1. HTTP Requests
   - HTTP
   - Requests

2. HTML Parsing
   - HTML
   - Beautiful Soup
The Internet in One Slide

- Network of computers that communicate via Internet protocol (IP)
- Internet service providers (ISP) direct traffic via Routing tables
- IP addresses say which computer(s) should receive a message
- A Uniform Resource Locator (URL) refers to an IP address
- Domain Name System (DNS) resolves URLs to IP addresses
- HyperText Transfer Protocol (HTTP) is a way to talk via IP
Types of Requests

- **GET**: retrieve a representation of the specified resource
  - Should not modify the state of the server

- **HEAD**: a GET request but without the body (only the header)

- **POST**: Supply the resource with the content of the POST
  - The resource is an entity that can process data
  - The content of the POST is the data to be processed

- **PUT**: Store this data at the resource
  - Defines what the contents of the URI should be
  - A GET to the resource should return what was PUT

- **DELETE**: deletes the resource
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Making a Request

- **First you must install requests** `pip install requests`
- `r = requests.get(url)` will make an HTTP GET request
  - Returns a `Response` object
- `requests.{head|post|put|delete}(url)` as well
- `r.text` is the body of the response
  - requests attempts to decode the body for you
- `r.content` is the raw body of the response
  - Use this if requests guessed the wrong encoding
- `r.headers` is the header of the response
  - Lots of extra details that you can usually ignore
Response Codes

- `r.status_code` is the HTTP status code of the response
- **1xx**: Informational. Not the actual response but not an error
- **2xx**: Everything is good
- **3xx**: Redirection. Need to make a new request
- **4xx**: Client Error: Didn’t ask right, not allowed, doesn’t exist
- **5xx**: Server Error: Might be your fault but probably not

Requests handles 1xx and 3xx for you. Can see in `r.history`

- `r.raise_for_status()` will raise an error for 4xx or 5xx
  - Prefer over:

    ```python
    if r.status_code ...:
        raise Exception
    ```
Arguments to GET and POST

- Parameters to a GET request go in the URL’s query string
  - `'http://www.example.com/test?a1=v1&a2=v2'`
  - GETs from the test page with a1=v1 and a2=v2
- `requests.get('http://.../test', params=p)`
  - If p = {‘a1’:v1, ‘a2’:v2} the above are the same
- POST request data can be passed as a dict
  - r = requests.post(url, data=d)
- GET and POST also support a headers dict as a kwarg
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HyperText Markup Language

- HTML is a standardized way of specifying the contents of a page
- It’s composed of elements (<tags>) with contents and attributes
- `<tag attribute="val">content</tag>`
- Tags are supposed to specify semantics not style
  - `<p>A paragraph</p>` Semantic grouping of page
  - `<b>bold</b>` Style of text. Better to use `<strong>` or CSS
- The tags form a tree with `<html>` at the root
<html>
  <p>
    This is the <strong>first</strong> paragraph
  </p>
  <p> Sub paragraph </p>
  <p>
    This is the <strong>second</strong> paragraph
  </p>
</html>
This is the (strong) paragraph (p)  

Sub paragraph

first

This is the (strong) paragraph

second

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Goals of Beautiful Soup

- Make searching through HTML easy (Beautiful)
  - Build the tree from the raw text
  - Provided methods for moving around the tree
  - Provide methods for finding sets of elements

- Handle poorly formatted HTML (Tag Soup)
  - Historically browsers have been lenient with HTML
  - Un-closed tags and badly nested tags are common
    - `<html><p>first<p>second</html>`
    - `<strong><p></strong></p>`
    - `<strong><p></strong></p>`
Using Beautiful Soup

- Install it – `pip install beautifulsoup4`
- Import it `from bs4 import BeautifulSoup`
- Create the tree from a string or file handle
  - `soup = BeautifulSoup(html_string)`
  - `soup = BeautifulSoup(open('html_file', 'r'))`
- `soup.<tag>` returns the first element with that tag
  - `soup.p` returns the first paragraph
  - If there are no `<tag>` returns `None`
- The object `soup.<tag>` returns has type: `bs4.element.Tag`
A tag represents `<tag attribute="val">content</tag>`

- `t.name` is the value within <> (tag in this case)
- `t[‘attribute’]` looks up attribute in a dictionary
- `t[key] ⇐⇒ t.attrs[key]`
- `t.text` will give a string of all text in the subtree rooted at `t`
- `t.string` returns a NavigableString
  - If `t` has exactly one child and
  - That child is a non-empty string
NavigableString Objects

- NavigableStrings support all operations of regular strings (str)
  - `tag.string.split(',')`
- Additionally, it knows where it is in the tree.
- You can move to a parent or sister tag
- Details of moving around are basically the same as Tags
Moving Around

- `t.<tag>` gets the first matching element below `t` in the tree
- `t.children` is an iterator over an element's immediate children
- `t.descendants` is an iterator over all elements under `t`
  - Pre-order traversal
- `t.strings` is an iterator over all navigable strings under `t`
- `t.parent` is the parent of `t` in the tree
- `t.(next_/previous_)sibling` moves to adjacent nodes
- `t.(next_/previous_)element` generalizes to the next node in the pre-order traversal
Can search by matching with the following filters:
- Literal strings
- Compiled regular expressions
- Any string in a list
- A function that returns True for tags you want
- True matches everything

\[ t.\text{find\_all}(\text{filter}) \] returns all descendants with names that match
\[ t.\text{find(...)} \] is like \[ t.\text{find\_all}(...) \] but only first match
\[ \text{kwargs} \] match attributes against filters
\[ t.\text{find(text=filter)} \] matches against the .\text{text} of a tag
\[ t.\text{find_}(\text{parents/next\_siblings/all\_next/previous}) \]

To use Python keywords, append an _
- \[ t.\text{find(class_=filter)} \]