Resources

# Revisions

18/11/2023 Issue

19/11/2023 General Revision

23/11/2023 Formatting, Addition of links for vvvv and new software packages, new plug ins and resources for QGis

Link to zoom recordings

27/11/2023 Adding link to the recording of “Arduino Datalogger”

04/12/2023 Adding links for Microsoft Cognitive Services, Google Trends in “Open Source Data”

08/12/2023 Link to skills recordings

12/01/2024 Link to skills recording

20/01/2024 Link to skills recordings

08/02/2024 Link to skills recordings, extra recording

09/02/2024 Link to extra recording

17/02/2024 Add link to Defra, add recording, add open MeshLab

21/05/2024 Link extra skills session

# Timetable

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Date | Skills | Topic | Location | Time |
| **01** | **25/10/2023** | **Skill 02 – Day 01** | **Open Data & Qgis** | Gordon Streel | 9:30 |
| 02 | 01/11/2023 | Skill 02 – Day 02 | Python API’s | Gordon Street | 9:30 |
| **03** | **15/11/2023** | **Skills 02 – Day 03** | **Google and Flickr API’s, Web scraping** | Zoom | 10:00 |
| **04** | **24/11/2023** | **Skills 01 – Day 01** | **Arduino Datalogger** | Gordon Street | 9:30 |
| **05** | **8/12/2023** | **Skills 01 – Day 02** | **Visualising the Results** | Gordon Street | 9:30 |
| **06** | **10/01/2024** | **Skills 03 – Day 01** | **Intro vvvv / skia** | Gordon Street | 9:30 |
| **07** | **19/01/2024** | **Skills 03 – Day 02** | **vvvv fuse (Particles) / Stride** | Gordon Street | 9:30 |
| **08** | **2/2/2024** | **Skills 03 – Day 03** | **vvvv fuse Particles 2** | Gordon Street | 9:30 |

# Recordings and Exercise files

The exercise files are stored on OneDrive and can be accessed through MS Teams. Zoom is used to record each lesson, and these recordings are accessible to students. Due to their size, the recordings are not shareable on OneDrive or MS Teams; instead, they are available on Dropbox using the following link:

[Recordings RC15](https://www.dropbox.com/scl/fo/k8ehra7ar30t8s66uez3e/h?rlkey=nutcaakx5e42e4pgsefoyqc71&dl=0)

Both the recordings and exercise files will remain accessible throughout the academic year but will be removed later. Please make sure to save the files for future reference.

Here are the links to the recoding hosted directly on zoom. This method is currently the preferred solution:

[Skills 02 Day 01 – Open data](https://us02web.zoom.us/rec/share/RSM1pblWKFtfHZGyHUPE9exPTZh8I6FK93BTNyRNEm1VcBC0DUQal6_Te80xE9Hm.2XP2HX6OLMdW5ARH)

[Skills 02 Day 02 – Python 01](https://us02web.zoom.us/rec/share/1UTuG7ccy-viaBnTE41guLeVTNCY6o1Cj4myi07lyUPO_fJ6yVRWQTegmMcA2Qv8.gy2OmSD575In-gKJ)

[Skills 02 Day 03 – Python 02](https://us02web.zoom.us/rec/share/T5fW2sczuQvD9gxSjlRu29c5rKnMOOOVw5_hnCdXNHBCIRy8fXL1s_NaBqqWPU1t.hFkysykfuWNAZUwo)

[Skills 01 Day 01 – Arduino Datalogger](https://us02web.zoom.us/rec/share/9xa1TJ4f43DZgF6DadOnaRlRmcab3BlCQ4b1DD4GX27tNDky0MriJY-u4CMHNNxj.b7tdZ2FRk_bQxg3o)

[Skills 01 Day 02 – Visualising the results](https://us02web.zoom.us/rec/share/bPDqdcAiOODDb8gRPc5ajqD9BvL2vuRgsOqV6Lc3iyrskY6rDJi2pPOl3uuVGwGF.eXvHx_Boq47is5wQ)

[Skills 03 Day 01 – Intro vvvv / skia](https://us02web.zoom.us/rec/share/CBcS4XFCJ13_LLkoHLIs8wrDjh5ukE11E6--6FQ5u2LKhV-S5ljtCyW-ZnuIq-m_.I0LnCyWEVnG4i6MH)

[Skills 03 Day 02 – Stride / Fuse Particle Systems](https://us02web.zoom.us/rec/share/5NFtBtcxS-A5CA-APC5RrJVNSYLJfVQRUmp9xADOxXkN0YGhn7K0EcH6h2a5UDhV.RGDcQAaZyRFaalpp)

[Skills 03 Day 03 – Fuse Particle Systems](https://us02web.zoom.us/rec/share/akmmJbC5qpOhf10bvgSSbB4LVfCVH3Tg6bH0evQyJGxSduH32yrLJzA3N2CShjF_.zpshpL6wvvUxwul7)

### Extra Recordings & Files

01 [Rhino to Illustrator 01](https://us02web.zoom.us/rec/share/wK6dxlymaO-I-7eXi7kmr7KSib_ZIKVj3756HbLuLFDHW5v6o9QWQ1anE-7davrf.8-OuTpyMbgA_0fxd)

02 [Rhino to Illustrator 02](https://us02web.zoom.us/rec/share/tt-y7GV8rBJlCLqLVht7yblhbMzcLbe5x4Q79HGHcPAW_P7QQX5x21uOgXkLpOyf.Xayl54acph5hVrY4)

03 [Arduino to vvvv](https://us02web.zoom.us/rec/share/ynoD2lzx8uSSBqsGcyvVEElbO3wdJ6s8N9hQLn5JZfSXEPllmIIymthZVfuL_XkV.3J4HJHXL8-FDNUiZ) / Exercise files: "… \_DIGITAL SKILLS\Extras\240208\_Arduino to vvvv"

Audio Analysis in vvvv (patch only) / “… \_DIGITAL SKILLS\Extras\240203\_vvvv Sound Analysis"

04 [SDF’s in Fuse](https://us02web.zoom.us/rec/share/GenaXElsHldw3xId443YdIS-eQQR4Kt7FOigv9Eayhcj6ICksFf9NXn5EkhzZKAy.w859xZCFWcSpXkbb) / Exercise files: "… \_DIGITAL SKILLS\Extras\240208\_SDF's"

05 [View Analysis in QGIS](https://us02web.zoom.us/rec/share/4qosp0n-o6wxm_ixKjWvVjzoYh3SI8k7ZHlZch-xmY4OxB31MOF58KIDvPD-KFqY.9L3u2t7YS2p6Mwqg) / Exercise files: “ … \_DIGITAL SKILLS\Extras\240217\_ViewshedAnalysis”

(some of the raster images are too large for OneDrive, so they are missing. If this poses a problem, please let me know and I will share them differently)

06 [Baking SFD with particles](https://us02web.zoom.us/rec/share/Dcs5DdLt1LwpOW2qkbzyZyLoJnO-cID9UDRHds5Uh3v9p3Yg9s3iDJ7nbDHQzUWP.X3bMzs_kruj8ehCU) / Exercise files: “…\\_DIGITAL SKILLS\Extras\240217\_BakeSDF with Particles”

[Extra Skills 20.05.2024](https://us02web.zoom.us/rec/share/fu4WWpNtAbdfr1tYXDk1gsWWGVz0FzYnNJM0BvRuAGot3Ob0EgsM-LC6lqaP_yit.Gg8xbFWvgfOvz2vW?startTime=1716227011000) - Passcode: gh%R6&iU

# Software Packages, Libraries & Apps

## QGIS

QGIS is a freeware, you can download and install it from here:

<https://qgis.org/en/site/index.html>

Usually, there are two versions. You can install the latest version

### QGIS Plug Ins

* *Flickr Metadata Downloader*: this plug in allows you to search geotagged Flickr images
* *Mmqgis:* this plug combines a handful of useful tools
* *QuickOSM:* this allows you to download shapes from QSM
* *Time Series:* This is a nice plug in if you want to animate series over time and export your maps as movies (Look [here](https://www.youtube.com/playlist?list=PLF97A9E490FB2563D))
* *TravelTime* platform Plugin: Network analysis, it looks at how far you can get within a certain time by foot, bus or car. It creates travel time diagrams. ([Link](https://docs.traveltime.com/qgis/tutorials/basic-tutorial)) *QNEAT3* does the same, but doesn’t require an account or an internet connection
* *Saga* allows you to do some very intricate analysis on satellite images. Previously part of QGis, it has now to be installed separately. Here a link of how to do it: <https://www.youtube.com/watch?v=iTr7fQucqUA>
* *Visibility Analysis* allowsyou to check how much you can see from a certain point. It works well with urban height maps from the Defra.

*… have a look on your own, there are many plug ins out there.*

## Sublime Text Editor

The sublime text editor is a multipurpose text editor that can display large text files.

<https://www.sublimetext.com/>

It’s very powerful, but you need to install extra plug ins. First you install [Package Control](https://packagecontrol.io/installation), then you can install extra packages such as a [JSON Formatter](https://packagecontrol.io/packages/Pretty%20JSON).

## Rhino / Grasshopper

Rhino 7 / Grasshopper plug ins:

* Elk
* Bison
* Mosquito
* Firefly
* <https://toolbox.decodingspaces.net/>
* https://unatoolbox.notion.site/
* The Rhino plug ins can be downloaded from here: <https://www.food4rhino.com/>

## vvvv

vvvv gamma is a visual live-programming environment build on top of C#. It’s free for non-commercial purposes and you can download the latest version from here:

* <https://visualprogramming.net/>

## Sensor Log

* <http://sensorlog.berndthomas.net/>

this is an iPhone Application that allows you to use your phone as a sensor and record noise levels for example. You can save the sensor values as csv file and export them.

## Kepler GL

Kepler GL is an online tool to visualise geo-datasets. It’s simple, performant, free and creates nice images:

<https://kepler.gl/>

## Ped Catch

Ped Catch creates pedestrian network diagrams that accounts slope as well. Easy to do and the results can be exported into QGis:

<http://pedcatch.com/>

## Google Earth and Google Earth Studio

<https://earth.google.com>

<https://www.google.com/earth/studio/>

Google earth lets you do screenshots from places, it also allows you to upload some simple geometry. Google earth studio however, allows you to do flythroughs and animations. This, for example, could be used for presentations and/or 3d point cloud reconstruction with Autodesk Recap.

## Best Time

<https://besttime.app/>

This is an app that gives you the foot traffic at any given location of the world. This is useful if you want to know how busy a certain area is at a certain time. This app has a user interface and an API. There is a free account too.

## Webscraper

<https://webscraper.io/>

This is a web scraping tool that is semi-automatic. It is an alternative to beautiful soup or selenium and it takes the pain out of many API restrictions. It appears to be slow and a bit manual.

## Network Analysis

<https://gephi.org/>

Gephi offers network analysis diagrams. It’s a free software package with some interesting plug ins.

## Meshlab

<https://www.meshlab.net/>

Meshlab allows you to work with large point clouds and to create meshes out of them. You can easily save the mesh as .obj file and open it in Rhino. Rhino can mesh point clouds for simple terrain generation, but it cannot mesh more complicated point clouds. Meshlab is free and open source.

## Python Libraries

### Popular Times

Google Places does not share information about the times, a business has a high traffic frequency. This library helps with that

<https://github.com/m-wrzr/populartimes>

### Beautiful soup

This library allows you to extract information from websites

### Requests

This is the -almost- standard library if you want to interact with web apis.

### Folium

A simple map tool

### Pandas

Pandas is the excel for python. You work with tables called data frames. Unlike excel, you can work with seriously large tables and it’s really fast too. This library is one of the reasons why python is so successful for data scientists.

### Anything else…

… it is impossible to list all possible libraries. There are libraries that will allow you to interact with Flickr, YouTube and similar services, this is dependent on your project and you would need to have a look yourself.

# Open-Source Data

## General

### Earth Vector Files

<https://www.naturalearthdata.com/>

### OpenStreetMap (OSM)

<https://www.openstreetmap.org/export>

<https://www.geofabrik.de>

<https://wiki.openstreetmap.org/wiki/Map_Features>

### Trees

<https://opentrees.org>

### Edina

<https://digimap.edina.ac.uk/>

### Google Trends

Google Trends allows you to look what people are searching in google. The data can be downloaded as csv file and you can search for related keywords.

<https://trends.google.com/home?hl=en-GB>

### Microsoft Cognitive Services

MCS offers some simple to interface tools for video, image and text analysis.

https://azure.microsoft.com/en-us/products/ai-services?activetab=pivot:languagetab

## Satellite Images

Satellite images can be imported into QGis and some plug ins in rhino rely of them (Grasshopper ELK). The services are free of charge, but the quality of data varies greatly. Whilst satellite imagery works well on relatively large scale (like entire London) the resulting is not good enough as soon as you zoom closer.

### USGS Earth Explorer

This gives you access to the images from the NASA. It’s a global coverage and one of the main points of reference.

<https://earthexplorer.usgs.gov>

### European Space Agency (ESA)

The same by the ESA

<https://scihub.copernicus.eu/dhus/#/home>

### EOS Land viewer

The EOS Landviewer offers images and combines it with some alaysis functions that indicates things like green activity, landuse and so on. It’s a commercial service with a free tier.

<https://eos.com/landviewer/>

### NASA

<https://earthdata.nasa.gov/>

### Department for Environment, Food and Rural Affairs (Defra)

This is website is difficult to navigate. But with a lot of patience, you will be able to download detailed heightmaps of London that include buildings.

<https://environment.data.gov.uk>

<https://environment.data.gov.uk/survey>

Here you can download Digital Surface Maps (DSM, Height map with buildings), Digital Terrain Model (DTM, Height map without buildings), and Point Cloud files. This is for UK only.

### Microsoft Planetary Computer

<https://planetarycomputer.microsoft.com/>

### Google Earth Engine

<https://earthengine.google.com/>

Both, the Planetary Computer and Google Earth Engine offer very similar things: A large library of satellite images that is regularly updated. The main providers are the NASA and the ESA. On top of that, it’s possible to run various algorithms over one or many images. The service is free, but you might need to apply for it (that is not a problem). The data itself has a relatively coarse resolution of 30m / pixel. Google Earth Engine has been around for a bit longer and it’s considered as more approachable that Microsoft’s offer.

## London / UK

### London Data Store

<http://data.london.gov.uk/>

### Data Gov

<https://data.gov.uk/>

### London Planning Applications

<https://www.london.gov.uk/programmes-strategies/planning/digital-planning/planning-london-datahub?ac-60574=60568>

this is part of the data store, there is also an API and some high level dashboard functions

### Air Pollution London

<https://www.londonair.org.uk/LondonAir/Default.aspx>

### Open Data TFL London

<https://tfl.gov.uk/info-for/open-data-users/our-open-data#on-this-page-10>

have a look here, there are some interesting API’s ( such as “Busiest times on trains and in stations” or “ Live traffic camera images (CCTV)” … )

## Mapbox Studio

Map box offers a map styling services that can be used as a background in QGIS. This is usually quite fast and of good quality. This is a paid service, but the free tier is quite generous and fully sufficient for our purposes.

<https://www.mapbox.com/mapbox-studio>

This shows you how you can use background images in QGIS:

<https://docs.mapbox.com/help/tutorials/mapbox-arcgis-qgis/>

# Learning Resources

It is easy to get confused about the right learning resources. Here is a selection of the places I recommend looking at.

## QGIS Beginner

The Qgis 101 of Patrick Stotz is a good entry point:

<https://github.com/PatrickStotz/mapping_101>

The official training manual and the online documentation are quite good:

https://docs.qgis.org/3.22/en/docs/training\_manual/index.html

<https://docs.qgis.org/3.22/en/docs/gentle_gis_introduction/index.html>

<https://docs.qgis.org/2.14/en/docs/training_manual/rasters/terrain_analysis.html>

If you have a specific question, then

<https://gis.stackexchange.com/>

will be of good help.

## QGIS Intermediate / Advanced

This is a more advanced, you may skip the large parts about datamining. It’s worth looking at method of map styling:

<https://www.youtube.com/playlist?list=PLpuejoPydMLUaWIEJD_FUvqNVJFp_h_gH>

## Rhino / Grasshopper

<https://www.rhino3d.com/en/tutorials/>

I recommend downloading the user manuals (1 and 2) and checking the videos

<https://www.grasshopper3d.com/page/tutorials-1>

This is a selection of learning resources for grasshopper. Most of it is free, I recommend the pdf of *Modelab* and the resources of *Zubin Khabazi*.

You might want to buy the book of Arturo Tedeschi “AAD, Algorithms-aided Design: Parametric Strategies Using Grasshopper“, it’s a good read with nice examples.

<https://www.youtube.com/channel/UC5dMacit2C5fYiS4lMNq3ow>

The YouTube channel of Jose Sanchez is a bit dated, but still excellent.

<http://runxel.xyz/rhino-secrets/>

This is a webpage with random tips and tricks for rhino/grasshopper. You will find some good things here.

## vvvv

A lot of example files ship with the installation of vvvv - this is the first point of reference.

The second entry point into the world of vvvv is this playlist:

[The patcher’s guide](https://youtube.com/playlist?list=PL2KeRstDQVRRVnzCHEambwAI4yWmpIF-p&si=xmCzNTx-n2AnOxvh)

It comes with example files that you can get from [here](https://github.com/chkworks/VL.ThePatchersGuide). These files are very useful if you are looking for a certain basic functionality, but you don’t know how to do it.

Another point of reference is the free vvvv course from the Node Institute in Berlin. Subscribe and you can get started. But beware, each lesson is very long and you need to be selective.

<https://thenodeinstitute.org/courses/node20-vvvv-workshop-bundle/>.

You might be able to find some more tutorials on YouTube, but there are not many. However, the community is rather nice and helpful. You might want to post your questions into the forum or join the vvvv group on “Element” (I recommend that!).

## Python

“Automate the boring stuff with python” is a good starting point to learn python. The book can be purchased on amazon, but there is also a free version of the book online:

<https://automatetheboringstuff.com/#toc>

It is not necessary to read the entire book, these chapters are important:

