "l" (no, not standard meta language, it's small, medium, or large)
  - \d – matches a digit
  - . – matches any character

Character Classes

“Boba is my character.
Boba is my personality”

Class	Matches
[abc]	a or b or c
[a-z]	Any single lowercase letter
\s	whitespace
\d	digit
\w	alphanumeric char
.	any single character (ie, wildcard)

More Character Classes

Class	Matches
[abc]	a or b or c
[a-z]	a lowercase letter
\s	whitespace
\d	digit
\w	alphanumeric char
.	any single character (ie, wildcard)

Class	Matches
[^abc]	Not any of a, b or c
[^A-Za-z]	Not a character
\S	Not a whitespace
\D	Any non-digit
\W	Any non-alphanumeric char
\.	Just a period

Parts of a regular expression

- Up until now, we've seen character classes that only match to 1 single character. How do we specify ~*quantity*~?

More Quantifiers

"How many cups of boba do you want?"
"yes"

Quantifier	Matches
a?	Zero or one (ie. optional)
a*	Zero or more
a+	One or more
a{3}	Exactly 3
a{3,}	3 or more
a{3,6}	Between 3 and 6 (inclusive)

Parts of a regular expression

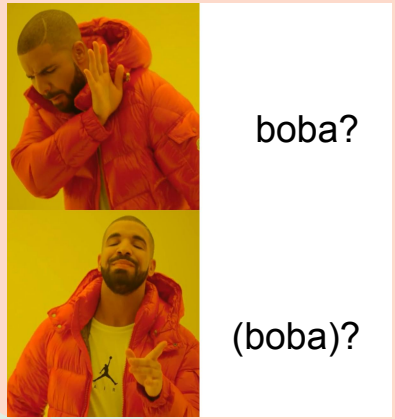
- Up until now, we've seen character classes that only match to 1 single character. How do we specify ~*quantity*~?

- Quantifiers act on the preceding character...
  - boba? - matches "bob" or "boba"
  - boba* – matches "bob", "boba", " bobaaaaa", etc.

or

Parts of a regular expression

- So far, the quantifiers only acts on the “character” immediately before it.
- Use parentheses for grouping
  - boba* - matches “bob”, “boba”, “bobaaa”...
  - (boba)* - matches “”, “boba”, “bobaboba”, “bobabobaboba” …
  - boba? - matches “bob” or “boba”
  - (boba)? - matches exactly “” or “boba”



Note that pattern matching does NOT have to start from the beginning!

- Pattern: \d (will match any digit)
- Matches: (almost like a search-and-find)
  - abc**1**xyz
  - **1**abcxyz
  - abcxyz**1**

... but you might get false positives

- Pattern: free boba
- Matches:
  - “**free boba** with the purchase of 10 bobas”
  - “**free boba** when you spend $1000 or more”
  - “Breaking news: care**free boba**-lover spends $1000”

Other special expressions

- ^ - Start of string/line (not to be confused with ^ in [^abc])
  - **^(free)** matches only “free” at beginning of the string/line
- $ - End of string/line
  - **(boba)$** matches only “boba” at the end of the string/line

^ - jump to the first non-blank character of the line
$ - jump to the end of the line

Other special expressions

- **(this|that)**
  - Don’t put spaces unless you want to match a space
  - Put as many as you want: **(this|that|here|there)**
  - Can nest or use other character classes! Ex. you can express the above as **(th(is|at)|t?here)**

Class	Matches
[abc]	a or b or c
[a-z]	a lowercase letter
\s	whitespace
\d	digit
\w	alphanumeric char
.	any single character
[^abc]	Not any of a, b or c
[^A-Za-z]	Not a character
\S	Not a whitespace
\D	Any non-digit
\W	Any non-alphanumeric char
\.	Just a period

Quantifier	Matches
a?	Zero or one (ie. optional)
a*	Zero or more
a+	One or more
a{3}	Exactly 3
a{3,}	3 or more
a{3,6}	Between 3 and 6 (inclusive)

Other expressions	Matches
^(start)	“start” at the beginning of line/string
(end)$	“end” at the end of the line/string
(this|that)	“this” or “that”

Example - boba shop phone numbers

- Multiple possible strings
  - 123-456-7890
  - 1234567890
  - 456-789-1234
- But the formats follow a few patterns
  - ###-###-####
  - ##########

Example - boba shop phone numbers

```
(\d{3}-?){2}\d{4}
```

Example - boba shop phone numbers

```
(\d{3}-?){2}\d{4}
```

Matches any 3 digits

Example - boba shop phone numbers

```
(\d{3}-?){2}\d{4}
```

Matches an optional hyphen

Example - boba shop phone numbers

Ex:
123-456-
123456-
123456

```
(\d{3}-?){2}\d{4}
```

Matches 2 groups of 3 digits

Example - boba shop phone numbers

```
(\d{3}-?){2}\d{4}
```

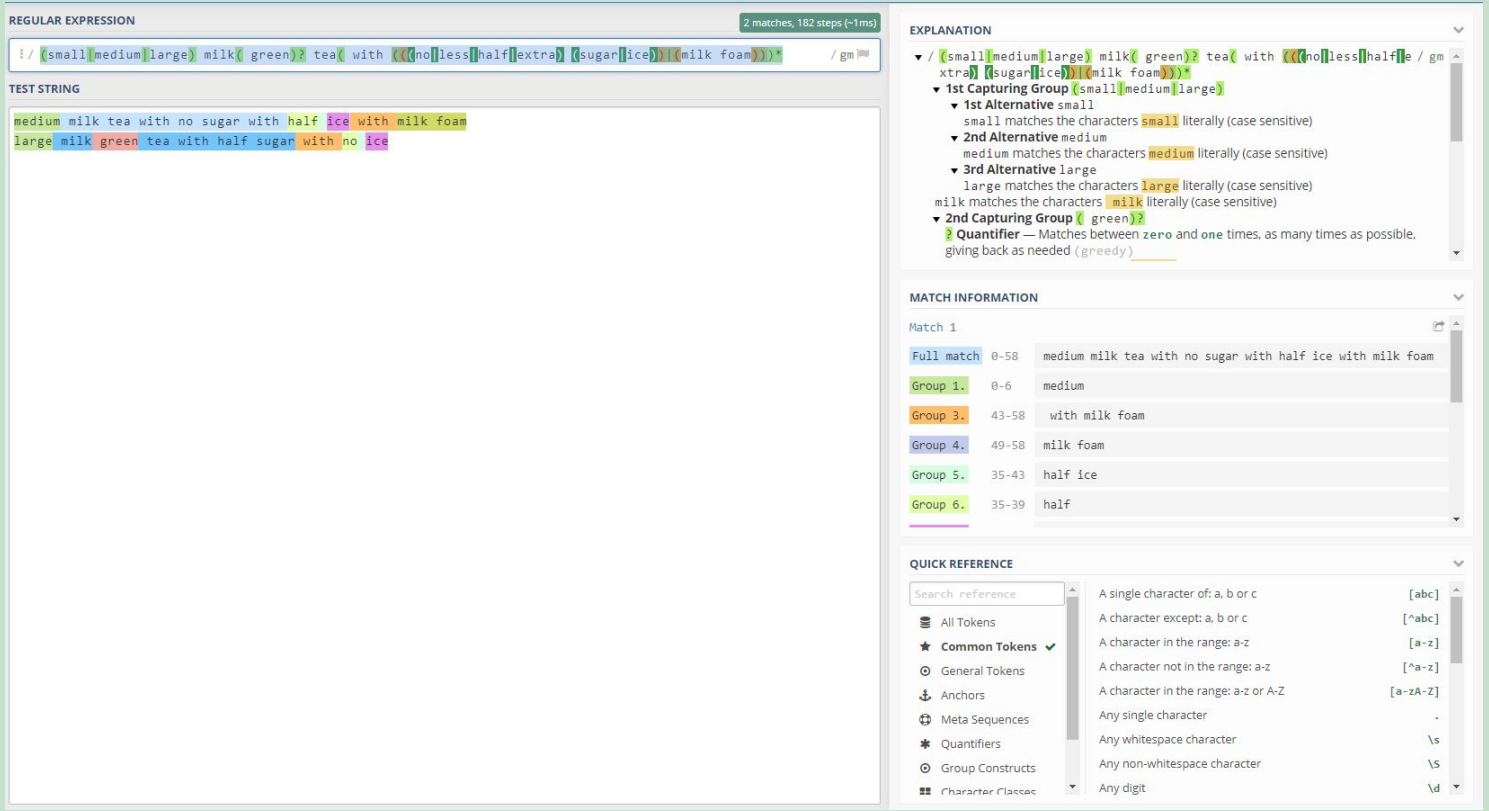
Matches 2 groups of 3 digits, then
4 more digits

Example

```
(small|medium|large) milk( green)? tea(
with (((no|less|half|extra)
(sugar|ice))|(milk foam)))*
```

Match your own favorite drink order!

https://regex101.com/



Quiz!

Matches	Regex
bobabobaboba or **bobaboba**	bobaboba(boba)? or (boba){2,3}
boba any number of times	(boba)*
[any letter][any number] ex: A4	[A-Za-z]\d
example.com website.com etc.	[a-z]+\.com

It's ~~confusion~~ time

Alright let's put glob back into our brain...

Regex vs Globs and ranges

Regex	Glob/Range equivalent
`.`	`?`
`IWant[1-7]CupsOfBoba\.please`	`IWant{1..7}CupsOfBoba.please`
`[sml]`	`{s,m,l}`
`(this|that)`	`{this,that}`
`.*`	`*`
`(ab)*`	`Not possible`

When to use what?

Regex

- Grep, sed, vim
- Searching with regex is also supported in VSCode, Google Sheets, etc
- Useful for parsing or validating data like an email, phone number, password, credit card num etc.

Glob

- In terminal command line, used by shells for matching file and directory names using wildcards. The capabilities of globbing depend on the shell.

GREP

- Bash terminal command!
- **G**lobal **R**egular **E**xpression **P**rint
- Usage: $ grep [flags] ‘pattern’ [file...]
- **$ grep 'needle' haystack.txt**
  - Searches haystack.txt for "needle"s.
- **$ grep -r 'boba' path/to/directory**
  - Searches recursively for "boba"s.
- grep is fast for theoretical reasons you will learn in the future

GREP - note!

- If you have quotes in your pattern, make sure to either escape OR put the whole pattern in another quotation
    - **$ grep '"' file or $ grep \" file**
    - **$ grep "'" file or $ grep \' file**

- If you have spaces in your pattern, put the whole pattern in quotes!
    - **$ grep 'free boba voucher' file**
- Remember that in general, put quotes around your shell command arguments if it has quotes!

most ambitious crossover in history?

use regex for the pattern...

… and globs for the filename(s).

$ grep [flags] ‘pattern’ file

wrap the pattern with quotes!!

(a glob of kittens)

flags

http://linuxcommand.org/lc3_man_pages/grep1.html

-l to print filenames

-i (ignores case when searching)

-c (counts up the number lines that contains a match)

-v (inverse; print out lines that do NOT match)

-n (also print out the line numbers)

-E (use extended regex)

Matching multiple patterns/files

(escaped) pipe to match patterns

Bracket notation to match file names

$ grep “pattern1\|pattern2\|pattern3” {file1, file2, file3}

equivalent to

$ grep -E “pattern1|pattern2|pattern3” {file1, file2, file3}
(-E flag if you don’t want to use ‘\’)

GREP - note!

- There are a lot of flags and edge cases and when-to-use-what (basic vs extended vs perl), so when stuff don't work, try googling it first!
- Example:
    - **$ grep (this|that) file** doesn't work …
    - Need to use egrep (or -E flag): **$ grep -E (this|that) file**
    - Same issue when using braced quantifiers like {3}
- Example:
    - **$ grep \d file** to look for a digit doesn't work… What should I do?
    - Use **$grep [[:digit:]] file** or **$grep -P '\d' file**

SED - stream editor

- Can perform find and replace on a file
- **$ sed 's/find/replace/g' path/to/file**
    - Prints result of replacement to the command line, leaving input untouched
    - You can use regex in find! ex/ **$ sed ‘s/[0-9]//g’ file.txt**

- **$ sed -i 's/find/replace/g' path/to/file**
    - -i for "In place"
    - Edits the file

Globfield

Pregex

Igreprus


cat
hair


CRAFTING WITH CAT HAIR
Cute Handicrafts to Make with Your Cat
by Kaori Tsutaya
translated from the Japanese
by Amy Hirschman

we want to make cat hair crafts

- we want to ~~grep~~grab it quickly (in one go) so we can start crafting
- All cat hair is labeled with the cat's name
  - **$ grep "Globfield" catsBeanBag**
  - **$ grep "Pregex" catsBeanBag**
- We want to get all the cat hair at once
  - **$ grep "Globfield\|Pregex\|Igreprus" catsBeanBag**
  - **$ grep -E "Globfield|Pregex|Igreprus" catsBeanBag**

globfield's cousin?

we want to make cat hair crafts

- There's a lot more hair throughout the apartment...
- To split the work of collecting cat hair, and we need a list of all the rooms(files) that have cat hair and we'll each take an equal amount of rooms.
    - **$ grep -lE "Globfield|Pregex|Igreprus" apartment/***
- Jeremy's responsible for the living room and bedroom! He wants to know exactly where each line each tuft of hair is located.
    - **$ grep -nE "Globfield|Pregex|Igreprus" apartment/{livingRoom,bedRoom}**
- Note how we use globs for directory!

l to **list** all the files
n for line **numbers**

we want to make cat hair crafts

- Friends are coming over, and they might not like to sit on cat hair
  - **$ grep -vE “Globfield|Pregex|Igreprus” apartment/livingRoom**
- Turns out they are allergic, so we want to know which room(file)(s) don’t have cat hair
  - hmm.. let’s try $ grep -vl “Globfield\|Pregex\|Igreprus” apartment/* … not quite
  - http://linuxcommand.org/lc3_man_pages/grep1.html
  - **$ grep -L “Globfield\|Pregex\|Igreprus” apartment/***

l to **list** all the files
v for the in**verse**

Remember...

- Give us feedback!
  http://tinyurl.com/f21-gpi-feedback
- Extratation for this weekend!
  Topic: Resume review. Come in w/ a resume!
- Next week's lecture... Advice & QA

2 labs for 2 weeks!

ZombieLab

- Be careful with escaping correctly
- Don't forget to do **$ chmod +x script.sh** and add **#!/bin/bash**

Hauntlab

- **Remember to put quotes around regex patterns!**
- Experiment with running some commands you think will work at the command line first. Then, when you think you've got an answer that will work, transfer it to your script.