Building a GIS Web App with Django

Chris Brown (@notthatbreezy)

Overview

- Coming up with an idea
- Getting data (model)
- Serving data (view)
- Displaying data (template/html/js)

Checkout the project on GitHub : github.com/notthatbreezy/phl-play

What is Django?

The web framework for perfectionists with deadlines.

- Common functionality that can be reused across applications
- Python
- Batteries Included
  - Authentication/Session Management
  - Database abstraction
  - Built-in Admin Interface

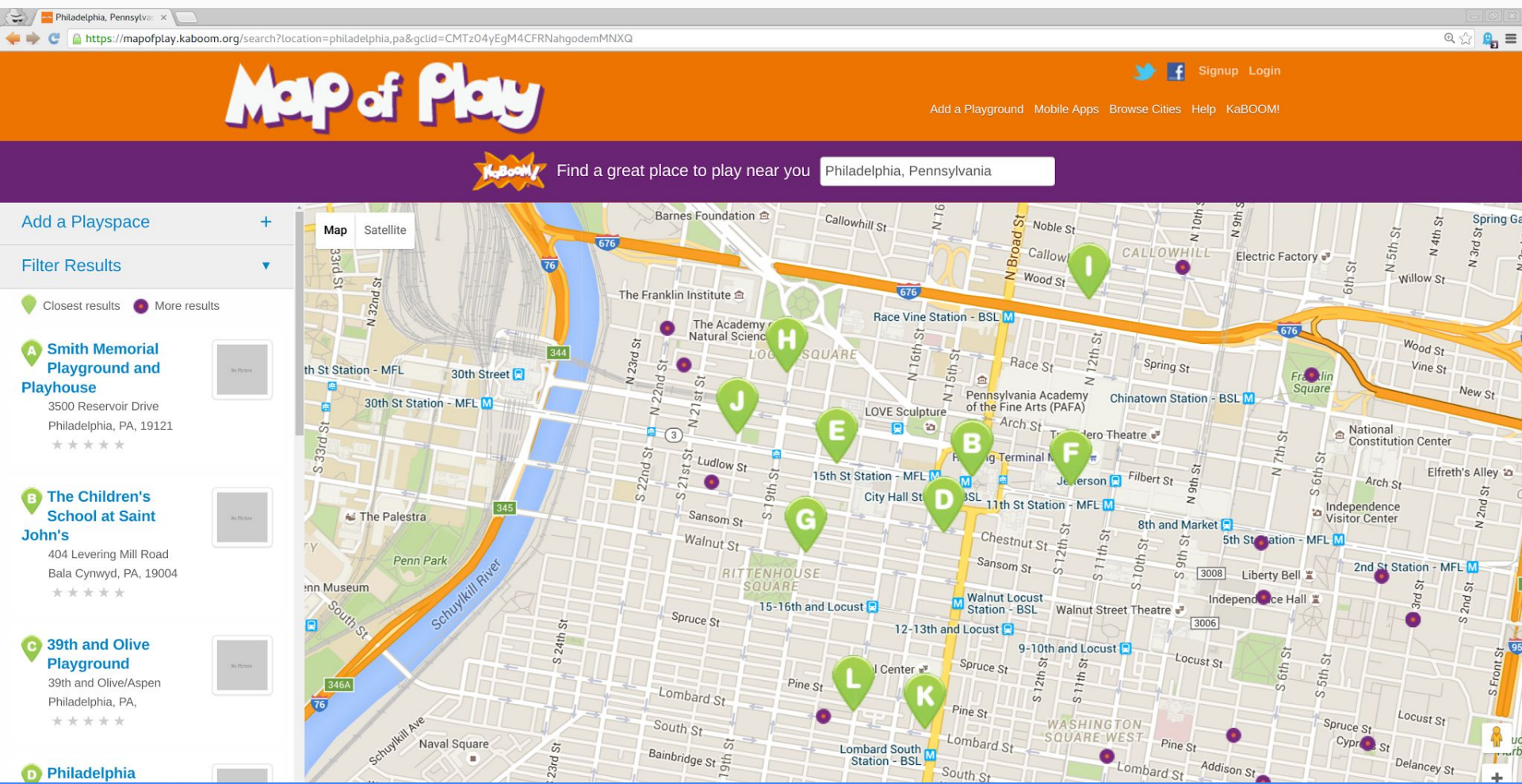
GeoDjango

- Spatially Enabled Django included by default
- Leverages well-tested open-source tools
  - GEOS (Geometry Engine, Open Source)
  - GDAL (Geospatial Data Abstraction Library)
- Management UI for Spatial Data
- GeoJSON Serialization

Step 1: Come up with an Idea

Finding a Playground in Philadelphia

This kid loves playgrounds



Kaboom Map of Play

Top Playgrounds In Phil

philadelphia.cbslocal.com/2012/03/23/top-playgrounds-in-philadelphia/

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Top Playgrounds In Philadelphia

March 23, 2012 6:00 AM

Filed Under: Activities, Family & Pets, Franklin Square Playground, Jake's Place Playground, Kid's Castle, Kids, Money-Saving, Philadelphia, Playgrounds, Seger Park Playground, Starr Garden Playground, Treehouse at Timber Creek Park

From the green oasis on a city block to a wonderland for the imagination, playgrounds spring back to life as the weather warms up. Playgrounds allow children to exercise their bodies as well as their minds; children easily transform into pirates, princesses and heroes with the layout of the playground as their guide. Here are Philadelphia's finest.

Photo Credit: Friendsofseger.org

Franklin Square Playground
200 N. 6th St.
Philadelphia, PA 19176
(215) 629-4026
www.historicphiladelphia.org

Hours: 6 a.m. – 9 p.m.

Franklin Square Playground is a great place to visit after touring nearby historical sites like the National Constitution Center and Betsy Ross House. Revitalized in 2006, the well-maintained equipment includes swings, climbers and kid-powered spinners. The space also includes a play area for children ages 2 to 5 years old. There is plenty of shade from

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CBS Philadelphia

Create Project Scaffolding

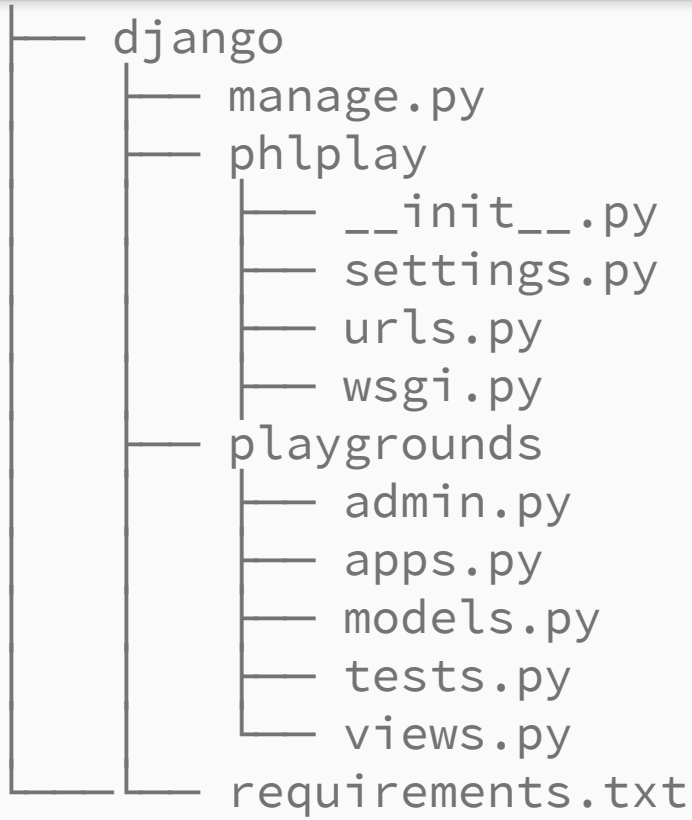
- Install Django and other dependencies
- Use Django starter script

```
django-admin.py startproject
```

- Create “App” for playgrounds

```
./manage.py startapp playgrounds
```

Project Structure



Step 2: Getting Data

Finding Data

Open Data Philly

- Great resource for Philadelphia related datasets
- City Facilities File - includes all playgrounds as points

Choosing a Database

- Oracle
- MySQL
- SQLite/SpatiaLite
- PostgreSQL/PostGIS

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- ~~Oracle~~
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Choosing a Database

- ~~Oracle~~
- ~~MySQL~~
- SQLite/SpatiaLite
- PostgreSQL/PostGIS

Modeling Data

```
1  from django.contrib.gis.db import models
2
3  class Playground(models.Model):
4      """Location with swings, slides, and other playground essentials"""
5
6      location = models.PointField(srid=26918)
7      name = models.CharField(max_length=255)
8      slug = models.SlugField()
9      address = models.TextField()
10
```

Django Migrations

- Tool to translate *Django* models to SQL Tables
- One of many Django *management* commands to help build an application

```
./manage.py makemigrations
./manage.py migrate
```

Modeling Data

```
  Column   |          Type           |                  Modifiers
-----------+-------------------------+---------------------------------------------
 id        | integer                 | not null default nextval('playgrounds_pla…);
 location  | geometry(Point,26918)   | not null
 name      | character varying(255)  | not null
 slug      | character varying(50)   | not null
 address   | text                    | not null
Indexes:
    "playgrounds_playground_pkey" PRIMARY KEY, btree (id)
    "playgrounds_playground_2dbcba41" btree (slug)
    "playgrounds_playground_location_id" gist (location)
    "playgrounds_playground_slug_a71eb275_like" btree (slug varchar_pattern_ops)
```

Importing Data

Add your own management command to import data

```
import csv
...
from playgrounds.models import Playground

class Command(BaseCommand):
    help = 'Import Playground Data'
    def add_arguments(self, parser):
        parser.add_argument('path_to_csv', type=str)

    def handle(self, *args, **options):
        csv_path = options['path_to_csv']
        playgrounds = []
        with open(csv_path, 'rb') as fh:
            reader = csv.DictReader(fh)
            for row in reader:
                if row['ASSET_SUBTYPE1'] != 'Playground':
                    continue
                name = row['SITE_NAME']
                playground = Playground(
                    point=Point(row['X'], row['Y'], srid=4326),
                    address=row['ASSET_ADDR'], name=name, slug=slugify(name))
                playgrounds.append(playground)
        Playground.objects.bulk_create(playgrounds)
```

Using the Django Admin

- Part of “batteries included”
- Can edit/modify data
- Includes spatial widgets that uses Open Street Map data and OpenLayers

Django administration

WELCOME, **ADMIN**. VIEW SITE / CHANGE PASSWORD / LOG OUT

Home › Playgrounds › Playgrounds

Select playground to change

ADD PLAYGROUND +

Action: --------- Go 0 of 100 selected

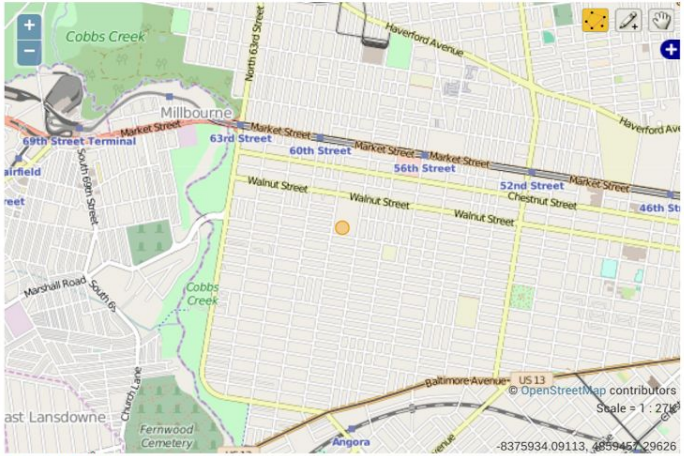
PLAYGROUND
Shepard Recreation Center
Seger Park Playground
Schmidt Playground
Russo Park Playground
Mallery Playground
Rose Playground
Sayre Morris Recreation Center
Samuel Recreation Center
Sacks Playground
Rivera Recreation Center
Reed Playground
Piccoli Playground
Dauphin Street Play Lot
Coxe Park Playground & Garage 290
Community Park
Cohocksink Recreation Center
Baldi School Playground
Fernhill Park
Donnelly Park
Murphy Recreation Center

Django Admin

Change playground

HISTORY

Location:



Delete all Features

Name: Sayre Morris Recreation Center

Slug: sayre-morris-recreation-center

Address: 5800 WALNUT ST

Step 3: Serving Data

Writing a *View*

- Data from database => User
- What should the URL look like?
  - /api/playgrounds
- What kind of data should be returned?
  - GeoJSON
- What parameters should be accepted?
  - latitude
  - longitude
  - distance

Playgrounds *View*

- Maps a request from a URL to a python function
- Parses query parameters
- Makes a spatial query
- Returns GeoJSON

```python
from django.contrib.gis.geos import Point
from django.core.serializers import serialize
from django.http import HttpResponse
from .models import Playground

def playground_view(request):
    """Handle GET Requests for Playgrounds"""

    distance = request.GET.get('distance', None)
    lat = request.GET.get('lat', None)
    lng = request.GET.get('lng', None)

    if not all([distance, lat, lng]):
        playgrounds = Playground.objects.all()
    else:
        point = Point(float(lng), float(lat), srid=4326)
        point.transform(26918)
        circle = point.buffer(float(distance))
        playgrounds = Playground.objects.filter(location__within=circle)
    serialized = serialize('geojson', playgrounds, geometry_field='location',
                           fields=('name', 'address'))
    return HttpResponse(serialized, content_type="application/json")
```

Spatial Queries

- Can make queries using our models using Django's Object Relational Mapper (ORM)

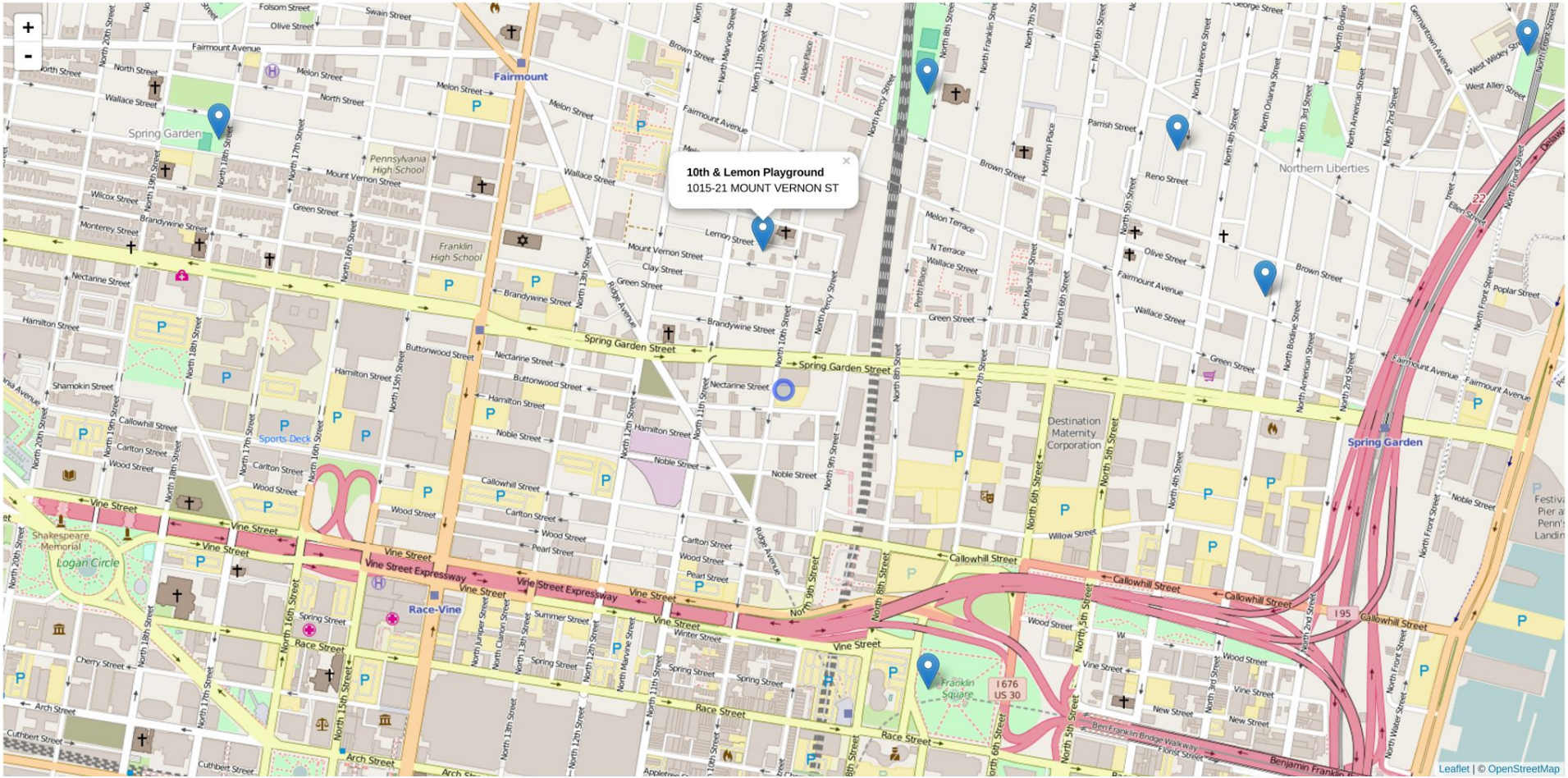
```
Playground.objects.filter(location__within=circle)
```

- Can also use: contains, intersects, within, covers, crosses, etc.

Step 4: Visualizing the Results

Making the User Interface (UI)

- Django has the ability to render templates/html
- Can use this to introduce logic based on
  - who the user is and whether they are authenticated
  - page being visited
  - other factors (time of day, etc.)
- When writing an API often the UI will be external to the Django application



Playgrounds UI