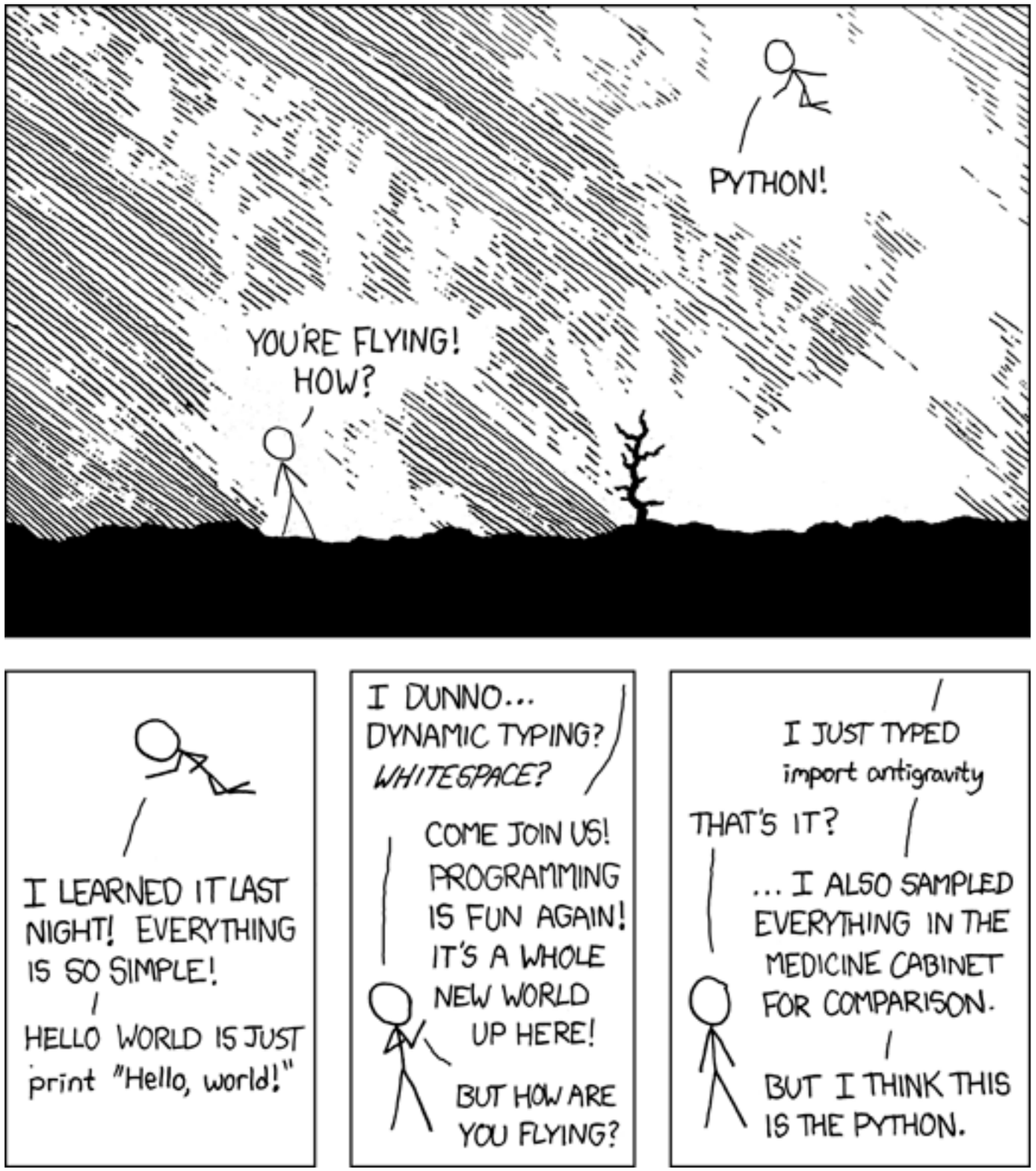
Python Evangelism

And Other Potentially Useful Information

11 April 2018

Outline

- Introduction to Python
- Survey of Useful Python Tools
- Computing in Python
- Scraping Tutorial
- Research in Python



Source: https://www.xkcd.com/353/

Why I Use Python

- Easy to code and test code
- Library available for almost any coding goal
- Well-documented trouble shooting
- The perfect glue language in any other case

Getting Started

- Code Academy

- Most Python documentation

- Quantitative Economics program by John Stachurski and Tom Sargent: https://quantecon.org/notebooks.html

- https://shapiromh.github.io - Walkthroughs of scraping examples

Ways to Use Python

1. Terminal Script (Hello, World!)
2. Interactive Python Terminal (IPython)
3. Notebook format (Jupyter Notebook)

Sample of Tools

Sample of Tools

- Data Analysis (Pandas, Statsmodels)
- Numerical Computing (Numpy/Scipy)
- Graphing (Matplotlib, plotly among others)
- Mapping / Geography (shapely among others)
- Machine Learning (tensorflow, scikit-learn)
- Bayesian Estimation (pymc)

Research in Python

Demo

Scraping

Basic Tools

- Any browser
- Python (and these modules for retrieval and parsing):
  - Requests
  - Selenium
  - Beautiful Soup
  - Regex (“re”)
  - Pandas (data management)

Some Terms

- Page Source
- HTML Tag
- HTTP Requests
- (RESTful) Application Programming Interface (API)
- Web Traffic Tools

Example:
Scraping Box Office Mojo

Steps

1. Figure out how to get to the site with data
2. Determine how to access data on page

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1. Figure out how to get to the site with data
2. Determine how to access data on page
    - Here most data is cleanly laid out in a table
    - Beautiful Soup will be a great tool in these cases
3. Wrap Python (or language of choice) around the problem

Other Hints

- When parsing, use well-documented tags to your advantage
  - Unique attributes of a tag can uniquely identify a part of the webpage
  - E.g: <table border="0" cellspacing="1" cellpadding="5">
  - Use the search function in web inspector to verify it is unique

Demo

Example:
Scraping Charging Station Usage

Steps

1. Figure out how to get to the site with data

    - Site is a pain! Sad! Find the API

2. Determine how best to access data on page

    - Data on site is a pain! Find the API…

3. Hunt for the API

API Hunting

- The "network" tab of web inspectors records all resources loaded by the page
- Usually look for **XHR** type resources used to load data from servers
  - Inspector yields the url, "**Request URL**"
  - In some cases the base url is everything before a "?"
  - **Params** are variables determining what information is returned
  - **Response** shows you what the request will return
  - Experiment to figure out what params should be manipulated

API Hunting (Old Site)

- Example, base url and parameters

https://na.chargepoint.com/dashboard/getChargeSpots?
&lat=34.0522342&lng=-118.2436849&ne_lat=34.094891308785547&
ne_lng=-118.13450826425782&sw_lat=34.009555616869 54&sw_lng
=-118.35286153574219&user_lat=0&user_lng=0&search_lat=34.052
2342&search_lng=-118.2436849&scWidth=1320&scHeight=798&sor
t_by=distance&f_estimationfee=false&driver_filters=false&f_available
=false&f_free=false&f_l1=false&f_l2=false&f_chademo=false&f_saec
ombo=false&f_tesla=false&f_cp=false&f_blink=false&f_semacharge
=false&f_evgo=false&community=true&non_community=true&show_
mode2_only=false&show_mode1_only=false&_=1459222733665

API Hunting (New Site)

- Example, base url and parameters

https://mc.chargepoint.com/map-prod/get?{%22station_list%22:
{%22page_offset%22:%22%22,%22sort_by%22:%22distance%22,%22scree
n_width%22:451,%22ne_lat%22:41.2962962963,%22ne_lon%22:-123.37333
333,%22sw_lat%22:40.9444444444,%22sw_lon%22:-124.4,%22page_size%
22:100,%22screen_height%22:764,%22filter%22:
{%22connector_l1%22:false,%22connector_l2%22:false,
%22is_bmw_dc_program%22:false,%22is_nctc_program%22:false,
%22connector_chademo%22:false,%22connector_combo%22:false,
%22connector_tesla%22:false,%22price_free%22:false,
%22status_available%22:false,%22status_available%22:false,
%22network_chargepoint%22:false,%22network_blink%22:false,
%22network_semacharge%22:false,%22network_evgo%22:false,
%22connector_l2_nema_1450%22:false,%22connector_l2_tesla%22:false},
%22include_map_bound%22:true},%22user_id%22:0}

API Hunting

- The url request may be a file, html, in this case JSON
- How best to extract the data depends on what the request returns…
  - Pray for JSON
  - HTML can be parsed like in the previous example

- **NB:** Make sure the website does not explain its API before searching

Review Approach

1. Check for a website-provided API

2. Check for an API by examining web traffic

3. All else fails, download page sources and figure out how to parse

Levels of Frustration

1. **Static urls directing to desired data**
2. API provided by the website
3. **API hidden by the website**

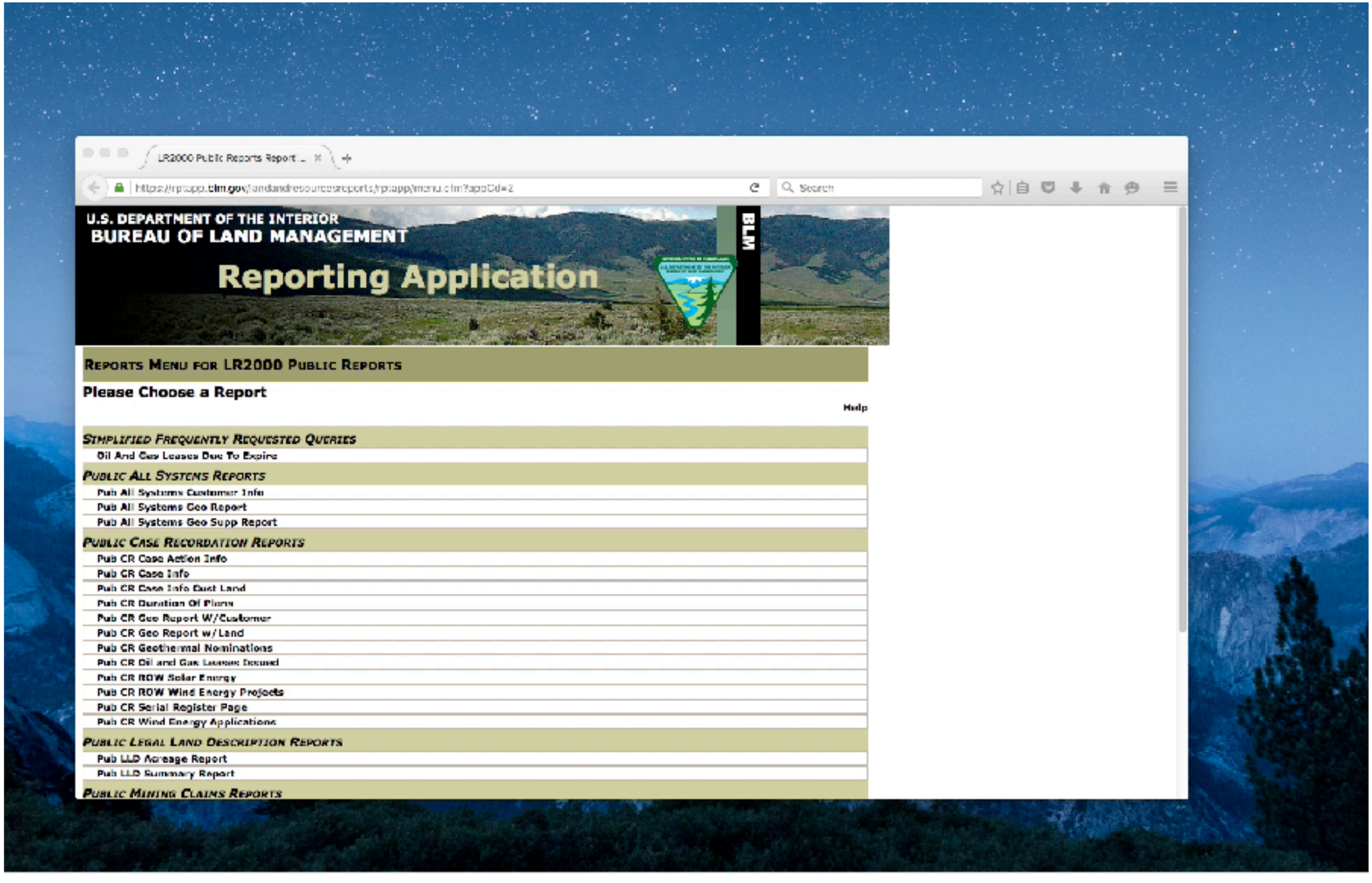
 API completely obscured

- A web driver required to automate scraping
- Try Selenium

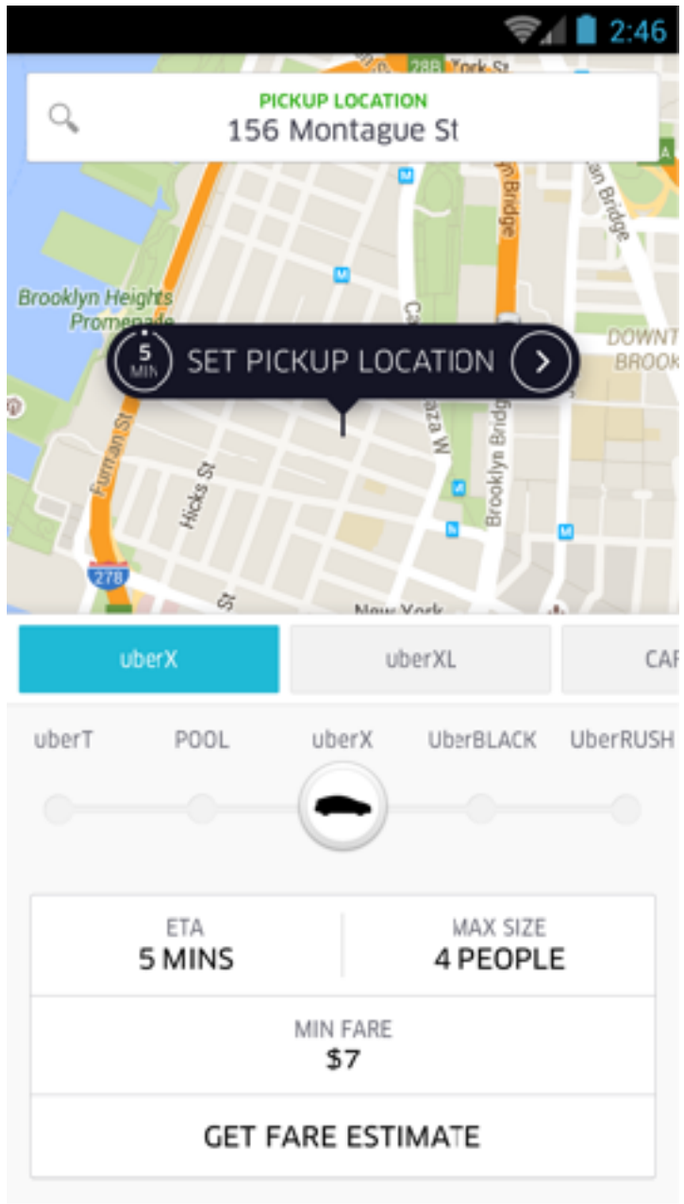
Advanced

- Javascript can screw up everything
- Selenium is an easy way to get around most complications
- Most network traffic can be captured using **proxies**
    - **Charles Proxy** is a cheap program to intercept non web-page traffic
    - Works similarly to examples explored
- Can even automate simulated smart phones with a bit of work

Selenium Demo



Automating a Smart Phone



Note: Automated through Genymotion, Appium (like Selenium for Android)

If you see it, you can scrape it!

More Research in Python

Demo