Object-Oriented Programming in Python

Advanced Programming & App Development (MIS 385N)
Summer 2022

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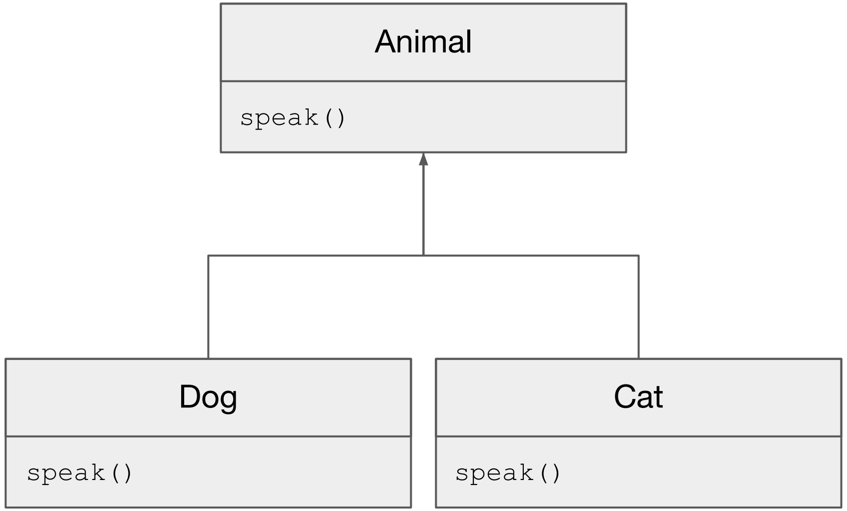
Classes and Inheritance: Animals

The usual Animal example.

- Dogs and Cats are both Animals that make sounds, but the sounds they make are different.

- `speak()` prints the subclass sound



Classes and Inheritance: Documents

Exercise: we are writing an application to read/write data in *different file types*.

We want modularity and flexibility:

- easily add support for new file types
- isolate programming efforts
- reuse old implementations in new ways

Clone today's exercises:

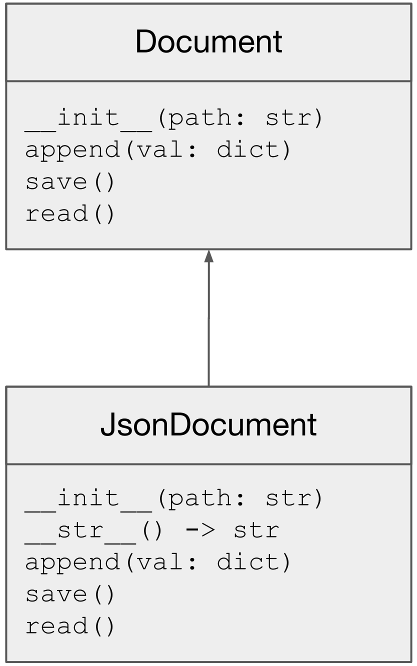
```
git clone https://github.com/evmaki/oopy.git
```

Document Class

Implement this class hierarchy in a module called Document:

- **Document** superclass defines the high-level interface of a document

- **JsonDocument** subclass implements the underlying behavior for a specific file type



JsonDocument

`def __init__(self, path: str)`

- Opens the json file at path and stores its contents in a class attribute called doc

`def __str__()`

- Overrides Python's default stringification; return the underlying document as str

`def append(self, content: dict)`

- Appends the passed dict to the doc (assumes dict is proper structure)

`def save()`

- Saves doc to the json file at the original path

`def read()`

- A generator which returns the contents of doc line-by-line

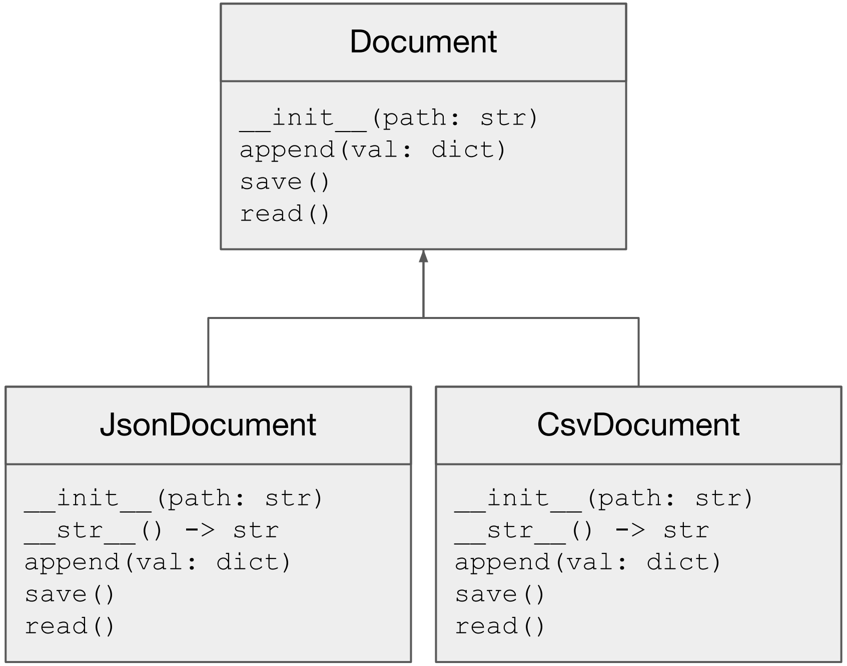
python's json library:

```
import json
```

New Subclass: CsvDocument

Now we want support for a new document type: csv documents

- **CsvDocument** has all the same inputs and outputs as other Document subclasses, but the internal implementation differs.



CsvDocument

CSV files are less flexible than JSON

```
def __init__(self, path: str)
```

- Opens the csv file at path and stores its contents in a class attribute called doc

```
def __str__()
```

- Overrides Python’s default stringification; return the underlying document as str

```
def append(self, content: dict)
```

- Appends the passed dict to the doc (assumes dict is proper structure)

```
def save()
```

- Saves doc to the csv file at the original path

```
def read()
```

- A generator which returns the contents of doc line-by-line

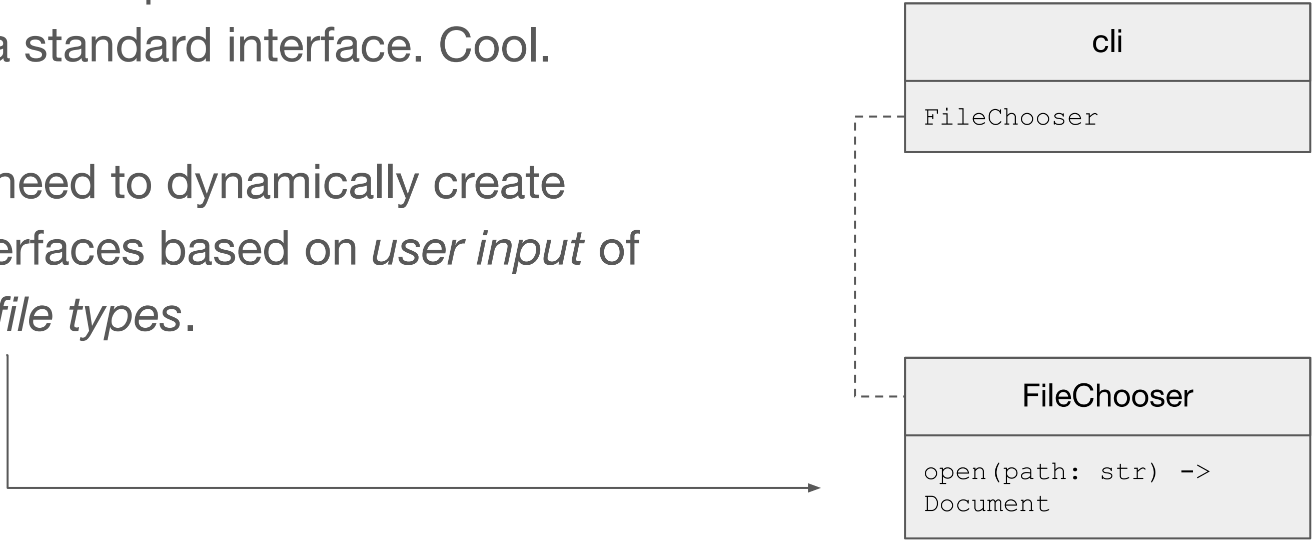
python’s csv library:

```
import csv
```

Using the Document Class

Document encapsulates different file types in a standard interface. Cool.

Now we need to dynamically create those interfaces based on *user input* of *different file types*.

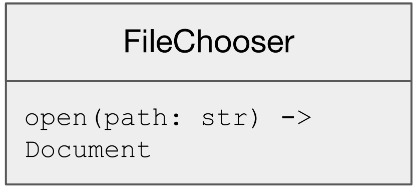


FileChooser

A “singleton” which implements one method, `open(path: str)` that takes a file path and returns the appropriate Document subclass.

The simplest singleton implementation in Python is a module that only implements functions, no classes.

Create a module named FileChooser and implement
`open(path: str) -> Document`


FileChooser

```
open(path: str) ->
Document
```

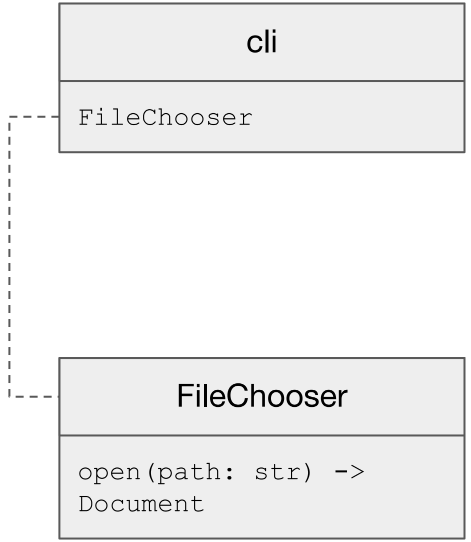
A simple cli (command line interface)

We have:

- Document class which encapsulates several different document types (polymorphism!)
- FileChooser singleton which creates the right Document subclass based on the input

We need:

- A way to take user input



Implementing the cli

Implement a cli that works with the following command:

```
python cli.py [filepath] [dict string to append]
```

Example:

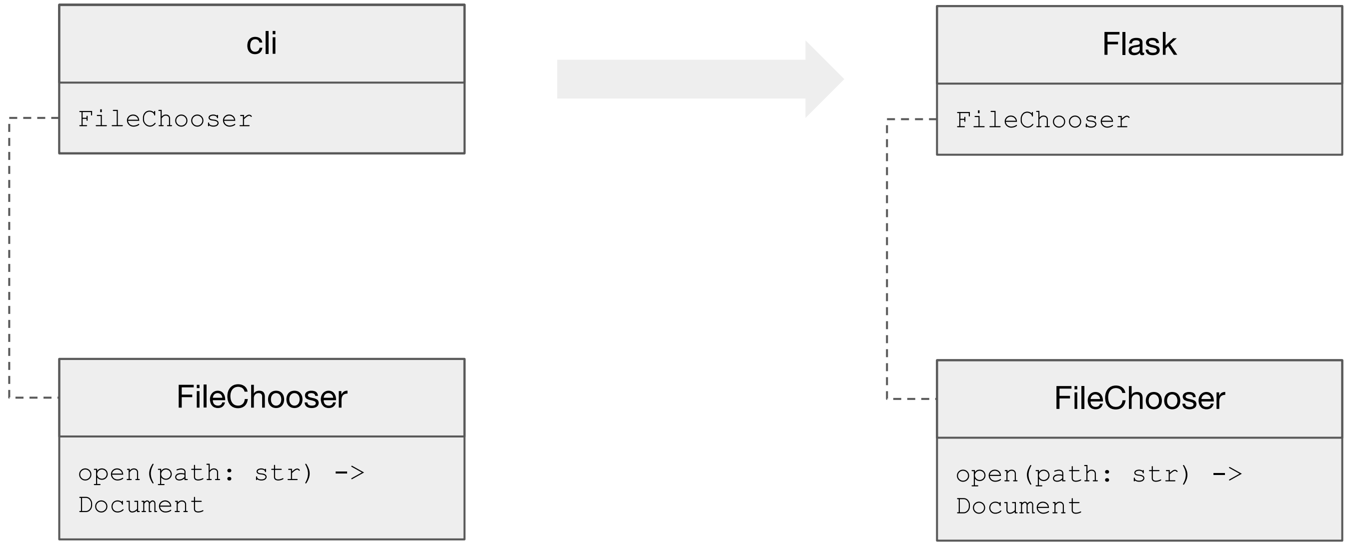
```
python cli.py ./capitals.json “{‘state’: ‘Texas’, ‘capital’: ‘Austin’}”
```

Things you’ll need:

```python
import sys, ast
```

`sys.argv` - list of tokens provided on the command line

`ast.literal_eval()` - converts strings to dictionaries


cli
FileChooser
FileChooser
open(path: str) -> Document
Flask
FileChooser
FileChooser
open(path: str) -> Document

A better user interface

Now we want to use the *same* Document and FileChooser objects but through an entirely different interface – a web application.

Provided for you:

- A basic Flask `app.py`
  - Serves an `index.html` at the site root
  - Accepts HTTP POST at `/document/` endpoint
- An `index.html` file
  - Contains a form which takes input and POSTS to `/document/`

TODO:

- Implement file handling at the `/document/` route using your classes

Recap

That was a lot. What did we accomplish?

- Defined a common interface for editing Documents
- Implemented some inheriting classes to define the behavior of Documents for different file types

abstraction, inheritance

- Implemented a module, FileChooser, which instantiates the right class type at runtime

polymorphism

- Wrote a command-line interface for interacting with our new classes
- Wrote a web interface for interacting with the same classes

modularity, code reuse