Plan for LWoC

- Power of Regular Expressions
  - From theoretical computer science to scraping webpages
  - Using documentation, understanding langauge

- Surveys and providing Feedback
- Review Recommender Assignment
  - Pending Questions
- APTs and APT-Quiz
  - Labs and APTs

APTs

- Final APT quiz starts tonight
  - See Sakai for grades on previous APT quizzes
  - 100 points max on APT quizzes
- Final APTs part of lab or challenge
  - Both are challenges, can be used as APT points
  - Completed by Friday
- Will update grades in Sakai ASAP

Course Evaluations: 10 minutes

- Please go to ACES and complete evaluation for course
  - Very important!

- Use Sakai for UTA evaluation if there's time

What is Computer Science?

- … "it is the study of automating algorithmic processes that scale."
  - https://en.wikipedia.org/wiki/Computer_science

- If you need to find one email address on a webpage, you don't need computer science
  - If you need to scrape every email address, that number in the 10's to 100's, you could use help

Contributions from The Web

- Randall Munroe
  - https://xkcd.com/208/
  - https://xkcd.com/thing-explainer/
- Regex "joke"
  - Some people, when confronted with a problem, think “I know, I'll use regular expressions.” Now they have two problems.
- Regular expressions can be tough to write and debug, but are often very useful

How do you solve a problem like …

- How many words end in "aria"?
  - Start with "aria"? Contain "aria"?
  - Why would you care about this?

- Can you find ola@cs.duke.edu, susan.rodger@duke.edu, and andrew.douglas.hilton@gmail.com when searching through a webpage source?
  - What is the format of a "real" email address?

Examples of regex's at work

- What do aria$ and ^aria and aria share?
  - Answers to previous question
- What about the regex .+@.+
  - Turns out that . has special meaning in regex, so does +, so do many characters
- We'll use a module RegexDemo.py to check
  - Uses the re Python library
  - Details won't be tested, regex knowledge will

Regex expressions

- Regex parts combined in powerful ways
  - Each part of a regex "matches" text, can extract matches using programs and regex library
  - ^ is start of word/line, $ is end
- Expressions that match single characters:

`A, a, 9 or …`	Any character matches itself
`.`	Matches any character
`\w`	Matches alphanumeric and _
`\d`	Matches digit
`\s`	Matches whitespace

Regex expressions

- Repeat and combine regex parts
  - * means 0 or more occurrences/repeats
  - + means 1 or more occurrences/repeats
  - ? Means (after * or +) to be *non-greedy*
- Expressions match more than one character

`[a-zAB]`	Brackets create character class
`(regex)`	Tag or group a regex
`\1 or \2`	Matches previously grouped regex
`{1} or {n}`	Repeat regex 1 or n times

Regex examples tried and explained

- Five letter words ending in p? Starts 'd'?
  - `^\w\w\w\wp$` but not `....p$`
- Seven letter words, or seven ending with 'z'
  - Difference between `^\w{7}$` and `^\w{7}`
- Words that start with a consonant:
  - `^[^aeiou]` double meaning of ^

Regex examples tried and explained

- Five letter words ending in p? Starts 'd'?
  - `^\w\w\w\wp$` but not `....p$`
- Seven letter words, or seven ending with 'z'
  - Difference between `^\w{7}$` and `^\w{7}`
- Start and end with the same two letters like sense and metronome, decipher this:
  - `^(\w\w).*\1$`
- Start and end with three letters reversed, like despised and foolproof?

Summary of Regular Expressions

regex	***purpose***	***regex***	***purpose***
`.`	any character	`*`	zero or more of previous regex
`\w`	any alphanumeric character (and _)	`+`	one or more of previous regex
`\s`	any whitespace character	`*? or +?`	non-greedy version of either * or +
`\d`	any digit character	`()`	tag/group a regular expression
`[]`	character class, e.g., [A-Z] or [aeiou]	`\1, \2, ..`	match numbered tagged/grouped regex
`{n}`	n occurrences of preceding regex	`^`	beginning of line/string
`[^...]`	not the characters in the class, e.g., [^aeiou]	`$`	end of line/string

Answer Questions

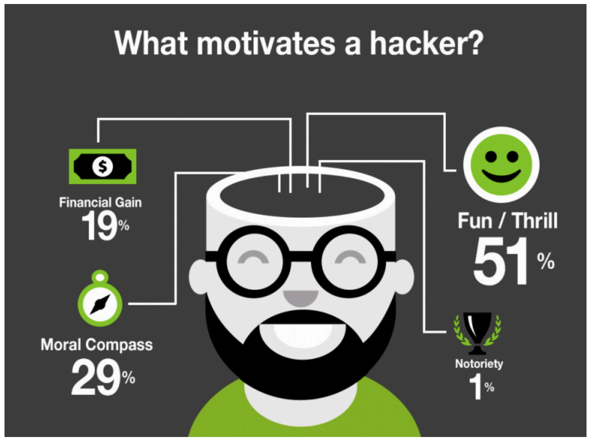
http://bit.ly/101fall15-dec1-1

NCWIT survey

- See course website for URL for survey

Scraping email address from websites

- Suppose we want to send email to all Duke Faculty to let them know …
  - Visit Departmental website, people, faculty
  - View (HTML) Source
  - Develop regex to access email – if possible!
- RegexScraper.py
  - Python makes this simple
  - Ethical hacking?



Scraping math.duke.edu faculty

- **Pattern:**
  - `r'math/faculty/(.*?)\"\>(.+?)\<'`
- **URL**
  - http://fds.duke.edu/db/aas/math/faculty/
- **Matches :**

```
…
 ('motta', 'Francis C. Motta')
 ('jmmza', 'James Murphy')
 ('ryser', 'Marc D. Ryser')
 ('sv113', 'Stefano Vigogna')
 ('haizhao', 'Haizhao Yang')
```

Scraping Sanford/PubPol faculty

- Pattern:
  - `r'(\w+[.\w]*)@(\w+[.\w+]*)'`
- URL
  - https://sanford.duke.edu/people…/
- Matches (call 16 times with different URL)

```
…
('schanzer', 'duke.edu')
('steveschewel', 'gmail.com')
('michael.schoenfeld', 'duke.edu')
('schroeder', 'law.duke.edu')
```

Scraping Biology faculty

- **Pattern:**
  - `r'mailto:(\w+[.\w]*)@(\w+[.\w+]*)'`
- **URL**
  - https://biology.duke.edu/people/all-faculty/a
- **Matches (call 26 times with different URL)**

```
…
('emily.bernhardt', 'duke.edu')
('emily.bernhardt', 'duke.edu')
('bhandawat', 'gmail.com')
('bhandawat', 'gmail.com')
('jboynton66', 'gmail.com')
('jboynton66', 'gmail.com')
```