Python Web Applications: Django

Option GIS-Python

hes·so business.

Jean-Paul Calbimonte

School of Management

Bachelor of Science HES-SO (BSc) in Business Information Technology

swissuniversities

> Before we start …

install QGIS: useful for visualizing and connecting with PostGIS

https://www.qgis.org

> Django

What is Django?

https://www.djangoproject.com

- high-level Python Web framework
- rapid development and clean, pragmatic design.
- takes care of much of the hassle of Web development
- free and open source.

> Django

- Abstraction layer (**models**) for structuring and manipulating the data of the Web application
- Concept of **views** to encapsulate the logic responsible for processing a user's request and for returning the response
- **Template** layer provides a designer-friendly syntax for rendering the information to be presented to the user.
- Rich framework to facilitate the creation of **forms** and the manipulation of form data.
- Automated **admin** interface
- Multiple **protection** tools and mechanisms:
- Robust **internationalization** and localization framework

Django classical installation

> Django installation

```
> conda install -c anaconda django
```

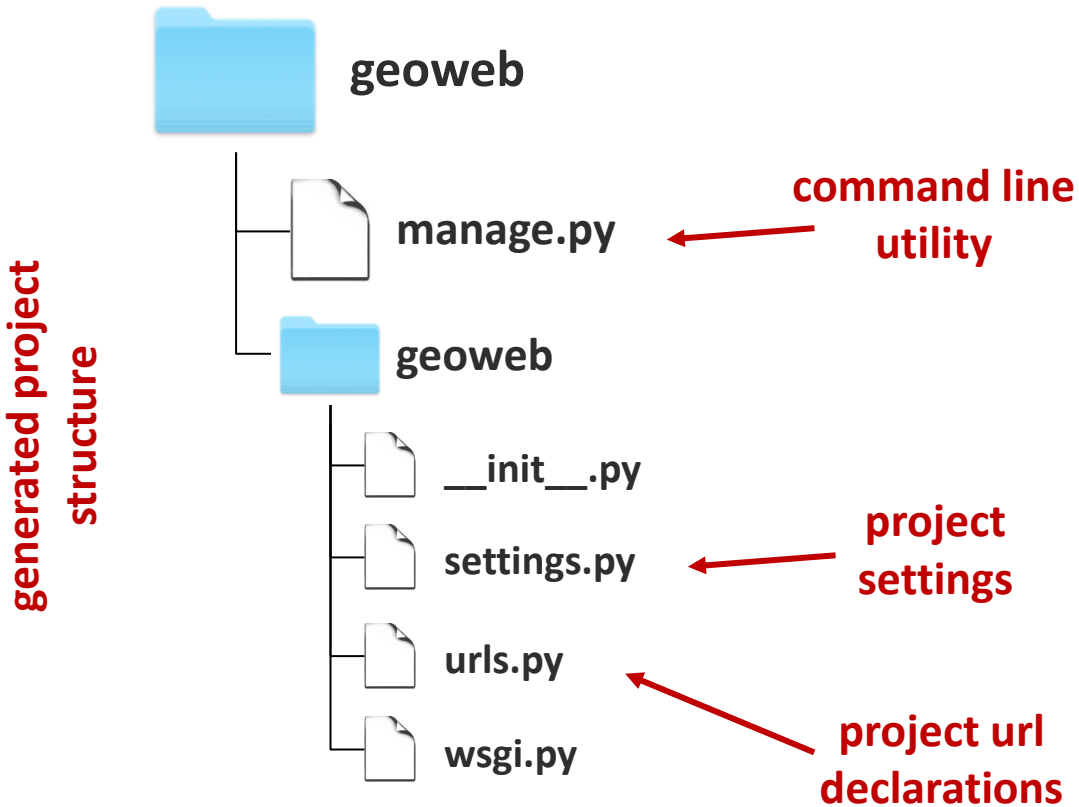
```
> python -m django --version
```

for further info check the docs at:
https://www.djangoproject.com

> Create django project

project name

```
> django-admin startproject geoweb
```



Django docker installation

Django with Docker

Dockerfile

Python image where we install django

```
FROM python:3
ENV PYTHONUNBUFFERED=1
WORKDIR /code
COPY requirements.txt /code/
RUN pip install -r requirement
RUN apt-get update && \
    apt-get install -y libproj
libfreexl-dev libgdal-dev gdal
COPY . /code/
```

requirements.txt

```
Django>=3.0,<4.0
psycopg2-binary>=2.8
django-leaflet
```

docker-compose.yml

```
version: "3.9"

services:
  db:
    image: postgis/postgis
    volumes:
      - ./data/db:/var/lib/postgresql/data
    environment:
      - POSTGRES_DB=postgres
      - POSTGRES_USER=postgres
      - POSTGRES_PASSWORD=admin
    ports:
      - "5432:5432"
  web:
    build: .
    command: python geoweb/manage.py runserver 0.0.0.0:8000
    volumes:
      - .:/code
    ports:
      - "8000:8000"
    depends_on:
      - db
  pgadmin:
    container_name: pgadmin4_container
    image: dpage/pgadmin4
    restart: always
    environment:
      PGADMIN_DEFAULT_EMAIL: admin@admin.com
      PGADMIN_DEFAULT_PASSWORD: root
    ports:
      - "5050:80"
```

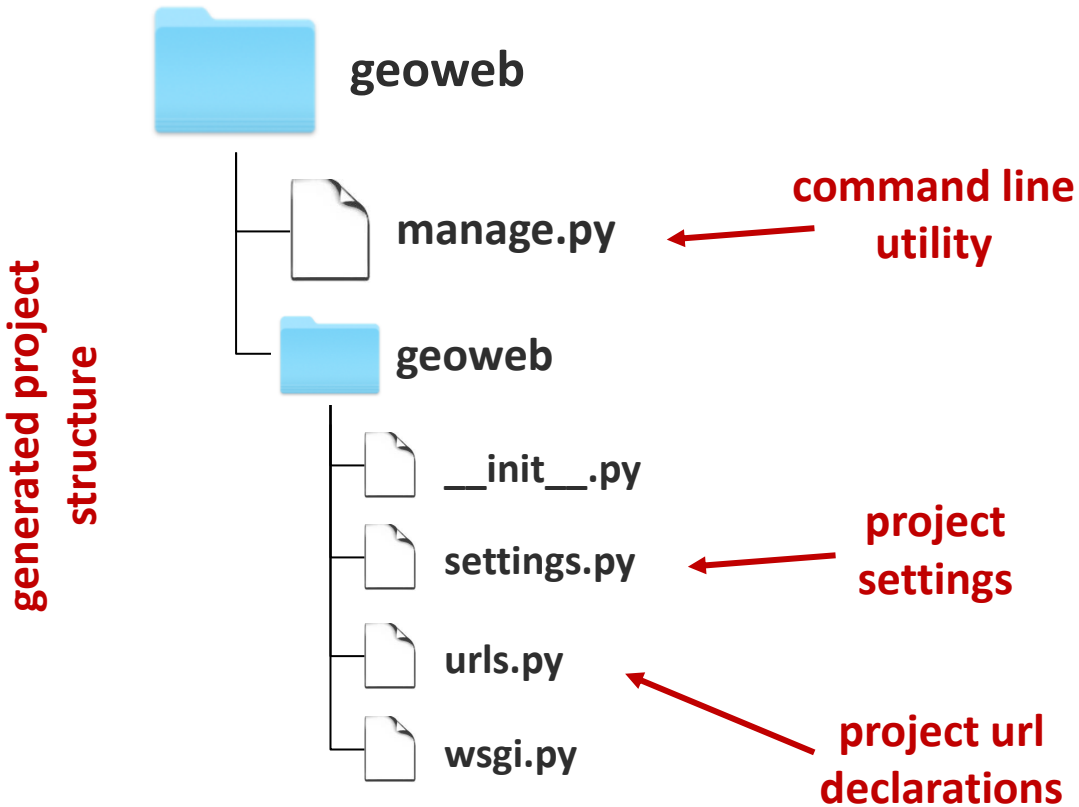
> Create django project

Version docker

```
> docker-compose run web django-admin startproject geoweb
```

project name

generated project structure



> settings.py

```
INSTALLED_APPS = [',
    'django.contrib.admin',
    'django.contrib.auth',
    'django.contrib.contenttypes',
    'django.contrib.sessions',
    'django.contrib.messages',
    'django.contrib.staticfiles',
]
```

many applications per project

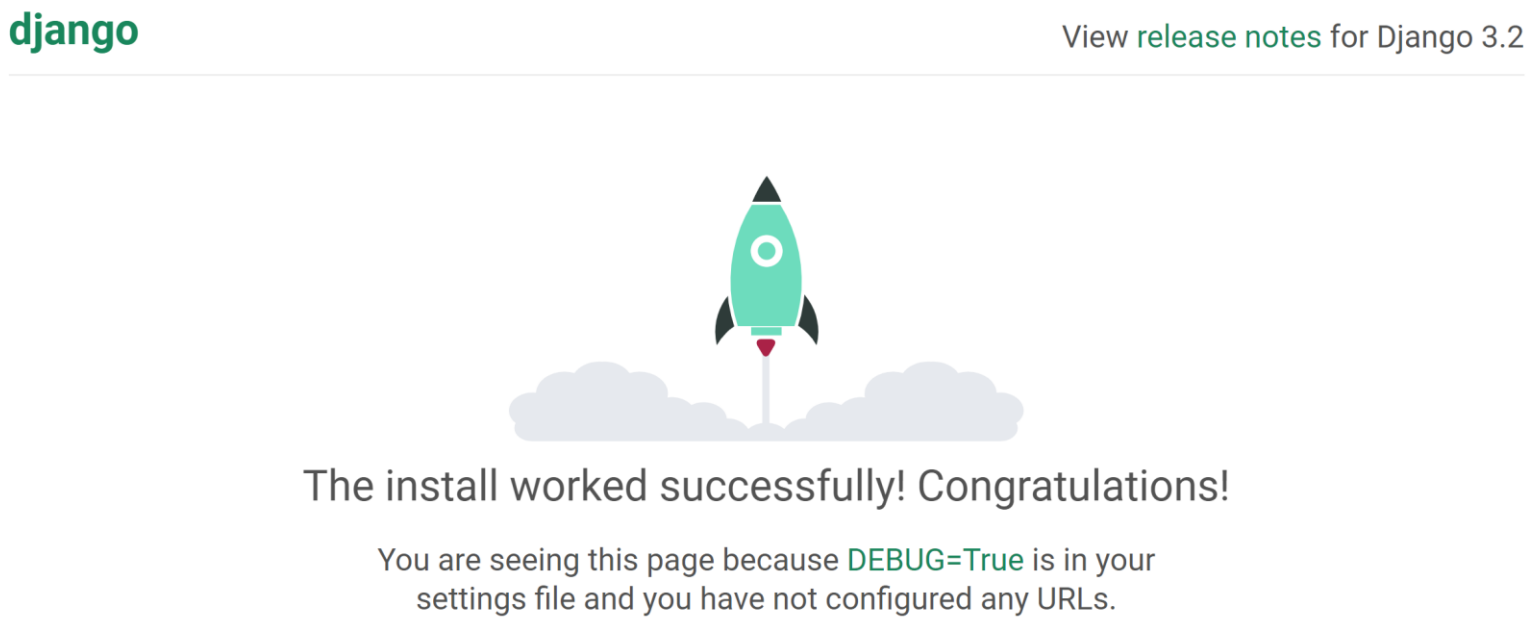
```
DATABASES = {
    'default': {
      'ENGINE': 'django.db.backends.postgresql',
      'NAME': 'postgres',
      'USER': 'postgres',
      'PASSWORD': 'admin',
      'HOST': 'db',
      'PORT': '5432',    }
}
```

database configuration

> Start django server

```
> python manage.py runserver
```

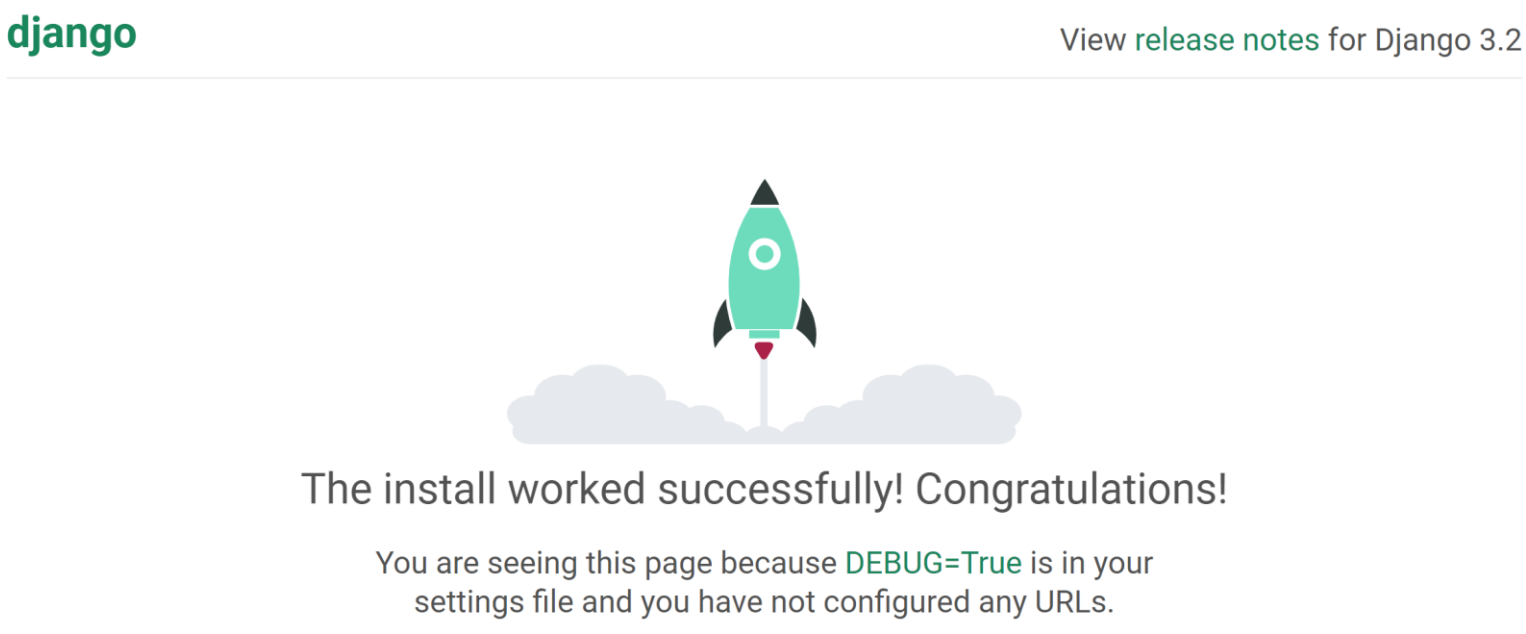
http://127.0.0.1:8000/



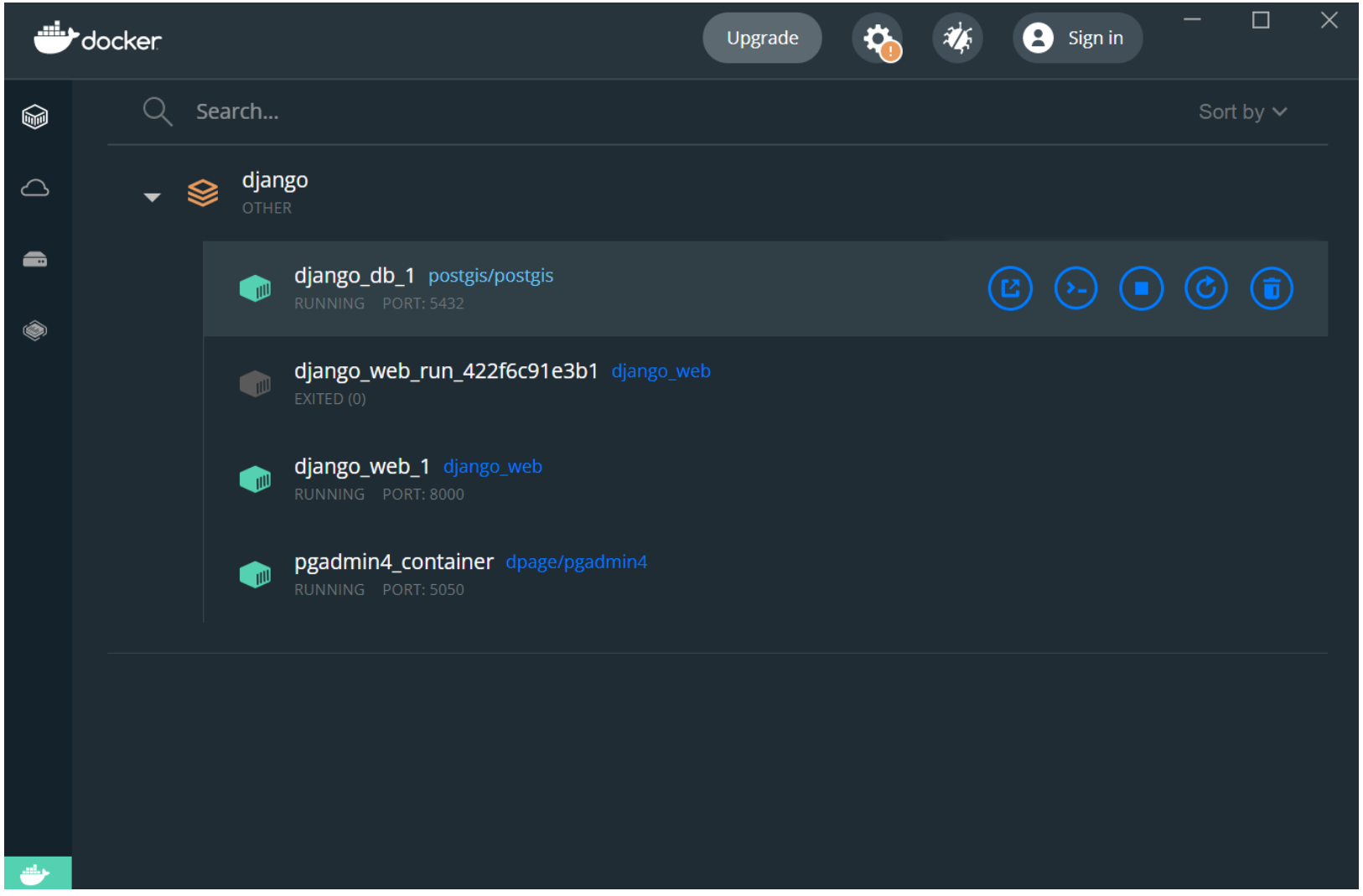
> Start django server in docker

```
> docker-compose up
```

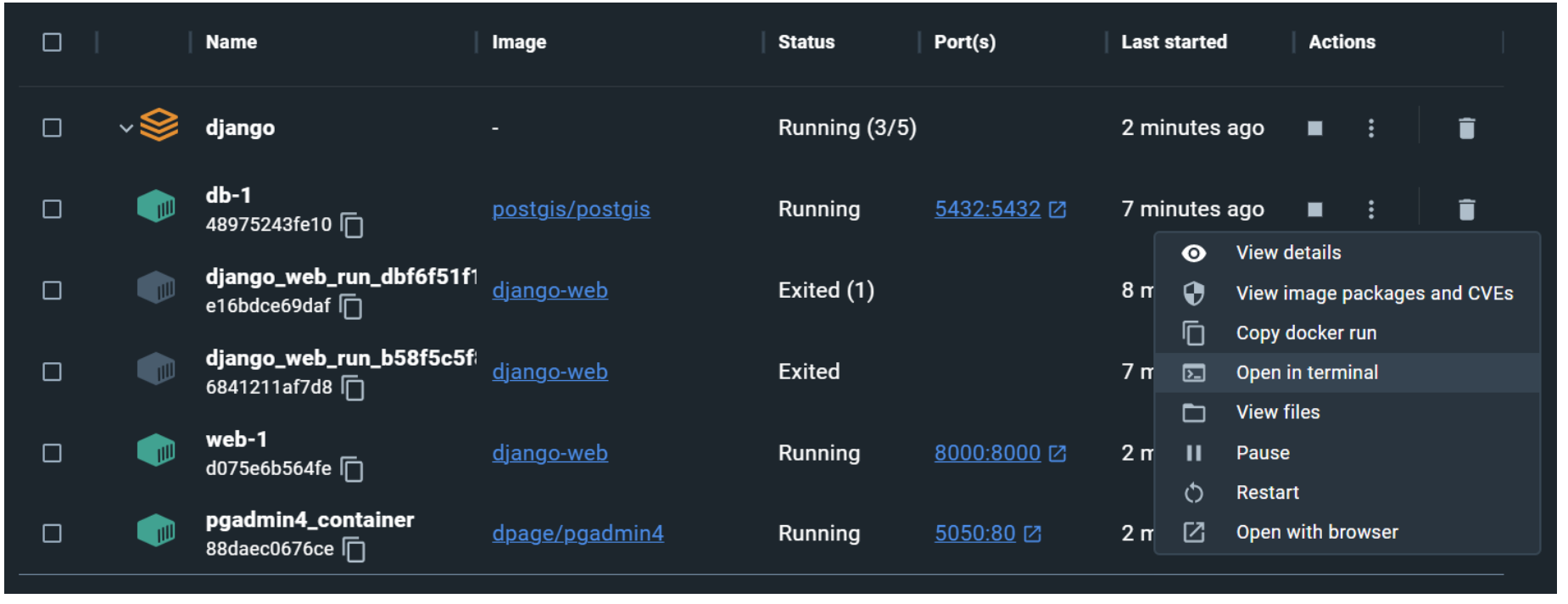
http://127.0.0.1:8000/



> Start django server in docker



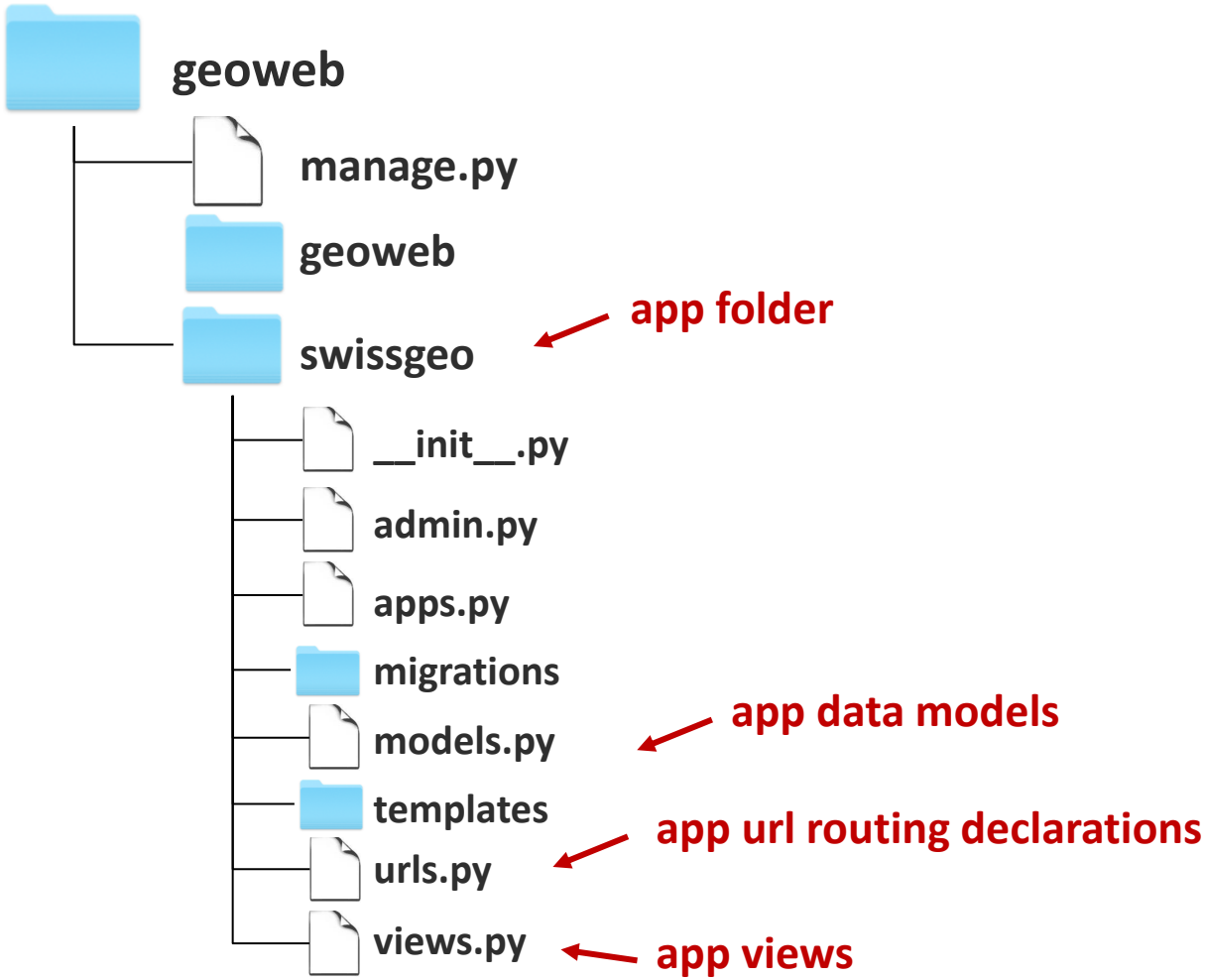
> Start django server in docker



> Create django app

app name

```
> python manage.py startapp swissgeo
```



> apps.py

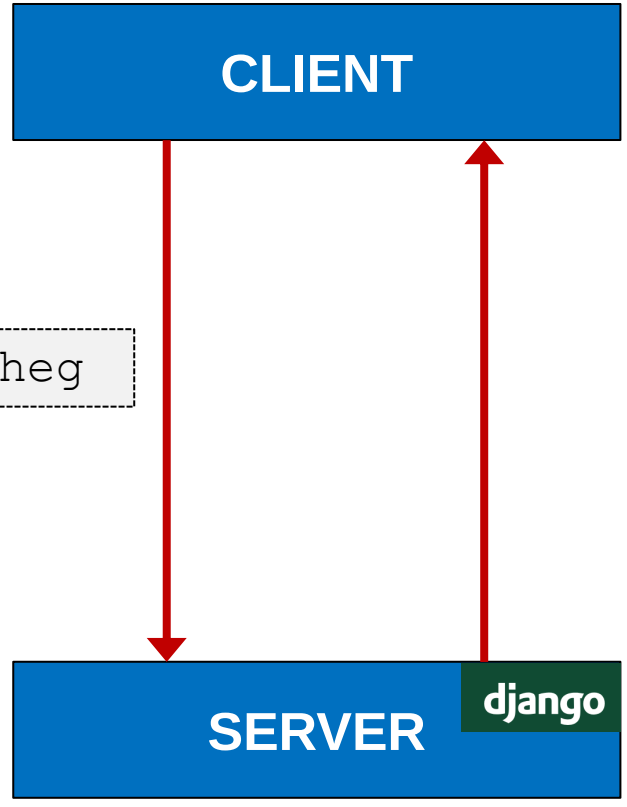
```
class SwissgeoConfig(AppConfig):
    name = 'swissgeo'
```

app config class

Settings.py

```
INSTALLED_APPS = [
'swissgeo.apps.SwissgeoConfig',
'django.contrib.admin',
'django.contrib.auth',
'django.contrib.contenttypes',
'django.contrib.sessions',
```

> HTTP requests & reponses



HTTP Request

```
GET http://www.hevs.ch/heg
```

GET /heg HTTP/1.1
Host: www.hevs.ch
Connection: keep-alive
Upgrade-Insecure-Requests: 1
User-Agent: Mozilla/5.0 …
Accept: text/html,
Accept-Encoding: gzip, deflate
Accept-Language: fr-CH;q=0.8
Cookie: SERVERID=consult8-6

HTTP Response

HTTP/1.1 302 Found
Server: Apache
Cache-Control: no-cache
Content-Encoding: gzip
Vary: Accept-Encoding
Location: http://www.hevs.ch/fr/hautes-ecoles/
haute-ecole-de-gestion
Content-Type: text/html; charset=UTF-8
Content-Length: 240
Accept-Ranges: bytes
Date: Thu, 28 Mar 2019 19:44:36 GMT

> Views & Urls: HTTP

HTTP Request `GET http://127.0.0.1:8000/swissgeo/`

geoweb/urls.py

```
from django.contrib import admin
from django.urls import include, path

urlpatterns = [
    path('swissgeo/', include('swissgeo.urls')),
    path('admin/', admin.site.urls),
]
```

match path

swissgeo/urls.py

```
from django.urls import path
from . import views

urlpatterns = [
    path('', views.index, name='index'),
]
```

empty path

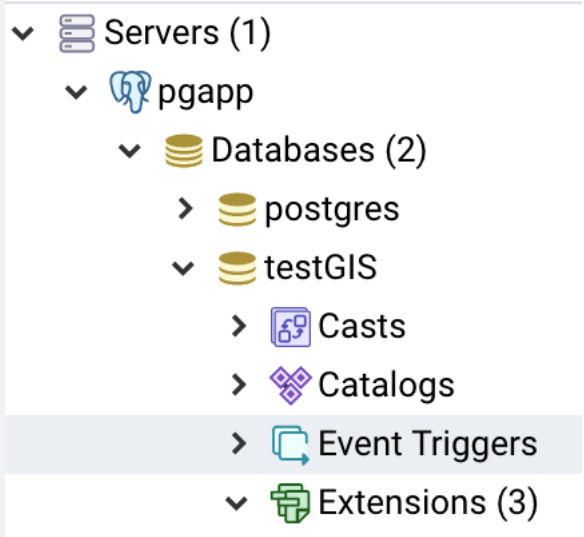
views.py

```
from django.http import HttpResponse

def index(request):
    return HttpResponse("Hi there this is Switzerland")
```

> settings.py

```
DATABASES = {
    'default': {
        'ENGINE': 'django.db.backends.postgresql',
        'NAME': 'postgres',
        'USER': 'postgres',
        'PASSWORD': 'admin',
        'HOST': 'db',
        'PORT': '5432',
    }
}
```

database connection settings



> models.py

```
from django.db import models
```

```
class City(models.Model):
    city_name = models.CharField(max_length=100)
```

map to column

map to datatype

model classes map to db tables

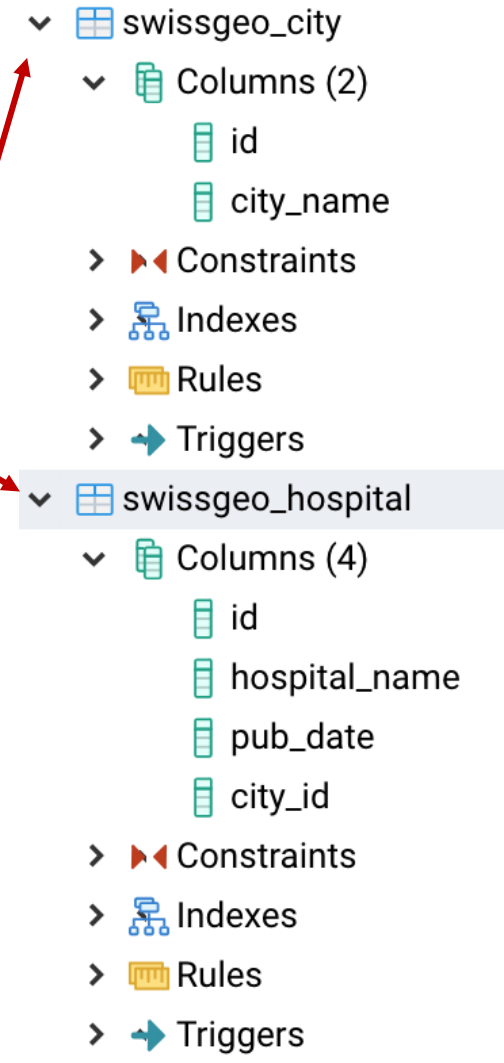
```
class Hospital(models.Model):
    hospital_name = models.CharField(max_length=100)
    pub_date = models.DateTimeField('date published')
    city = models.ForeignKey(City, on_delete=models.CASCADE)
```

foreign key object

> Make migrations

```
> python manage.py makemigrations swissgeo
> python manage.py migrate
```

Django generates SQL to create/modify tables



> Manipulating data through the API

```
> python manage.py shell
```

```
from swissgeo.models import City
```

```
c = City(city_name="Sierre")
c.save()
```

create a city

```
c.id
1
c.city_name
'Sierre'
```

```
City.objects.all()
<QuerySet [<City: Sierre>, <City: Sion>, <City: Martigny>]>
```

query all cities

```
City.objects.filter(id=1)
<QuerySet [<City: Sierre>]>
```

filter

```
City.objects.filter(city_name__startswith='S')
<QuerySet [<City: Sierre>, <City: Sion>]>
```

public.swissgeo_city/testGIS/postgres@pgapp

Query Editor | Query History

```
1  SELECT * FROM public.swissgeo_city
2  ORDER BY ID DESC LIMIT 100
3
```

Data Output | Explain | Messages | Notifications

	id [PK] integer	city_name character varying (100)
1	3	Martigny
2	2	Sion
3	1	Sierre

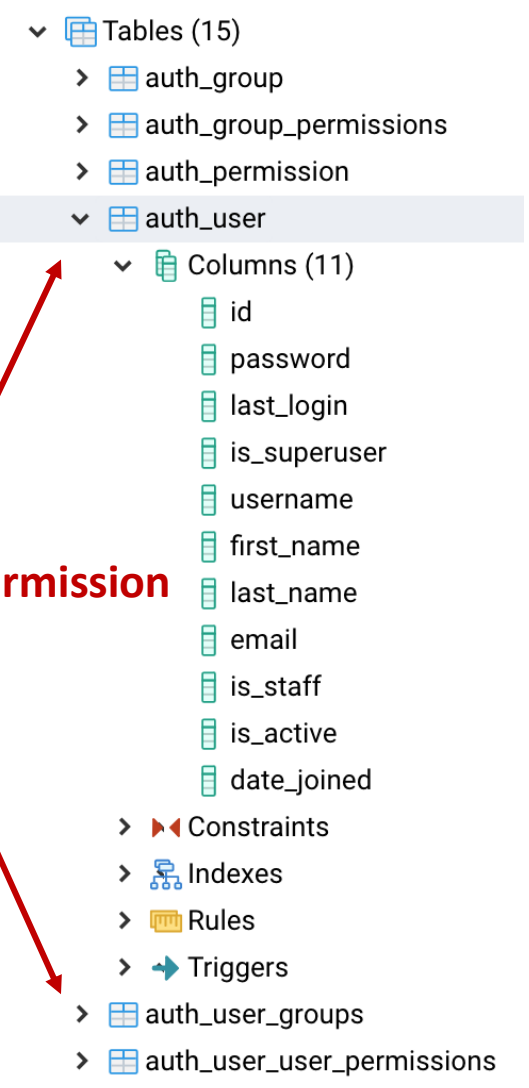
> models.py

```
class City(models.Model):
    city_name = models.CharField(max_length=100)

    class Meta:
        verbose_name_plural = "cities"

     def __str__(self):
         return self.city_name
```

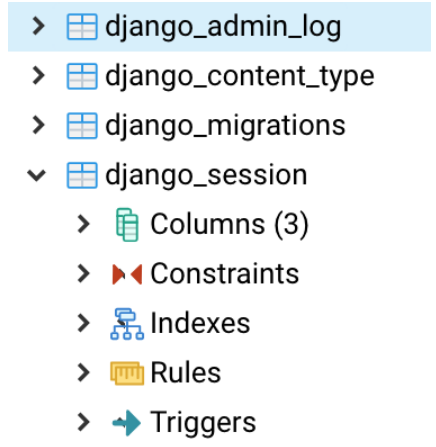
> Django admin

```
> python manage.py createsuperuser
Username: admin
Email address: …
```

create admin user



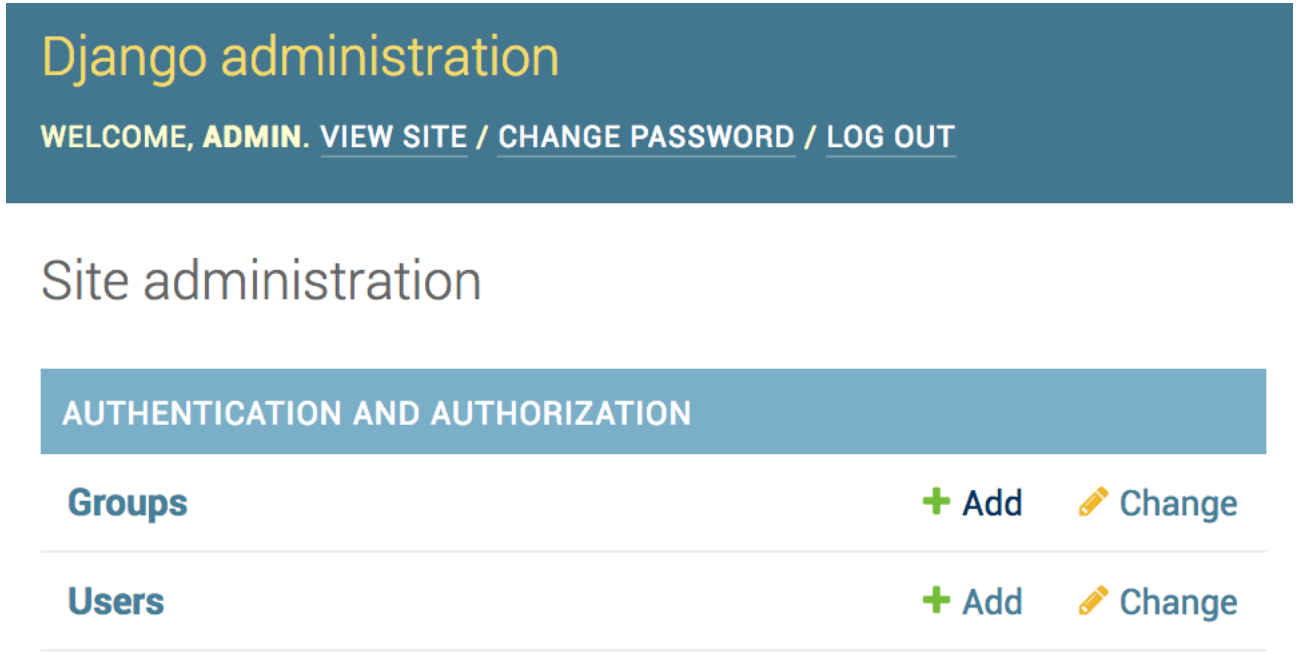
django user/group/permission tables

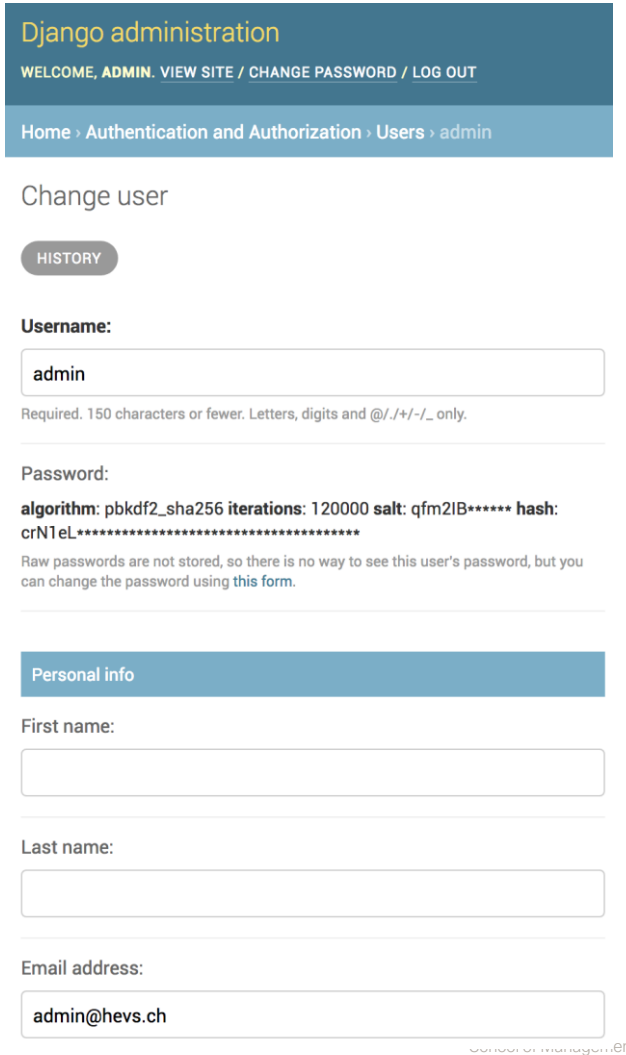


django admin/log/migration tables

> Django admin

http://127.0.0.1:8000/admin

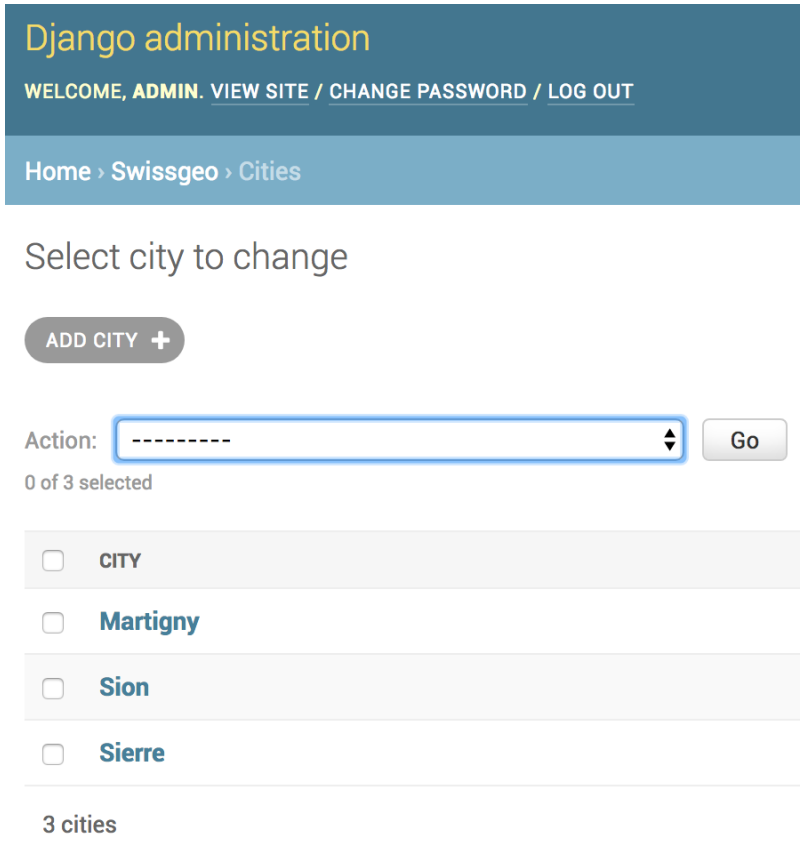


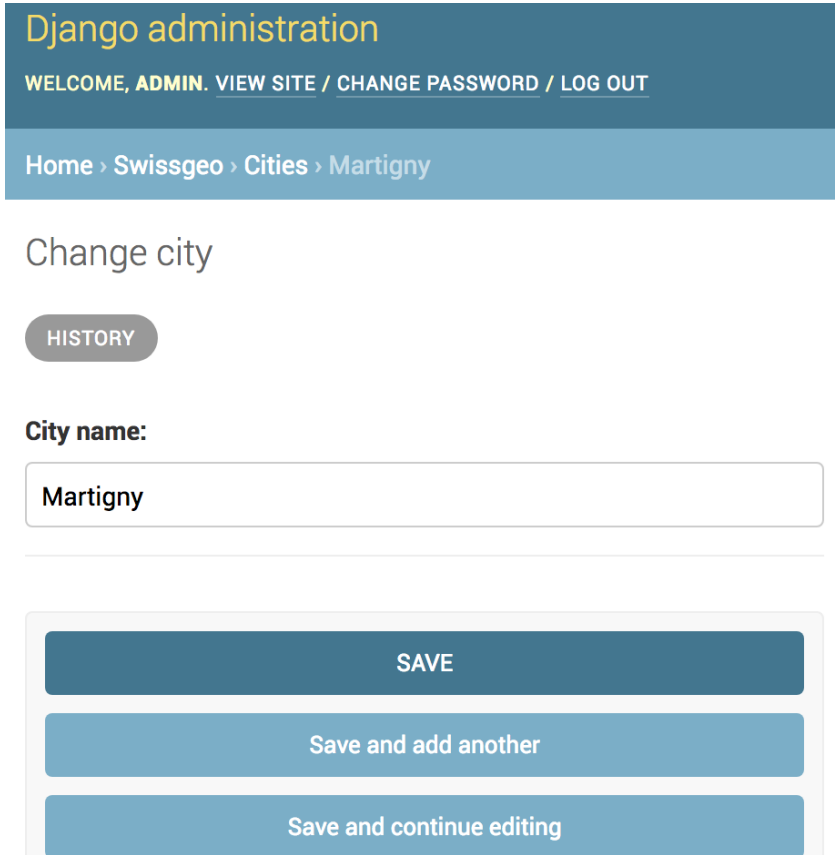


> admin.py

```
from django.contrib import admin
from .models import City

admin.site.register(City)
```

also manage app models





> Views using Models

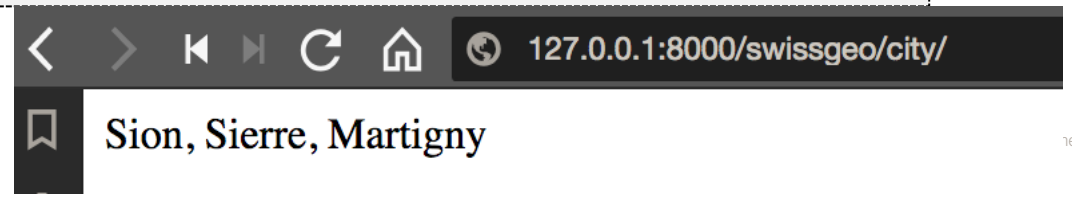
```
http://127.0.0.1:8000/swissgeo/city/
```

urls.py

```
urlpatterns = [
    path('',views.index, name='index'),
    path('city/', views.cities, name='cities'),
]
```

views.py

```
from .models import City

def cities(request):
    top_cities=City.objects.order_by('-city_name')[:3]
    output = ', '.join([c.city_name for c in top_cities])
    return HttpResponse(output)
```



> Django Templates

views.py

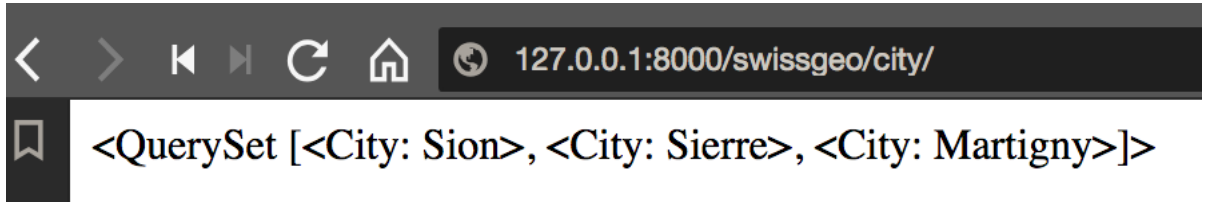
```
from django.template import loader

def cities(request):
    top_cities=City.objects.order_by('-city_name')[:3]
    template= loader.get_template('swissgeo/cities.html')
    context = { 'top_cities':top_cities, }
    return HttpResponse(template.render(context,request))
```

query 3 cities

pass objects to template

templates/swissgeo/cities.html

```
{{top_cities}}
```

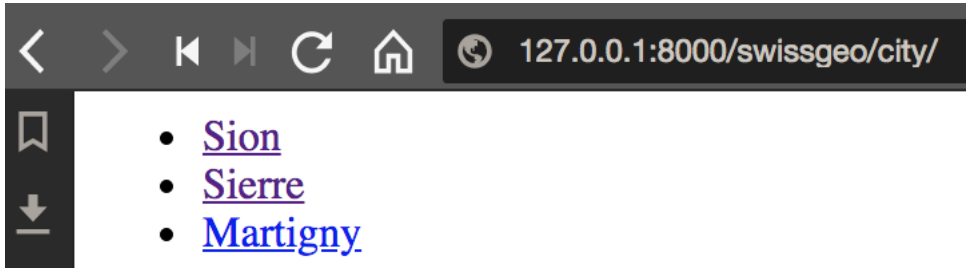


> Django Templates

cities.html

```
{{top_cities}}
```

```
<ul>
  {% for city in top_cities %}
     <li>
       <a href="/swissgeo/city/{{city.id}}">
          {{city.city_name}}
      </a>
    </li>
  {% endfor %}
</ul>
```



> Views: shortcuts

```
def cities(request):
    top_cities=City.objects.order_by('-city_name')[:3]
    template= loader.get_template('swissgeo/cities.html')
    context = { 'top_cities':top_cities, }
    return HttpResponse(template.render(context,request))
```

```
from django.shortcuts import render

def cities(request):
    top_cities=City.objects.order_by('-city_name')[:3]
    context = { 'top_cities':top_cities, }
    return render(request,'swissgeo/cities.html',context)
```

> Display city

```
urlpatterns = [
  path('',views.index, name='index'),
  path('city/', views.cities, name='cities'),
  path('city/<int:city_id>', views.city, name='city'), ]
```

```
def city(request,city_id):
   city=City.objects.get(pk=city_id)
   return render(request,'swissgeo/city.html',{'city':city})
```

templates/swissgeo/city.html

```
{{city}}
```

> Exceptions

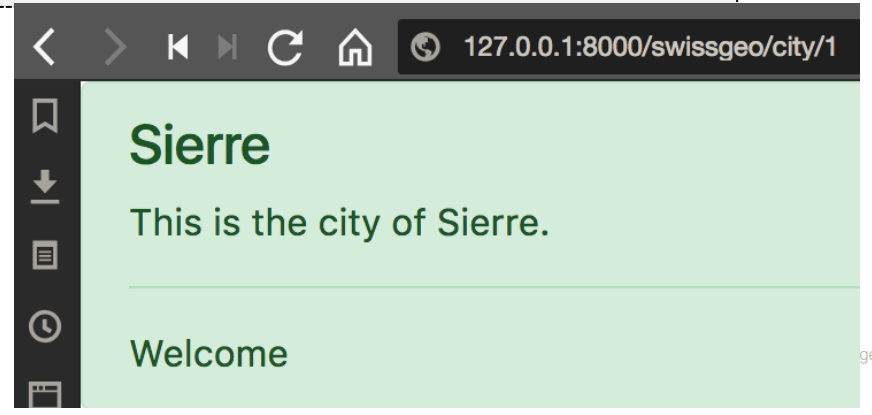
```
urlpatterns = [
  path('',views.index, name='index'),
  path('city/', views.cities, name='cities'),
  path('city/<int:city_id>', views.city, name='city'), ]
```

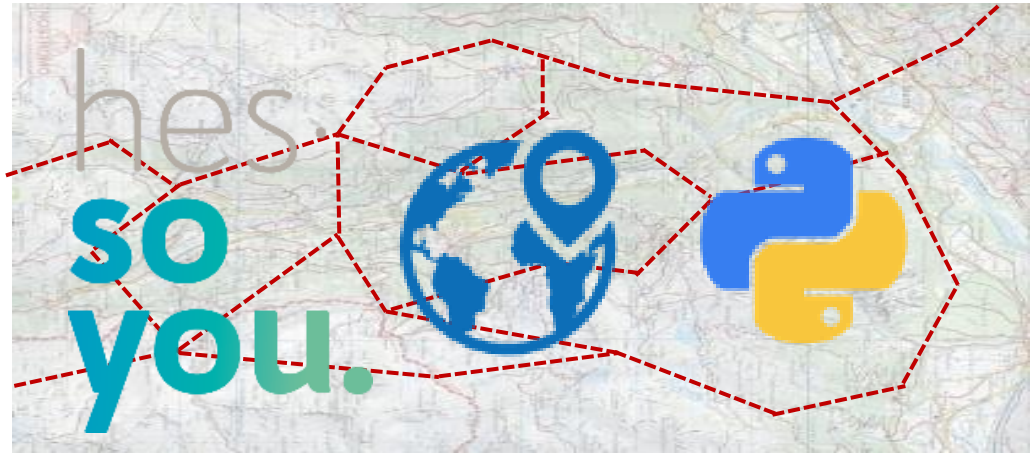
```
from django.http import Http404

def city(request,city_id):
    try:
        city=City.objects.get(pk=city_id)
    except City.DoesNotExist:
        raise Http404("City not found!!")
return render(request,'swissgeo/city.html',{'city':city})
```

> Using styles

```
<head>
    <link rel="stylesheet"
      href="https://stackpath.bootstrapcdn.com/bootstrap/4.3.1/css/bootstrap.min.css"
      integrity="sha384-ggOyR0iXCbMQv3Xipma34MD+dH/1fQ784/j6cY/iJTQUOhcWr7x9JvoRxT2MZw1T"
      crossorigin="anonymous">
</head>
```

```
<div class="alert alert-success" role="alert">
    <h4 class="alert-heading">{{city}}</h4>
    <p>This is the city of {{city}}.</p>  <hr>
    <p class="mb-0">Welcome</p>
</div>
```





Thank you for your attention.

School of Management
Route de la Plaine 2
3960 Sierre

hevs.ch/heg