**Part II *GIS for Geoscientists* - Cambridge**

**Lecture 4 Links**

XYZ Tiles (Base maps)

If you are interested in having aces to different base maps, add the HTML links provided below under the XYZ Tiles dropdown, found under the Browser panel. Right click on XYZ Tiles and select “New Connection.”

* Bing Virtual Earth: [http://ecn.t3.tiles.virtualearth.net/tiles/a{q}.jpeg?g=1](http://ecn.t3.tiles.virtualearth.net/tiles/a%7bq%7d.jpeg?g=1)
* CartoDB Dark Matter <http://basemaps.cartocdn.com/dark_all/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* CartoDB Positron <http://basemaps.cartocdn.com/light_all/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* ESRI Boundary Places <https://server.arcgisonline.com/ArcGIS/rest/services/Reference/World_Boundaries_and_Places/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* ESRI Grey (Dark) <http://services.arcgisonline.com/ArcGIS/rest/services/Canvas/World_Dark_Gray_Base/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* ESRI Grey (Light) <http://services.arcgisonline.com/ArcGIS/rest/services/Canvas/World_Light_Gray_Base/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* ESRI National Geographic <http://services.arcgisonline.com/ArcGIS/rest/services/NatGeo_World_Map/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* ESRI Ocean <https://services.arcgisonline.com/ArcGIS/rest/services/Ocean/World_Ocean_Base/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* ESRI Satellite <https://server.arcgisonline.com/ArcGIS/rest/services/World_Imagery/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* ESRI Standard <https://server.arcgisonline.com/ArcGIS/rest/services/World_Street_Map/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* ESRI Terrain <https://server.arcgisonline.com/ArcGIS/rest/services/World_Terrain_Base/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* ESRI Topo World <http://services.arcgisonline.com/ArcGIS/rest/services/World_Topo_Map/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* ESRI Transportation <https://server.arcgisonline.com/ArcGIS/rest/services/Reference/World_Transportation/MapServer/tile/%7Bz%7D/%7By%7D/%7Bx%7D>
* Google Maps <https://mt1.google.com/vt/lyrs=m&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D>
* Google Satellite <https://mt1.google.com/vt/lyrs=s&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D>
* Google Satellite Hybrid <https://mt1.google.com/vt/lyrs=y&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D>
* Google Terrain <https://mt1.google.com/vt/lyrs=t&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D>
* Google Terrain Hybrid <https://mt1.google.com/vt/lyrs=p&x=%7Bx%7D&y=%7By%7D&z=%7Bz%7D>
* Open Weather Map Clouds <http://tile.openweathermap.org/map/clouds_new/%7Bz%7D/%7Bx%7D/%7By%7D.png?APPID=ef3c5137f6c31db50c4c6f1ce4e7e9dd>
* Open Weather Map Temperature <http://tile.openweathermap.org/map/temp_new/%7Bz%7D/%7Bx%7D/%7By%7D.png?APPID=1c3e4ef8e25596946ee1f3846b53218a>
* Open Weather Map Wind Speed <http://tile.openweathermap.org/map/wind_new/%7Bz%7D/%7Bx%7D/%7By%7D.png?APPID=f9d0069aa69438d52276ae25c1ee9893>
* Open Street Map [https://tile.openstreetmap.org/{z}/{x}/{y}.png](https://tile.openstreetmap.org/%7bz%7d/%7bx%7d/%7by%7d.png)
* Open Street Map HOT <http://tile.openstreetmap.fr/hot/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* Open Street Map Monochrome <http://tiles.wmflabs.org/bw-mapnik/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* Open Street Map Standard <http://tile.openstreetmap.org/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* Open Topo Map <https://tile.opentopomap.org/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* Stamen Terrain <http://tile.stamen.com/terrain/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* Stamen Toner <http://tile.stamen.com/toner/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* Stamen Toner Light <http://tile.stamen.com/toner-lite/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* Stamen Watercolor <http://tile.stamen.com/watercolor/%7Bz%7D/%7Bx%7D/%7By%7D.jpg>
* Strava All <https://heatmap-external-b.strava.com/tiles/all/bluered/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* Strava Run <https://heatmap-external-b.strava.com/tiles/run/bluered/%7Bz%7D/%7Bx%7D/%7By%7D.png?v=19>
* Wikimedia Hike Bike Map <http://tiles.wmflabs.org/hikebike/%7Bz%7D/%7Bx%7D/%7By%7D.png>
* Wikimedia Map <https://maps.wikimedia.org/osm-intl/%7Bz%7D/%7Bx%7D/%7By%7D.png>

WMS Connections

WMS (Web Map Service) connections are like XYZ Tile Connections. These give you access to image “base maps,” often with more specialized applications. I’ll highlight a few examples of WMS services. They for you: search online for WMS links from your preferred data provider (e.g., national geological survey).

* British Geology <http://ogc.bgs.ac.uk/fcgi-bin/exemplars/BGS_Bedrock_and_Superficial_Geology/wms>?
* US Active Mines <https://mrdata.usgs.gov/services/active-mines?version=1.3.0>

WFS Connections

Web Feature Services (WFS) provide connections to underlying datasets with features includes. This differs sharply from WMS connections, which import a still “image,” of underlying data. A layer imported by WFS includes all underlying vector/raster data as a distinct layer. Examples below:

* Smithsonian Institution Global Volcanism Program <https://webservices.volcano.si.edu/geoserver/ows?version=2.0.0>
* World Mineral Deposits <https://mrdata.usgs.gov/services/wfs/ofr20051294?version=1.1.0>

Python in QGIS – Further Learning

Learning how to use Python in QGIS effective takes a lot of time! Here are some resources I’ve found useful.

<https://anitagraser.com/pyqgis-101-introduction-to-qgis-python-programming-for-non-programmers/pyqgis-101-creating-functions-to-load-geopackage-layers/>

<https://www.qgistutorials.com/en/docs/getting_started_with_pyqgis.html>

<https://locatepress.com/ppg3>

<https://anitagraser.com/pyqgis-101-introduction-to-qgis-python-programming-for-non-programmers/>

Google Earth Engine

To run my example GEE code, generating a global cumulative rainfall layer for the year 2017, you can access the script here: <https://code.earthengine.google.com/64e577d1f3e1f63be06f9449a7e8476f>

Further GEE learning links can be found here:

<https://developers.google.com/earth-engine/guides>

<https://developers.google.com/earth-engine/guides/getstarted>

<https://geemap.org>

<https://courses.spatialthoughts.com/end-to-end-gee.html>

**Final Further Learning Tip**

Ujaval Gandhi provides (in my opinion) the world’s best, most accessible geospatial training academy. He offers course on QGIS, Python, GEE, and Remote Sensing. Each of his courses are detailed, professional, and come with an official certification (e.g., the Advanced QGIS course I took with him came with an official QGIS certificate endorsed by the QGIS software developer consortium).

I highly recommend you view his offerings and consider taking a course with him ☺

<https://spatialthoughts.com/>