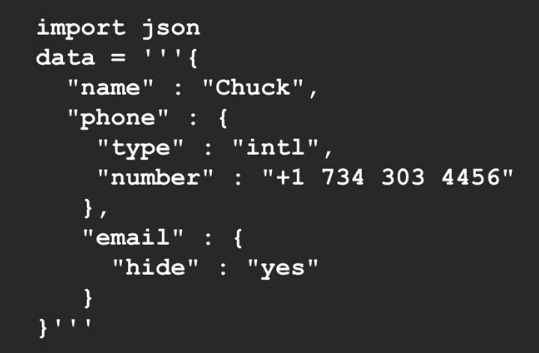
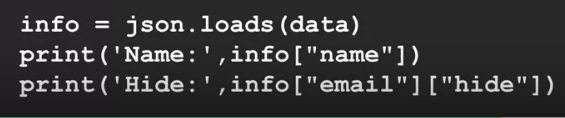
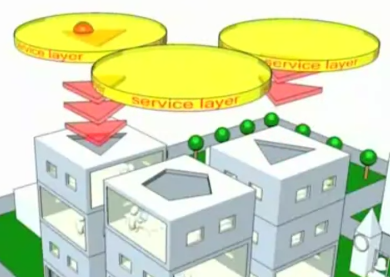
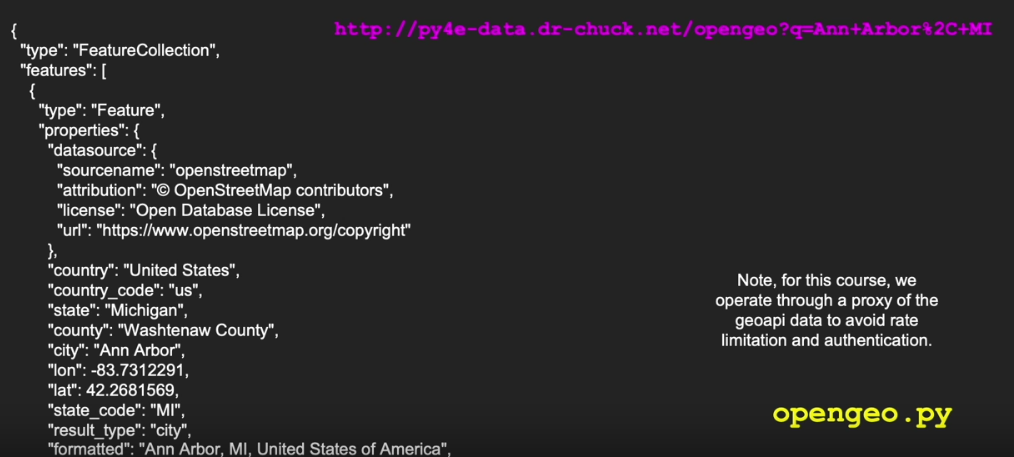
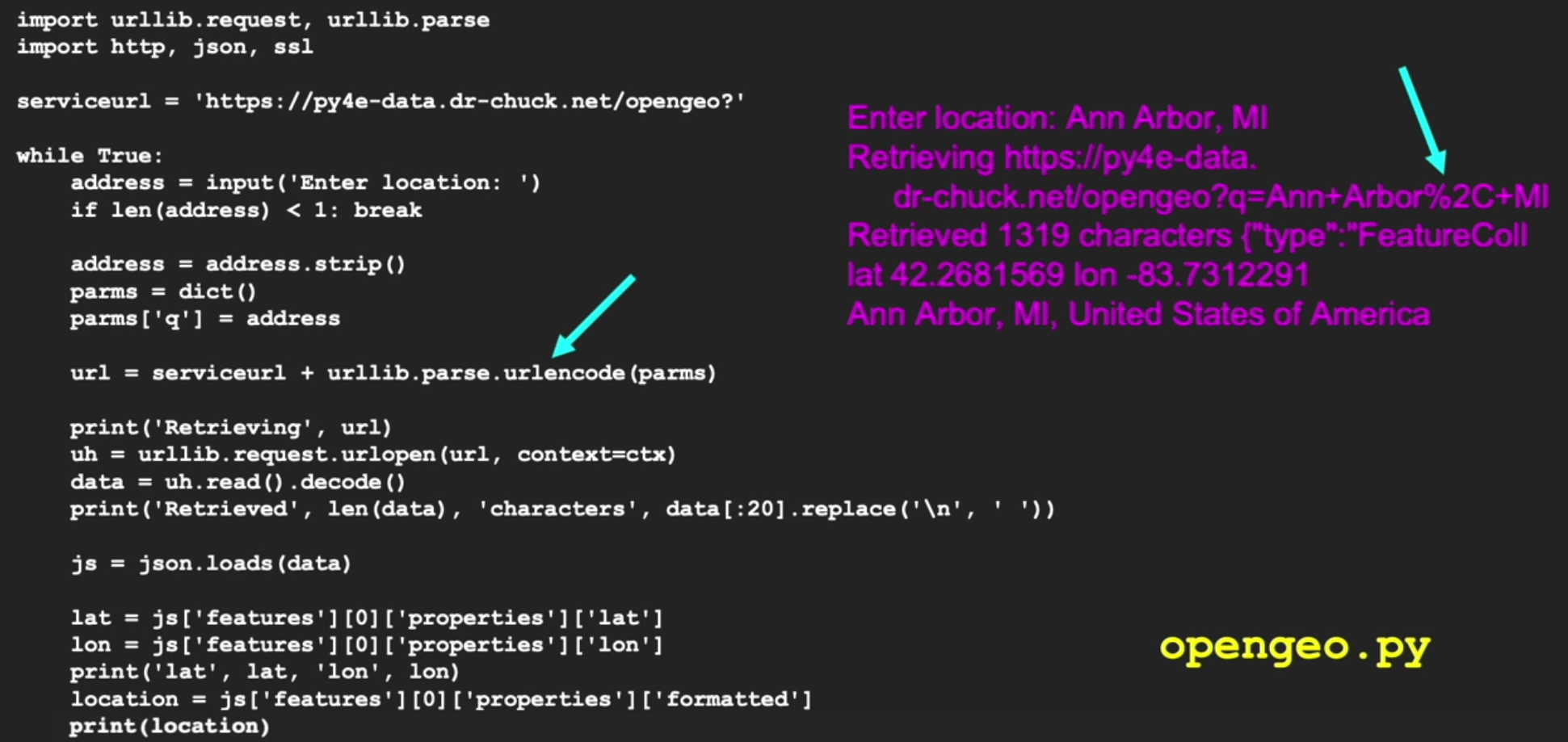
- JSON is a lightweight data interchange format that is easy for humans to read and write, and easy for machines to parse and generate. It is primarily used to transmit data between a server and a web application, serving as a more compact and flexible alternative to XML  
- Need to import *json* module, use ‘’’ or “”” around data, and start/end with {}- data is represented as nested “lists’ or ‘dictionaries’ due to use of *key:value* pairs  
 

**Service Oriented Approach**  
  
- When your service pulls data (via JSON or XML) from other service providers to display to your users (Airline websites offering you car rentals/hotel rentals when you book flights)  
- This is done via ***API (Application Programming Interface)*** - a set of rules and protocols that allows different software applications to communicate with each other. It defines the methods and data formats that applications can use to request and exchange information. Enables developers to integrate different systems, applications, or services, allowing them to work together and share functionality.  


**GeoCoding API**

- [Geoapify.com](https://www.geoapify.com/)  
- Cloudflare performs “edge caching”. Once data is asked for once, it keeps a copy of that data in servers all over the world so when another user asks for that same data it is served from the Cloudflare server and not the actual data server (Below is data returned by web browser)  


JSON version returned in Python  
- ‘q’ = address  
- url encoding - % = encoding for , and space  


(Textbook)

**eXtensible Markup Language (XML)**- The original data exchange language, best suited for document-style data  
- Looks similar to HTML  
A computer screen shot of white text

Description automatically generatedA computer screen shot of a computer code

Description automatically generated

- Triple quotes (‘’’ or “””) allow for creating strings that span multiple lines  
- *fromstring –* converts the string representation of the XML into a ‘tree’ of XML elements  
- *find* - searches through the XML tree and retrieves elements that match the specified tag  
- *findall -* Retrieves a list of all subtrees that represent the desired structure in the XML  
- *ElementTree -* is an XML parser that allows us to extract data from XML without worrying about the rules of XML syntax

* **For Loop:**A screenshot of a computer program

  Description automatically generated**A screenshot of a computer

  Description automatically generated**

***JavaScript Object Notation (JSON)***– Best suited for exchanging dictionaries, lists, or other internal information  
- Influenced by Pythons syntax for dictionaries and lists  
A computer screen shot of a code

Description automatically generated

* Cannot add tags like ‘intl’ into data, simply *key:value* pairs
* ‘person’ tag is gone and replaced by a set of curly braces {}
* JSON data structures are simpler than XML and it has fewer capabilities
* Can nest together as many lists and dictionaries as needed  
  A screenshot of a computer code

  Description automatically generatedA screen shot of a computer code

  Description automatically generated**A screenshot of a computer

  Description automatically generated**
* JSON data is less descriptive so we must know in advance what parameters we are getting (through API documentation)

**Application Programming Interfaces (API’s)**

- One service makes their data available for other services to access/use via an API by publishing a set of rules and guidelines on how to access their data – this allows for easy automatic access without manual input by people with data  
- *Service-Oriented Architecture (SOA)* – When an application makes use of the services of other applications (a hotel booking site that also offers car rentals via an Enterprise API)   
- API’s always maintain only one copy of the data   
- *Web Services* – When an application makes a set of services in its API available over the web  
A diagram of a hotel service

Description automatically generated

- Most API’s require that you possess an API key to use their API. This is for security purposes as well as to differentiate between different tiers of users (free vs paid)  
- Once you have this key you either include it in POST data or as a parameter in the URL  
- [*OAuth*](https://oauth.net/) – is a common cryptographic protocol that is used to digitally sign requests being sent over the internet