Conference Abstracts
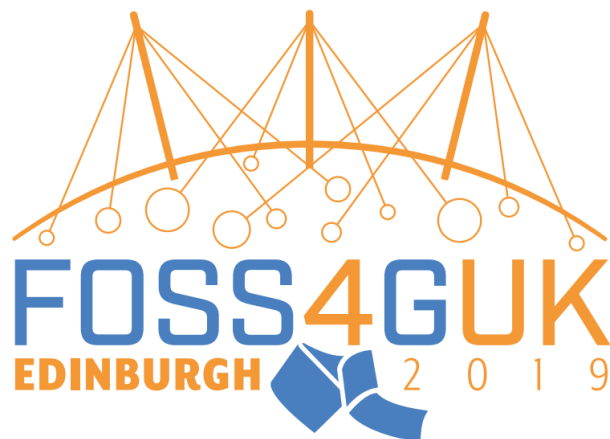
Contents

Abstracts

Projecting future population data using open source tools and opendata

Dave Barter

Nautoguide Ltd.

Population data is important across many business and social applications. From managing election boundaries to anticipating future healthcare needs it is vital that we have a view of the spread and makeup of population. Many closed proprietary data sets exist for this very purpose but they are expensive and often fixed to a particular purpose. And as proponents of open source software surely we all see the value in open data as well. Dave Barter addresses this issue by walking through the process he took to engineer an open data set of building level population projections using only open source tools and open data. His talk will encompass the data sets used, QGIS Process models and migrating this into production using PostgreSQL/PostGIS

Composing and securing spatial data interfaces. When? Why? How? Serverless edition.

Dennis Bauszus

GEOLYTIX

A comprehensive presentation of the design process leading to a NodeJS framework which acts as a spatial data and application interface. The XYZ framework also provides a control library and responsive views tying everything together. Library methods make use of function composition in javascript to augment methods for a range of client applications. A monorepo is used to handle deployments on a server, as a cloud function or as an API gateway for microservices. A security strategy made possible through the use of JWT + JOSE in NodeJS' middleware will be outlined to fit different deployment modes and client application requirements.

Using R, open-source government data, and remotely-sensed oceanographic products to enhance epidemiological models for Atlantic salmon aquaculture in Scotland.

Annette Boerlage

SRUC

Farmed Atlantic salmon is the largest food export product from Scotland and the UK, and Scotland is the third largest salmon producer in the world. Environmental variables have a large impact on salmon production. For example, because salmon depend on water temperature to regulate their body temperature, temperature has a large effect on physical and biochemical processes such as efficacy of growth and food conversion. Also prevalence of salmon pathogens is affected by water temperature, for example the life-cycle of sea lice, one of the most important pathogens of farmed salmon, has an increased turn-over at higher temperatures. Another important variable is dissolved oxygen levels in the water, which affect oxygen uptake of salmon, so that low levels can lead to reduced growth. Most salmon producers monitor variables in situ at farm locations. These measurements can be very helpful in describing temporal fluctuations at a site, and help site managers adjust management practices. However, in situ measurements can be less informative in comparative studies between sites, for example because the tools are of different types, tools may not be calibrated the same between sites, and measurements may be taken at different depths on different sites. One potential cost-effective solution to be able to take environmental variation into account in comparative studies is making use of remotely-sensed satellite products. Such products have become available open-sourced and have the advantage that they are of consistent quality between sites. Previous research in British Columbia, Canada, has shown that in situ and remotely-sensed Sea Surface Temperatures and Salinity have differences, and that suitability for aquaculture studies differs between different remotely-sensed measurement sources (Thakur et al., 2018). This talk will comprise an overview of how we used data on aquaculture from Scotland's aquaculture governmental website, and products from the marine environment monitoring service of Copernicus in R to generate maps of environmental variables, and datasets that can be further used in comparative studies.

Exploring transport routes and journey characteristics using R Shiny

Caterina Constantinescu

The Data Lab, University of Edinburgh

This talk will focus on displaying transport data interactively, using open source software. Starting from a dataset including a set of origins and destinations (i.e., postcodes stored as strings), I will discuss how to convert these to long/lat coordinates and trace connecting journeys using the local transport network. This can be achieved with the GraphHopper routing engine, via the 'stplanr' R package. I will also show how these journeys can then be visualised interactively (as spatial lines) using the 'leaflet' package in R. At this stage, it is possible to go one step further and embed the resulting 'leaflet' maps within a Shiny app, for more powerful and user-friendly exploration. The talk will illustrate this entire process using booking data from a subsidised transport service, operated by a local Scottish council.

Don't let metadata get you down

Jo Cook

Astun Technology

Do you find working with metadata complicated? Do you have information in legacy formats that you're not sure what to do with? Is compiling a decent metadata catalogue something you know that you should do, but keep putting off? If so, this talk is for you!

Geonetwork is a fantastic open source product for building and managing your metadata catalogue, but it can still be a pain to get started, or to understand how your data is being used. Throwing some additional open source packages into the mix can make it more powerful still, easier to import your metadata, and provide some real insights into how your data is used.

In this talk I'll highlight some of the work we've done with the Environment Agency, DEFRA, Scottish Government, and numerous local authorities, the sorts of problems we've encountered, and the solutions we've developed to overcome them. Expect some Geonetwork, Python, SQL, AWS, some fine-looking dashboards, and some command-line geekery. I'll also update everyone on work to create a Geonetwork Plugin for the new Gemini 2.3 metadata standard.

From Cloud to Cloud GeoServer and Cloud Optimised GeoTiff.

Pascal Coulon

SCISYS / Defra

Earth Observation (EO) data has the potential to transform delivery across many policy and operational areas within Defra. However, there are significant overheads to getting analysis ready EO data to the end users that need it. These barriers are restricting the wider use of analysis ready EO data especially in terms of informing current and future policy to ensure cost effective, more efficient and customer focussed service delivery. To overcome these issues Defra aims to deliver an open by design infrastructure to provide access to analysis ready data and demonstrate how this can be applied to support operational areas. Using the Defra case study this presentation will address some of the key steps and open source tools employed to automate the retrieval and processing of raw Sentinel-1 and Sentinel-2 data. In the second part the presentation will demonstrate how a clustered cloud environment coupled with elastic computing enabled the delivery of a scalable platform, with a specific focus on the new open source GeoServer Azure plugin allowing access to cloud optimised GeoTiff.

Scottish Pig Health Network: making better use of data for health improvements

Andrew Duncan

Inverness College UHI and SRUC Epidemiology Unit Inverness

The Scottish Pig Health Network (SPHN) started in 2016 with the aim to combine health and performance data to drive for change and improvements in the Scottish pig sector. It uses raw data from a number of pre-existing and emerging but untapped, unconnected sources. The network has drawn upon individual farm data from: Quality Meat Scotland Pig health scheme (also known as Wholesome Pigs Scotland WPS) data Salmonella Scheme results Collection and Communication of Inspection Results (meat inspection data) Carcase performance information Quarterly Veterinary Report (veterinary observations on farm) - QVR Farm management software Porcine Reproductive and Respiratory Syndrome (PRRS) survey data Quarterly reports from each pig herd are collated for each producer and their vet. This combination of health monitoring and rapid feedback are providing benefits in terms of reduced use of antibiotics and medicines, eradication of diseases, reduced production costs and the ability to promote a healthy more wholesome' product in the market. In addition to the quarterly reports, which have been developed using open source software (R (R Core Team, 2018) and Shiny (RStudio, 2019)), mapping has been used to identify target areas for disease prevention and investigation. The shiny package (Chang et al., 2018) allows for the creation of online and interactive applications and with the addition of the leaflet package (Cheng et al., 2018) it is possible to create interactive maps for stakeholders. At present three

mapping applications have been developed as part of the SPHN project. - PRRS: To aide in the setup of a control programme for PRRS, a leaflet map tool is being used to identify areas of Scotland to target with control measures (including vaccine and disease management tools). An example map (grouped to anonymise locations) can be seen in figure 1. - QVR: The QVR maps show current and historical disease statuses for scheme members across Scotland. Data on six diseases is included and individual farms can be examined to get their disease status plotted over time. - WPS: The WPS maps display the batched abattoir reports for each farm for 13 conditions, which are proxy of endemic diseases. As with the QVR data individual holdings can be selected and their results examined longitudinally.In both the WPS and QVR maps, the plotted points are colour coded green/orange/red depending on the disease status. Figure 1: Grouped results of PRRS testing in pig producers across Scotland, plotted on an interactive map. The integration of the several data sources has allowed for the Scottish pig industry to have a better picture of their health status and performance. This has led to several health improvements at farm and national level, through initiatives as full or partial depopulations, and to the inception of a control programme for PRRS. Throughout the project open source software has been used but particularly in the introduction of the interactive mapping to help stakeholder, farmers and vets control the impact of disease on the pig industry.

Open-source viewers for putting historical maps online

Chris Fleet

National Library of Scotland

Over the last seven years, the National Library of Scotland has used an extending suite of open-source viewers for making available historical maps online. Our website https://maps.nls.uk now makes freely available 220,000 historic maps, focusing on Scotland, but with a significant and growing number covering England, Wales and further afield. The website is busy with around 8,000 users and 40,000 page views per day, with georeferenced map viewers being the most popular part of the site. This talk would aim to provide an overview of these map viewers, as well as an update on some of the most useful recent developments. All of the viewers are available on Github (https://github.com/NationalLibraryOfScotland), with OpenLayers and GeoServer being the most important components. As described in a recent blog post (https://blog.nls.uk/using-the-librarys-open-source-map-viewers/), the viewers can be divided into those supporting search and retrieval, and those making available historic georeferenced map layers. The viewers are built on open-standards, including Web Feature Services and Web Map Tile Services. They can easily adapted for retrieval of other resources, and the tools are re-usable in other georeferenced map applications. Recent developments that would be covered include moving our former Google Maps-based marker search interface (https://maps.nls.uk/geo/find/marker/) to OpenLayers, adding vertical exaggeration to our historic map 3D viewer using Cesium (https://blog.nls.uk/scotland-from-above-our-3d-map-viewer-with-new-vertical-exaggeration/), and the creation

of bespoke viewers for mapping slavery (https://geo.nls.uk/maps/douglass/) and visualising maps of Stornoway (https://geo.nls.uk/maps/stornoway/index-en.html).

OpenStreetMap Notes, visualisations and improvements.

Chris Fleming

Personal

Over 1 735 319 notes have been added to OpenStreetMap, currently 416 224 notes are still open. Even looking at a small area such as Edinburgh, we have around 10 new notes added every day.

It's interesting to note the motivation of people adding notes, many are added by regular experienced mappers for changes that need to happen in the future, some are added by local businesses or anonymous users altering us to problems on the map and some by non technical users for changes that are required.

These note encapsulate a few different categories: Things that can be fixed quickly and the note closed straightaway. We then have short to medium term notes, such as shops closing or road closures that may be for issues for between days and months. Finally then some of the very long term items, such as the construction of the Forth Crossing, New Hospitals or Housing Estates that may be tracking developments for years.

But with so many notes remaining open, issues can very easily be missed. I will briefly review some of the tools available for tracking notes, including some visualisations using QGIS. Talk about how we deal with notes in Edinburgh including some of our local tests with using github issues to track some of the longer term issues.

Finally as well as hopefully look at some ways of managing notes. Hopefully with some prototypes for ways that notes might be improved either directly on the OSM site or via an external site.

Rapid and repeatable Geospatial analysis with python and node using notebooks

Mila Frerichs

Civic Vision

This talk will provide tips and libraries to use notebooks more effectively and will showcase ways to create geospatial data analysis using notebooks rapidly. Notebooks are a great way to create repeatable analysis and share them with your colleagues quickly. With the increased access to data and code data analysis is not only done by data scientists, statisticians, and software engineers but there is an increasing number of people with a different background working with data. Notebooks offer an excellent bridge for software engineers and non-technical people. "A Notebook

6

is an interactive, editable document defined by code. Its a computer program, but one thats designed to be easier to read and write by humans." Mike Bostock.

There are several ways for creating notebooks. I will focus on two: Jupyter notebooks with python and Observable notebooks with javascript. Both are a great way to do exploratory geospatial data analysis or visualization quickly. Jupiter Notebooks are available for a long time but theyre getting new traction with the explosion in Earth Observation data. They offer access to all the powerful geospatial python tools that are out there. The new kid on the block is observable notebooks for analysis and visualizations in JavaScript. Written by the creator of d3 Mike Bostock with the help from Tom McWright and Jeremy Ashkenas it offers a new way for JavaScript developers to quickly test and share code and create interactive visualizations and explain their code. A notebook can be used as a scratchpad for exploring data, or to explain quantitative phenomena.

Open MasterMap improving access to OS data

Michael Gordon

Ordnance Survey

Have you heard of Open MasterMap? Want to find out what Open MasterMap is designed to achieve and what benefits it will give you? Join Michael Gordon, OS's Programme Lead, for this workshop where we'll give you a brief overview of what the programme is and why we're doing it. We will show you how we've approached the trial phases so far, and what we've done with the feedback gained to meet the Government's intended outcomes from this policy. We'll share a preview of the upcoming OS Data Hub trial and give you the chance to be part of the remaining phases of the programme, helping us to continue developing a solution that meets your needs, the needs of your customers, and the needs of Government.

Cool EO: Awesome FOSS for remote sensing

Alastair Graham

Geoger Ltd

The Earth observation (EO) sector has transitioned from having a lack of data to being swamped by a flood of data, all over the past few years. Much of these data have been made openly available. At the same time there has been a huge shift from primarily proprietary image processing software to open source and freely available tools for data management, analysis and dissemination. Based on the presenter's experience of looking for news stories for the Scene From Above podcast, this talk will introduce some of the online platforms for data and processing, key FOSS software projects linked to EO, and will have a poke around GitHub to find out and report on some nifty less well-known tools. This talk is an overview aimed at those starting to get interested in EO and wanting to know what software is available.

Geography as a Service? Serverless Architectures for Geospatial Applications

Tomas Holderness

Addresscloud

Serverless technologies mean that applications can scale to meet the demands of users and their data. The recent development of Cloud Optimized GeoTiffs using object storage, and the availability of serverless PostGIS instances mean that developers now have first-class support for geospatial raster and vector data in their cloud applications. As a result, previous constraints of system capacity are replaced by user-bandwidth; now that our users can access all our data instantly and in real-time, how can we use stateless functions, and ephemeral storage, to query and filter multiple geographies in parallel to get the best result? This talk explores these transformations; narrating the recent cloud, data, and software changes that are disrupting the way developers think about and architect geospatial applications. Drawing on real examples from production systems the presentation explains how FOSS4G, coupled with a serverless architecture, enables us to store and serve national-scale raster and vector data-sets for the global insurance market, whilst maintaining sub-second latency.

D-MOSS: An integrated dengue early warning system in Vietnam driven by Earth Observations

Alison Hopkin

HR Wallingford

D-MOSS, Dengue MOsquito Simulation from Satellites, is a dengue fever early warning system for Vietnam being developed in a project funded by the UK Space Agency's International Partnerships Programme. The D-MOSS project is developing a suite of innovative tools that will allow public health authorities to identify areas of high risk for disease epidemics before an outbreak occurs, in order to target resources to reduce spreading of epidemics and improve disease control. Beneficiaries will be enabled to issue alerts for dengue fever and provide assessments of vector-borne disease risk under future climate and land-use change scenarios. The D-MOSS architecture relies on open and non-proprietary software and on flexible deployment into platforms including cloud-based virtual storage and application processing. The tools produced will also be used to increase the understanding of climate change-related health risks during a period when Vietnam is developing an updated National Adaptation Plan in line with its Paris Agreement obligations. Before 1970 only nine countries had experienced severe dengue epidemics. Today the disease is endemic in 141 countries, affecting 390 million people and with a global annual cost estimated at almost US$9 billion, which is three times that of cholera and over four times that of gastroenteritis. Since 2000, there has been an increase of over 100% in the number of cases of dengue fever in Vietnam, with 185,000 cases occurring in 2017 alone, and there is currently no system for forecasting future dengue outbreaks. The D-MOSS project is developing a forecasting system in

which EO datasets are combined with weather forecasts and a hydrological model to predict the likelihood of future dengue epidemics up to eight months in advance. D-MOSS integrates multiple stressors such as water availability, land-cover, precipitation and temperature. The approach integrates historical stressor datasets with each other and with historic dengue fever incidents, which are then input into a statistical model to provide forecasts based on future seasonal weather and hydrological forecasts. The D-MOSS project is within the first year of its three-year term and is currently focused on platform and model development, while gathering the key input data and engaging with the Vietnamese government to ensure that all components are fit for purpose. The portrayal system is designed to communicate the dengue and water availability forecasts to the Vietnamese Ministries of Health and Natural Resources and Environment. A user interface will also incorporate supporting information on recommended actions, provided by the decision makers and based on the forecasts and associated uncertainty. The D-MOSS project is led by HR Wallingford, working with the London School of Hygiene and Tropical Medicine, the Met Office and Oxford Policy Management in the UK, and with the following international partners: the United Nations Development Programme, the World Health Organisation, the Vietnamese Institute of Meteorology, Hydrology and Climate Change, the Pasteur Institute Ho Chi Minh City, and the National Institute of Hygiene and Epidemiology in Vietnam.

Application of GIS in the field of Emergency Planning and Resilience

Avais Ijaz

Unknown

Fri
14:20
Green

A previous incident in a neighbouring authority led to Falkirk Council implementing a GIS solution allowing them to identify vulnerable persons prior to an emergency event. Falkirk Council now have a GIS solution that allows for the modelling of various types of emergency scenarios. The solution has been hailed as a game changer within the field of Emergency Planning and Resilience and has gone on to win two national Resilience awards and has been picked up by the Scottish Govt to be rolled out nationally. This business case highlights the benefits of GIS when applied to field that usually isn't exposed to GIS.

Procedural generation using Mapbox for land planning

Shaun Landy

TheCartoGroup

The presentation will start by providing insight into the development of our proof of concept procedural generation tool that was used within LandHawk (land finding and planning software). The tool uses threebox.js, a plugin for Mapbox GL JS and wrapper around javascript 3D library three.js. Using a 3D library on top of the Mapbox platform gives more control over what can be rendered to screen allowing the creation of more complex geometry such as high poly models and procedurally generated non-extruded shapes. This additional control can be applied to textures allowing different uv coordinates to be applied to single or multiple textures to create many building facade designs.

Use cases of the tool will be covered next. The default use case would be to preview what a housing site could look like which could then be used as a point of reference for land owners or architects. The more advanced use cases could include the ability to perform shadow impact analysis of surrounding buildings or to estimate costs and resource requirements for sites. While covering the possible use cases and future direction of the tool it would be wise to point out that in the end it only provides estimates which should be used to provide insight and not taken as 100 percent accurate.

Considering the current stage of development for this tool, the development and future prospects of this technology is a big discussion point:

Improving the complexity of the base algorithm eg. road shapes and curves Adding parameters eg. minimum distance between properties Adding preferences eg. fill as much space as possible with buildings Adding weightings and landuse eg. must be 25% park space Ability to load in custom models and textures Simulations eg. traffic flow

To conclude, the tool is working within LandHawk as a standalone module but as an early version. There is a large amount of potential for the tool to be developed and expanded on which will allow it to have a more practical purpose when land planning.

Using computer vision and entry-level machine learning to automate the extraction of building footprints from scanned historic maps.

Marguerite le Riche

Registers of Scotland

The National Library of Scotland (NLS) has a large collection of high-resolution scanned maps, including the Ordnance Survey, 25-inch-to-the-mile County Series, mapped between 1841 and 1952, over four surveys. The maps show the footprint of the built environment at the time of each survey, which means they can be used as a source of information about the presence or absence of buildings at the point of

each survey. These maps are therefore a potential source of temporal information on the historic Scottish built environment but in order to use this information, the maps need to be digitised. The House Age Project aims to vectorise these maps and polygonise individual buildings. Vector datasets of historic buildings would open up new avenues of GIS-based research into the Scottish built environment, both past and present. Information about the age of individual buildings would not only enrich housing statistics and inform heritage conservation but could potentially be of value to historians, poverty and fuel poverty researchers, house condition surveys and the general public. Following an initial development phase where The Registers of Scotland participated in the first round of the Scottish Government's Data Science Accelerator, under a mentorship from EDINA, RoS and the NLS have now teamed up with Historic Environment Scotland (HES) on a pilot to automate the extraction of building footprints from the County Series maps for the City of Edinburgh using computer vision and machine learning. The aim of the project is: to develop vector datasets of historic buildings in Edinburgh at various points in time and, to investigate how these intermediate vector datasets can be used to help assign an age estimate to currently extant buildings in Edinburgh. The technology used so far is open source using Python 3.6 with modules including openCV, Rasterio, GDAL, and Scikit libraries in conjunction with a PostGIS database and QGIS. Work is currently focussed on extracting the building footprints from the raster images. The results, to date, have been encouraging. Issues remain in dealing with hollow letters that are fused to the inside edge of buildings and damage to the original paper maps (such as warping, cellotaping, scuff marks and bad printing). It is likely that some manual quality corrections will be required. It is anticipated that once we progress to assigning an age estimate to currently extant buildings, there will be issues of precision due to shape ambiguity and misregistration between map series.

Drone imagery, from field survey to image analysis: what is the place of open source software?

Juliette Maire

Scotland's Rural College , University of Edinburgh, Centre for Ecology and Hydrology, Teagasc

The mixture between curiosity, the will for novelty and time/cost constraints made my Ph.D. study a perfect playground for exploring open source software capabilities. So, I wish to present the workflow that I am using to extract coverage of excreta depositions in grazed grassland from images captured from RPAS (Remotely Piloted Aircraft System). In grazing livestock systems, the deposition of reactive nitrogen via urination and dung are hotspots of environmental degradation (e.g. nitrate leaching), productivity limitations (e.g. reduction of grass production, over-use of fertiliser) and greenhouse gas emissions (e.g. nitrous oxide and ammonia emissions). Locating deposition excreta in a low-cost manner opened an opportunity for improving our understanding of these impacts, the possibility of creating tools to limit their impacts and develop better farming practices in general. Open source

software such as the statistical R program was used at different steps of the data collection and analysis of the information from the different studies. For instance, this statistical software was used to perform image segmentation and object classification using the K-means method on cows and sheep grazed in Scotland and in Ireland. The total coverage and the number of depositions were determined and mapped using R. The detection of excreta depositions using RPAS imagery combined with soil measurements, made during my studies, shows potential to aid automatic and fast determination of excreta depositions cover at the field scale. The development of this method could improve spatial modelling of nitrogen inputs allowing better targeting of nitrogen fertilisers and reduced greenhouse gas emissions.

Thu
11:50
Green

WebAssembly for Geospatial

James Milner

SitePen

Until recently there was only one way to write client side logic for geospatial web applications; JavaScript. WebAssembly provides another way, as a low-level language similar to assembly, with a compact binary format. It aims to provide closer to native speeds and predictable and consistent running times for programs. This talk will examine if WebAssembly can be used to speed up and improve geospatial libraries and apps,as well as look at which languages might work well as host languages to compile WebAssembly to. Attendees can expect to come away with an introductory understanding of WebAssembly and it's benefits for the future of geospatial.

Thu
14:10
Green

Our Falkirk : Mitigating the impacts of poverty using OSM

Alison Moon

thinkWhere

Fairer Falkirk is Falkirk Council's strategic response to the rising poverty in the Falkirk Council area. It brings community planning partners together and sets out in detail a series of practical, deliverable, and achievable programmes aimed towards mitigating the impact of poverty on individuals and families. Services that provide money advice, access to food provision, digital access and community support are key to supporting those facing poverty, but ensuring that local people and front-line staff have access to up-to-date information relating to these services is challenging. With funding from the Open Data Institute (ODI)'s Local Government Geospatial Data Stimulus Fund, Fairer Falkirk have partnered with thinkWhere to create Our Falkirk: an online, map-based tool to allow local people to easily access information on services in the area. The presentation will look at how we've created a simple mapping platform for service discovery that allows enriched OSM data to be easily described, mapped and shared through the concept of data themes'. We'll look at some of the key challenges and opportunities identified through this process, and

show how taking an Open Data approach has allowed Falkirk Council to democratise access to vital information through the streamlining of data creation of publication. We'll also sign-post the resources now available as a result of this fully opensourced project.

GeoSeer is a search engine for the OGC services

Jonathan Moules

LightPear

GeoSeer is a search engine for the OGC services: WMS (Web Map Service),WFS (Web Feature Service), WCS (Web Coverage Service), and WMTS (Web MapTile Service). It is designed to solve the "discoverability problem" bymaking these open data (and Open Data) datasets and services discoverable. This talk will briefly cover GeoSeer, what it is, and how it works,before looking at the data it has collected on these services. The talkwill provide a global synopsis of these services as they stand,including their numbers, the distribution patterns, metadataobservations, and more.

QGIS in the Cloud - Desktop GIS in a Web Browser

Daniel Ormsby

Astun Technnology

QGIS in the Cloud is an innovative alternative to local QGIS installations, where users access a pre-configured QGIS platform hosted in the Amazon Web Services cloud via a web browser. Astun developed QGIS in the Cloud as a managed environment for delivering QGIS training courses and customer workshops, and now offer it as an enterprise platform to other organisations. This talk will explore the rationale behind its development, examine the pros and cons of hosting QGIS in the Cloud, and provide an overview of how the desktop virtualisation tools available in the Amazon Web Services environment has made QGIS in the Cloud a reality. There will be an opportunity for delegates to get hands on experience with QGIS in the Cloud in the accompanying workshop. If both a talk and workshop are accepted, then it would make sense for the talk to be scheduled prior to the workshop as an introduction.

BioCoRe an R tool for targeting ecological restoration

Andrew Rattey

Forest research

How we manage priority habitats within increasingly fragmented landscapes is a critical conservation issue. Practitioners and policy makers are often faced with the dilemma of deciding where to focus limited resources, but evidence on where particular actions will have the largest return on investment is lacking. Local patch' scale indicators of habitat quality are often compared in isolation from important information on the composition and spatial configuration of the surrounding landscape. To aid this decision making process, we have developed a spatial framework in the open source programming environment R for measuring and combining indicators of habitat biodiversity, coherence and resilience. A triage approach enables the prioritisation of areas for protection and restoration. Users can analyse their own data and adapt the parameters via an interactive R Shiny App. The final product provides an easy-to-use yet powerful tool to assist the development of cost-effective land management decisions.

Mesh: beyond vector and raster data

Saber Razmjooei

Lutra Consulting

Most real world features can be presented as vector or raster layers. In open source world, GDAL provides a comprehensive set of tools to interact with such datasets. But vector or raster is not always a suitable description of real world features. Data from oceanography, metrology, hydrology, etc often have multiple components at each location on an irregular structured mesh. A mesh can a collection of vertices, edges and faces in 2D or 3D space: vertices - XY(Z) points (in the layer's coordinate reference system) edges - connect pairs of vertices faces - sets of edges forming a closed shape - typically triangles or quadrilaterals (quads), rarely polygons with higher number of vertices Mesh gives us information about the spatial structure. In addition to the mesh we have datasets that assign a value to every vertex. For example, ice cap thickness at particular moment of time. A single file may contain multiple datasets - typically multiple quantities (e.g. water depth, water flow) that may be varying in time. Mesh Data Abstraction Layer or MDAL was introduced to handle various types of mesh. MDAL has been incorporated within QGIS. We have also provided several processing algorithms to convert mesh to vector or raster. A mesh calculator tool with aggregate functions was added to QGIS to better handle temporal component of the data.

Registers of Scotland: Land Registration using open source software

Alastair Reid

Registers of Scotland

Registers of Scotland (RoS) is responsible for compiling and maintaining 20 public registers relating to land, property and other legal documents in Scotland. Times have changed dramatically since then however, and we need to change too. New technology means new opportunities and new ways of working for RoS and our customers. That's the basis of our digital transformation - becoming an effective digital land registration body that is innovative, flexible and able to meet the needs of our customers. To enable digital transformation and support the development of new services we are replacing our 30 year old infrastructure, databases and tooling used to support the capture of data for land registration and replacing them with open source systems. Using OpenLayers, Geoserver, Postgres and PostGIS we're developing according to agile principles, constantly improving according to user feedback and building a new flexible and innovative roadmap to support land registration in Scotland. This work has already led to the development of a number of new services from our Digital Discharge Service (DDS) to one of our most important developments ScotLIS, Scotland's Land Information Service. It's an easy to use map-based service underpinned by open source software that for the first time allows citizens, communities, professionals and businesses to access comprehensive information about any piece of land or property in Scotland. We will demonstrate the mapping and data journey RoS have started to support Scotlis, how we're building and developing new Land Registration tools and services using open source software and where we hope to be with our mapping and data strategy in the next 5 years.

The QGIS NetworkAPI - a Remote Control for QGIS

Barry Rowlingson

Lancaster University

There are a number of options for making different systems work together, from loosely-coupled approaches like open specifications for file interoperability to tightly-coupled systems with linked compiled code from one system to another. An intermediate approach is to have one system expose a network API for remote control by the second system. It was this that we implemented in the QGIS "networkapi" plugin developed as a Google Summer of Code project in 2017. Student Kevin Stadler did most of the coding and implementation, mentored by Julia Wagemann and me. With this plugin running, any application capable of sending HTTP requests could (with security concerns) control a running QGIS. We built the system with two applications in mind - using the QGIS map canvas as a cartographic display for R spatial data, and calling QGIS routines from a Python notebook in a loosely-coupled way so that the Python notebook does not need to run as a PyQGIS script. An R package, "qgisremote" was also written to serve as a client. In this talk I will

present the state and capabilities of the "networkapi" plugin. Unfortunately it targeted QGIS version 2.x, and currently does not run on the QGIS version 3 series. Based on the enthusiasm for this presentation I will decide what to do with it.

GWRFC: An R implementation of Geographically Weighted Regression and Random Forest for the analysis of deforestation determinants

Fabián Santos

Universidad Indoamrica

Commonly, spatial data requires non-stationary modelling to capture relationships between variables. This has been satisfied by approaches such as the Geographically Weighted Regression (GWR; Fotheringham, Charlton, and Brunsdon 1998), which uses a moving window weightening technique to apply a linear regression model and determine variables effects. However, such approach has been criticized due to their sensitivity to multicollinearity and misleading cartographic representations ofregression coefficients (Wheeler 2007). In this talk, we report the implementation of a novel non-parametric approach using Random Forest (RF; Breiman 2001) to solve multicollinearity issues in GWR.Here, instead of regression coefficients, our algorithm allows the production of spatial representations of variables importance, while their effect is evaluated through clustering. We developed our algorithm in the R language with a QGIS interphase to facilitate its testing and reproducibility. To demonstrate its application, we applied it in the evaluation of forest change determinants in the Ecuadorian Amazon, using a multivariate dataset of 34 variables including: census databases, satellite time-series derived products, ancillary cartography and accessibility models. Our results indicated that RF local models can predicted using all variables, achieving overall accuracies around 76-81% and coherent relationships among variables according experts. Nevertheless, to achieve these results, we had to discretize dependent variables to use RF classification, as RF regression performed less than our expectations. Our proposal extends the possibilities of GWR and differs from other available tools that have not implemented GWR and Random Forest.

Software Bilingualism: Running ESRI, QGIS and Keeping Everyone and Everything Happy

Ant Scott

MapAction

MapAction has traditionally used ESRI products for its emergency mission work, using licences provided by ESRI. This has to some extent been self-perpetuating, as volunteers were recruited for their ArcGIS skills (among other qualities), though QGIS has always been used for training and capacity building work. More recently, a number of factors have moved the organisation towards a bilingual' software strategy - i.e. the ability to perform all its activities in either Arc or QGIS. As well as providing flexibility to volunteers on deployment and allowing a change of focus in recruitment from specific software skills to more generic GIS capabilities, this also supports MapAction's ability to work alongside, and in some cases hand over to, other NGOs who are using QGIS and other open source tools. However there are a number of implications for MapAction above and beyond availability of software, and the skills of volunteers. These include: Replicating custom Arc tools which manage publication of maps to the MapAction website, and naming of file data according to our naming convention Mirroring standard print templates Generating web output Migration of software-specific data and files between Arc and QGIS, including for example layer files, GeoDatabases, style files and project files Maintaining training resources Version management and compatibility issues While these challenges are mostly capable of being addressed, resourcing is an issue - volunteer resource time is limited, and specific skills are needed in some areas. The presentation will set out MapAction's progress towards reaching its goal of bilingualism, and identity blockages and areas where external help might be useful.

Finding flat roofs with FOSS tools and data

Emily Selwood

Satellite Applications Catapult

This beginner friendly talk will give you an overview of how to find flat roofs with free and open tools and data. Where to source the data, steps needed to process it and clean it to a level where it is useful. The hope of this talk is to spark ideas and show people who have not worked with LIDAR data the kind of things that are possible. It will include a brief introduction in to how LIDAR works before jumping into how to acquire the data, convert it into useful formats, process, and clean the data. To fit this in a 20-minute talk unfortunately this will not be able to be a live demo.

Creating a Scottish Crop Map From Sentinel-1/2 Satellite Images

Stephen Smith

Scottish Government, Agriculture Analusis Unit

The Agriculture Analysis Unit in the Scottish Government are constantly looking for ways to make better use of data, reduce data collection costs, share new insights to support policy makers, and continue to deliver effective public services. One such creative effort is a collaboration between Scottish Government and EDINA (University of Edinburgh) to develop the methodology and capability to produce a crop map for Scotland, applying machine learning techniques to satellite data from the Copernicus programme. This data is freely available, and using open source software such as R, Python and QGIS we will develop machine learning algorithms that can predict which crops are growing in Scotland. Using open data and software, we aim to provide an interactive map, open and accessible outputs, and source code to allow our users to interact with the data and reproduce our methods. This also has the advantage of reducing reliance on the costly surveys that would otherwise be needed to collect this data. There are many possible methodologies available and this project will explore and compare a number of those possibilities, including supervised Random Forest (RF) and Convolutional Neural Networks (CNN) classifiers, and unsupervised clustering techniques. We will then make our data and codes available under Open Government Licence and in a way that users can reproduce and build on our work using freely available software. In this talk we will share details about our workflow, issues faced during implementation, and the final deliverable, a Scottish Crop Map, all through a lens of using open source software and data.

Cartography with R and QGIS, which to choose?

Mike Spencer

SRUC

We all love maps. Like many, I grew up with the rich tapestry of Ordnance Survey landranger maps. This OS product uses clever cartography to display many different attributes at the same time. At the opposite end of the scale, we've all seen maps which only display one or two attributes - like continent outlines and temperature. These two map extremes are often created using different tools, with maps featuring many attributes usually developed by hand in a desktop GIS or illustration package and single attribute maps often being the output of a bespoke code, e.g. analysing the output of a climate model. In this talk I'll explore when a point and click interface, like QGIS, is more appropriate to develop a map and when writing code like R is a more suitable solution. I'll use examples from my work in the public sector, consultancy and academia. These examples will encompass environmental data like flood maps, to sociology and economics datasets. You should attend this talk if you want to learn about making maps in R and QGIS and what the advantages of each environment are.

Open source spatial ETL with Python and Apache Airflow

John Stevenson

British Geological Survey

Thu
11:10
Green

Extract-Transform-Load workflows are used to move data in and out of databases, perhaps with some processing along the way. They are usually performed by database specialists. A well-known proprietary spatial ETL software provides (1) a point-and-click tools for defining workflows without writing code and (2) a server with a web interface for scheduling, triggering and monitoring jobs. Pipelines defined this way are difficult to use with the version control and testing tools that are essential for the development of reliable software. It is better to define pipelines as code, but this can be difficult without software developers.

We have developed a library to simplify interacting with databases with Python. It is a wrapper around the Python DBAPI2 standard and takes care of driver selection, connection setup and paging through the results of large queries. There are functions to 'get_rows', 'insert_bulk' and 'copy_rows'. An Oracle Spatial to PostGIS pipeline (using SDO_UTIL.TO_WKTGEOMETRY() and ST_GeomFromText() for geometry objects) can be written with just six commands. This makes it easy for non-developers to write ETL scripts in testable code.

Apache Airflow provides the scheduling server and web interface for job management. ETL scripts are called by workflows that can include triggers (e.g. on database table changes) and notifications. They are also defined by version-controlled Python code. Airflow has a powerful backfill function that divides big tasks into small chunks and puts them on a queue to be processed by any number of worker nodes. This satisfies the need for a central location to manage jobs.

Combining Python with Apache Airflow provides an open-source way for non-developers to write and manage spatial ETLs. We will show examples of transferring spatial data and a large table of time-series data.

GeoAI: A Field Guide to AI in geospatial workflows

Dominic Stubbins

Esri UK

Fri
11:40
Blue

AI is becoming an increasingly important tool in geospatial workflows as more and more organisations are adopting machine learning approaches to data analysis and processing of spatial data. This talk will provide a high level guide to the types of problems that are being addressed and the different approaches and frameworks being used. Looking at real world examples of where AI has been used across both raster and vector data to help with challenges such as pattern and cluster analysis, prediction, feature extraction, object detection and more.

Nyanza, Reveal Your Secrets (FOSS4G-ly)

Philip Taylor

Centre for Ecology and Hydrology

A body of water so vast it's known simply as Nyanza (lake') in many Bantu languages, the world's second largest lake by area is suffering considerable challenges, but also seeing a recent boom in local and international research. Over 150 years since David Livingstone couldn't find an object the size of his home country despite knowing where it was, what can open solutions bring to one of East Africa's most important resources? Join me on a journey from the small Scottish island of Ulva all the way to an aquarium tucked away along the shores of the Winam Gulf to find out how free and open-source geospatial software is beginning to impact the area and its research community. Using QGIS, PostGIS, R and a host of open source libraries, we'll delve into the unknown and uncover some of the secrets of the largest of Africa's Great Lakes. Just how big can a Nile Perch get? Why can't I see water from the shore? What's actually underneath the surface? And just what and where is a tripoint? See how the FOSS4G stack is answering these questions and helping us better understand the region as a whole as well as Ulva!

Using the OGC Web Processing Service (WPS) to move business logic to the server

Ian Turton

Astun Technology

In the past, desktop GIS were necessary to handle complex spatial business decisions. This lead to problems with data management, model updates and an increased cost to the organisation in hardware and (often) software maintenance. As organisations move to more cloud based solutions and provide staff with thinner client machines (chrome books etc.) it becomes harder for staff to manage more complex geospatial problems. The Open Geospatial Consortium (OGC) developed the web processing service (WPS) standard in 2005. It provides rules for standardizing how inputs and outputs (requests and responses) for geospatial processing services are made. The standard also defines how a client can request the execution of a process, and how the output from the process is handled. It defines an interface that facilitates the publishing of geospatial processes and clients' discovery of and binding to those processes. This talk will present case studies of how Astun Technology has used the OGC WPS standard, as implemented by GeoServer, to allow users of web based mapping applications to carry out advanced spatial operations and allowed them to implement complex business logic with out the need for specialised hardware or software.

Serverless Zoomstack on AWS

Mark Varley

Addresscloud

The Ordnance Survey Open Zoomstack makes OS open data more accessible, customisable and easier to use. It provides a single, customisable map of Great Britain to be used at national and local levels. This is a fantastic asset for any geo developer however we still need to host the data or pay for a third party service to host this for us. In this talk we will explore the opportunities that serverless technology provides us to host Zoomstack or any other vector tile service on a fully scalable, resilient and secure architecture on Amazon Web Services (AWS) at almost no cost.

Visualising Commuting in Ireland with QGIS

Heikki Vesanto

Personal

The Central Statistics Office in Ireland publishes a great data set that contains the start and end locations of work, school, and college commutes in Ireland. The data is aggregated to an electoral division level but still provides an excellent resource for visualising the flows of people. When join by start and end location the full data set comprises of just under 300 thousand commute lines. Which can be difficult to interpret in its raw form. The data can be visualised in multiple different ways, highlighting local and regional flows. QGIS provides a versatile tool for for exploring the different aspects of the data. Utilising blending modes and data driven cartography the data can be presented in a visually appealing and comprehensible way. Allowing us to derive insights from the data. The talk will cover the data processing in PostgreSQL/PostGIS, the visualisation in QGIS, and the insights we can derive from the flow data.