

SEST-6577
Geographic Information Systems for Security Studies
Lab 12 (+ Walk-Through 4)

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Figure 1: News = data about **who did what to whom, when and where**

Who	Did what	To whom	When	Where	Source
Russia	rocket strike	Ukraine	2/24/2022	Kyiv	CNN
Russia	rocket strike	Ukraine	2/24/2022	Kharkiv	CNN

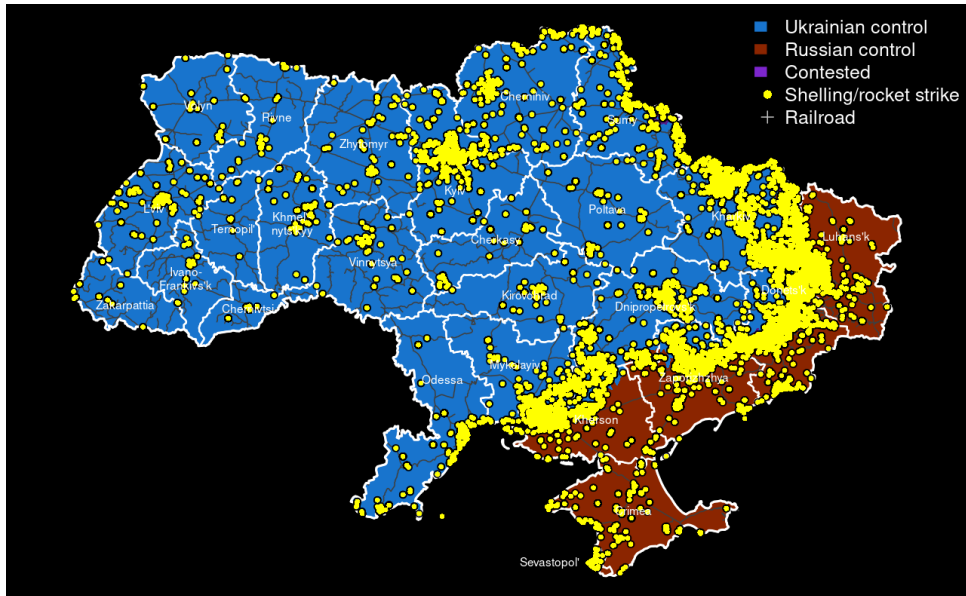


Figure 2: Near-real time event, territorial control data on Russian invasion of Ukraine

Overview

Motivation: during Russia's 2022 invasion of Ukraine. . .

1. Russia has become a hermetically-sealed information environment
 - a) media required to stick to MoD press releases
 - b) cannot use word "war" when describing "special military operation"
 - c) up to 100K ruble fine for publicly "discrediting" Russian army
 - d) up to 15-year sentence for "knowingly false information" about war
 - e) last independent media shut down (e.g. TV Rain, Echo of Moscow)
 - f) Facebook, Twitter, Instagram, VPNs blocked
2. Ukrainian media more free, but vulnerable
 - a) TV news sometimes broadcasts from basements, bomb shelters
 - b) Russia has targeted TV towers, cut electricity, cell service
 - c) all national TV channels merged onto one platform under martial law
 - d) radio silence on Ukrainian casualties, ongoing operations

Solution: use machine learning, remote sensing to track events on the ground

Tracking the War in Near-Real Time

What are “event data”?

1. Incident-level data on “who did what to whom, when and where”
 - a) “who”: initiator of action (subject)
 - b) “did what”: description of action/tactic (verb)
 - c) “to whom”: target of action (object)
 - d) “when”: time/date of event
 - e) “where”: location of event
2. Types of events (examples we have used in this class)
 - a) political violence
 - b) bike crashes in NYC
 - c) crimes in DC
 - d) 311 calls about flooding in New Orleans
3. Sources of data
 - a) media/open sources (including social media)
 - b) government records/archives
 - c) remote sensing

VIINA: Violent Incident Information from News Articles

1. Near-real time event data on Russian invasion of Ukraine (updated daily)
 - a) based on news reports from Ukrainian and Russian media, geocoded and classified with Bidirectional Encoder Representations from Transformers (BERT)
 - b) each event is accompanied by full source info, text and URLs
2. Data on territorial control at municipality level (updated daily)
 - a) based on vectorized georeferenced maps (e.g. DeepState, Wikipedia)
 - b) “boosted” by VIINA event data on changes in control

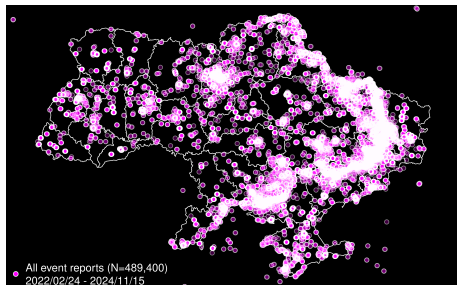


Figure 3: Events

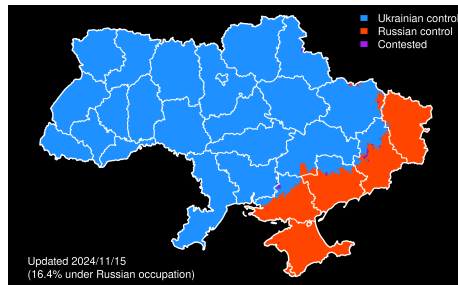


Figure 4: Control

Problem: 1 news report $\neq$ 1 unique event

1. We can characterize each event as a unique configuration of
[subject]-[verb]-[object]-[time]-[location]
(i.e. who did what to whom, when and where)
2. We can learn about these events from news reports
 - a) one report of one event ("A attacked B")
 - b) multiple reports of one event ("A attacked B", "B attacked by A")
 - c) multiple events in one report ("A attacked B, C attacked A")
 - ⋮
 - d) N reports of an unknown $\#$ of events

Question: do these news reports refer to the same event?

Date	Source	English translation
2022/02/25	Interfax.ua	Russian forces purposefully shelling residential buildings in Kharkiv – head of regional administration Synyehubov
2022/02/25	24tv.ua	Shell hits residential building in Kharkiv: casualties possible – frightening photos

Who	Did what	To whom	When	Where
	✓	✓	✓	✓

Question: do these news reports refer to the same event?

Date	Source	English translation
2022/08/10	liveuamap	In Kharkiv as a result of Russian shelling one person is wounded
2022/08/15	24tv.ua	Woman, wounded during shelling of Saltivka in Kharkiv, died in hospital

Who	Did what	To whom	When	Where
	✓			✓

Coreference resolution (CR)

Process of resolving multiple references to same physical object or event

1. Why are duplicates a problem?
 - a) duplicates are a threat to causal inference
 - b) over-reporting of events may be correlated with unobservables
(e.g. media presence, perceived "newsworthiness" or novelty)
 - c) duplicates make it harder to assess ground truth about violence
 - d) this problem affects both machine-coded and hand-coded data
2. Applications to event data:
 - a) remove exact textual duplicates ("bare minimum")
 - b) "1 per day" filter (if two reported events are of the same type, and were reported in same location on same day, then they are references to the same event)
 - c) MELTT spatio-temporal filter (match based on co-occurrence in space and time)
 - d) model-based methods (e.g. convolutional neural networks, transformers)

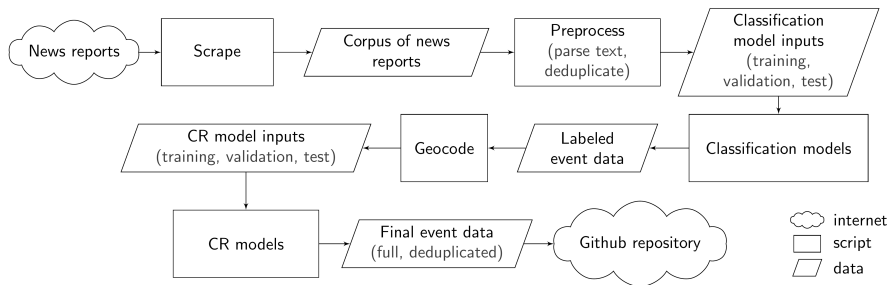


Figure 5: VIINA workflow

VIINA turns online news articles & social media into geocoded event data by:

1. Scraping online news & social media, preprocessing the raw text
2. Classifying the news reports by actor and tactics with large language models
3. Assigning geo coordinates based on locations mentioned in reports
4. Identifying (but not removing) likely duplicate events

Other Near-Real Time Data Sources

Historical weather & climate raster data (partial list)

Dataset	ACLED	GDELT	ICEWS	VIINA
Data on Violence?	✓	✓	✓	✓
Data on Control?				✓
Fully Automated?		✓	✓	✓
Text Descriptions?	✓			✓
Source URLs?		✓		✓
Events in 1st Year	40,448	778,350	27,858	113,446
Unique Event Locations	2,430	1,762	581	9,771
Update Frequency	1 week	Daily	1-2 months	Daily
Event Types	24	50	105	23
Sources	97	8,887	126	30
English-Only?	No	Yes	Yes	No
Ukrainian Sources (%)	74.2	10.1	4.2	92.5
Russian Sources (%)	14	11.8	12	7.5
Unknown Sources (%)	0	0	47.3	0

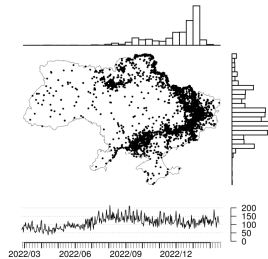


Figure 6: ACLED

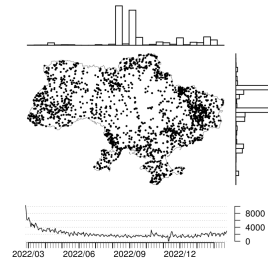


Figure 7: GDELT

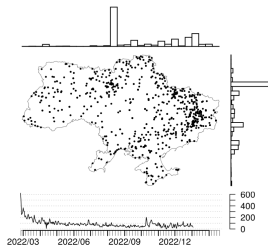


Figure 8: ICEWS

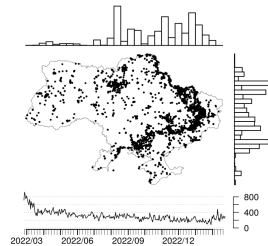


Figure 9: VIINA

Near-real time remote sensing data (partial list)

Type	Source/link	Spatial resolution	Frequency	Free?
Fire anomalies	FIRMS	Points	Daily	✓
Night lights	VIIRS	Raster	Nightly	✓
Vegetation	NDVI	Raster	2 weeks	✓
Meteorological events	NASA Worldview	Raster	Daily	✓
Reflectance (photos)	NASA Worldview	Raster	Hourly/Daily	✓

What kinds of events can remote sensing capture that media cannot? (+ vice versa)

Vignettes

Overview of lab exercise

1. How much of Ukraine's territory does Russia occupy?
2. Compare media reports to remote sensing data on fire anomalies.

We will work with a (very large) dataset on territorial control in Ukraine

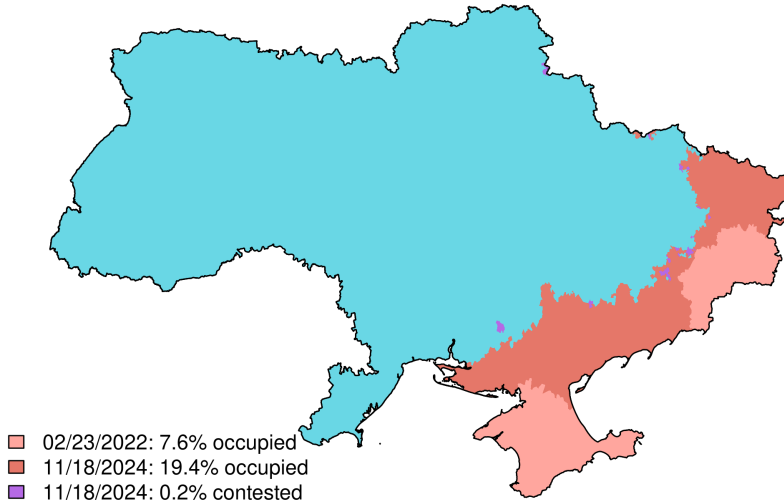


Figure 10: Vignette 1

We will then integrate NASA's data on active fires with VIINA event reports

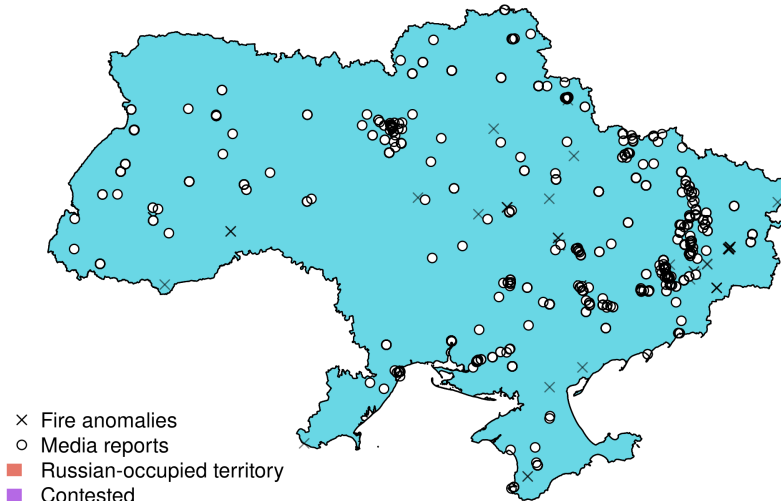


Figure 11: Vignette 2 / Step 1

... and identify locations that may be overlooked media vs. fires data

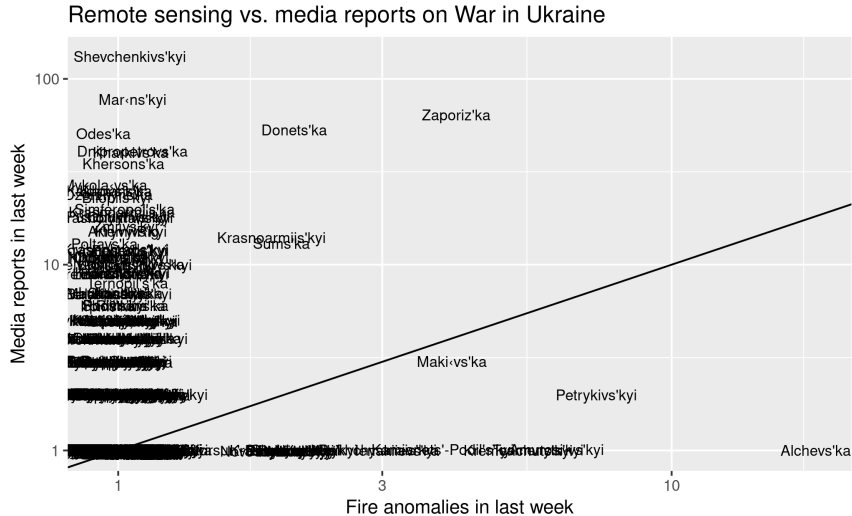
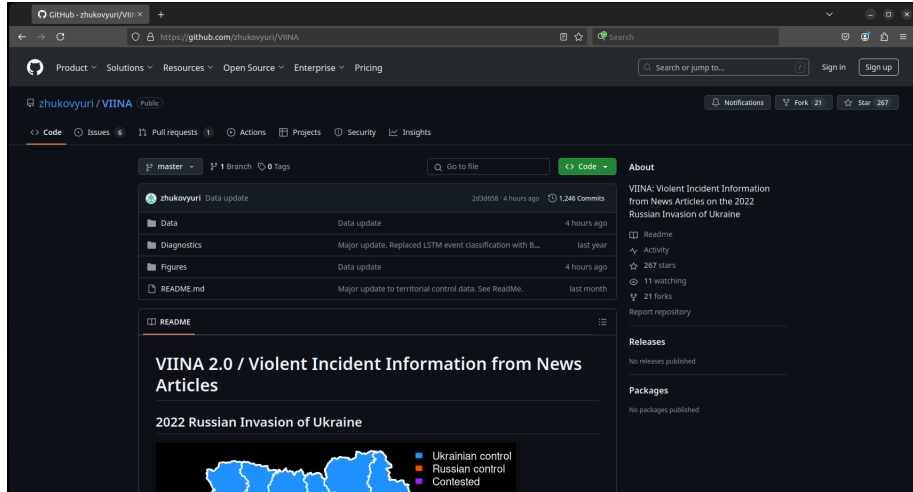


Figure 12: Vignette 2 / Step 2

We can obtain **data on territorial control and media reports** from github.com/zhukovyuri/VIINA



GitHub - zhukovyuri/VIINA

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zhukovyuri / VIINA Public

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Code

About

VIINA: Violent Incident Information from News Articles on the 2022 Russian Invasion of Ukraine

Readme Activity 267 stars 11 watching 21 forks Report repository

Releases

No releases published

Packages

No packages published

zhukovyuri Data update 2d3d058 · 4 hours ago 1,246 Commits

File	Description	Last Update
Data	Data update	4 hours ago
Diagnostics	Major update. Replaced LSTM event classification with B...	last year
Figures	Data update	4 hours ago
README.md	Major update to territorial control data. See ReadMe.	last month

README

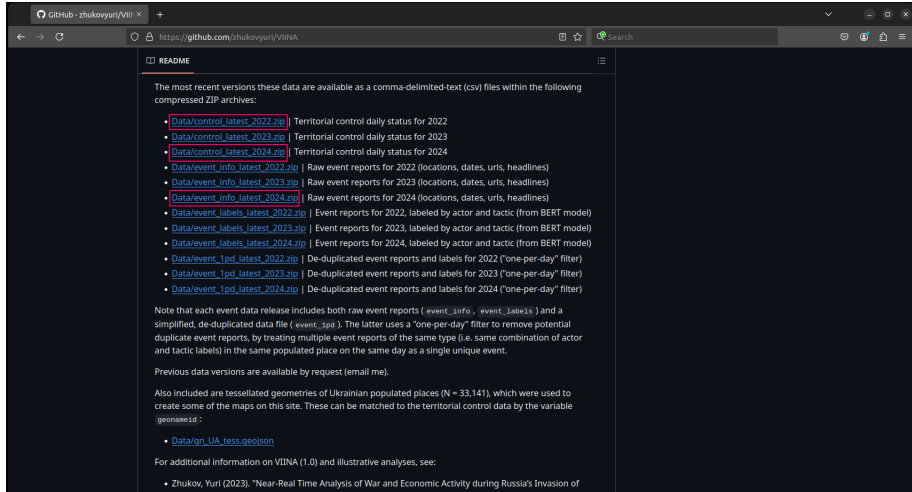
VIINA 2.0 / Violent Incident Information from News Articles

2022 Russian Invasion of Ukraine



Ukrainian control
Russian control
Contested

There are several datasets here. The ones we need are `control_latest_2022`, `control_latest_2024` and `event_info_latest_2024`



The screenshot shows a web browser displaying the GitHub repository page for `zhukovyuri/VIIINA`. The README file is open, and the following text is visible:

The most recent versions these data are available as a comma-delimited-text (csv) files within the following compressed ZIP archives:

- [Data/control_latest_2022.zip](#) | Territorial control daily status for 2022
- [Data/control_latest_2023.zip](#) | Territorial control daily status for 2023
- [Data/control_latest_2024.zip](#) | Territorial control daily status for 2024
- [Data/event_info_latest_2022.zip](#) | Raw event reports for 2022 (locations, dates, urls, headlines)
- [Data/event_info_latest_2023.zip](#) | Raw event reports for 2023 (locations, dates, urls, headlines)
- [Data/event_info_latest_2024.zip](#) | Raw event reports for 2024 (locations, dates, urls, headlines)
- [Data/event_labels_latest_2022.zip](#) | Event reports for 2022, labeled by actor and tactic (from BERT model)
- [Data/event_labels_latest_2023.zip](#) | Event reports for 2023, labeled by actor and tactic (from BERT model)
- [Data/event_labels_latest_2024.zip](#) | Event reports for 2024, labeled by actor and tactic (from BERT model)
- [Data/event_1pd_latest_2022.zip](#) | De-duplicated event reports and labels for 2022 ("one-per-day" filter)
- [Data/event_1pd_latest_2023.zip](#) | De-duplicated event reports and labels for 2023 ("one-per-day" filter)
- [Data/event_1pd_latest_2024.zip](#) | De-duplicated event reports and labels for 2024 ("one-per-day" filter)

Note that each event data release includes both raw event reports (`event_info` , `event_labels`) and a simplified, de-duplicated data file (`event_1pd`). The latter uses a "one-per-day" filter to remove potential duplicate event reports, by treating multiple event reports of the same type (i.e. same combination of actor and tactic labels) in the same populated place on the same day as a single unique event.

Previous data versions are available by request (email me).

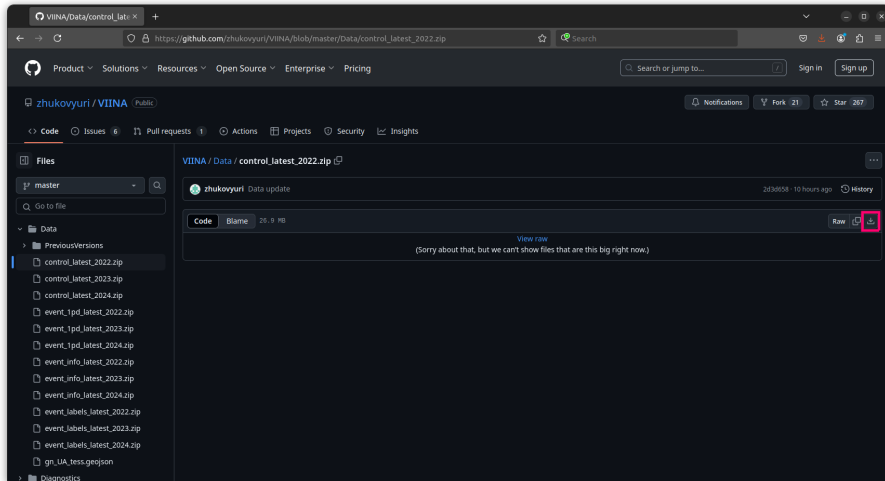
Also included are tessellated geometries of Ukrainian populated places (N = 33,141), which were used to create some of the maps on this site. These can be matched to the territorial control data by the variable `geonameid` :

- [Data/gn_UA_tess.geojson](#)

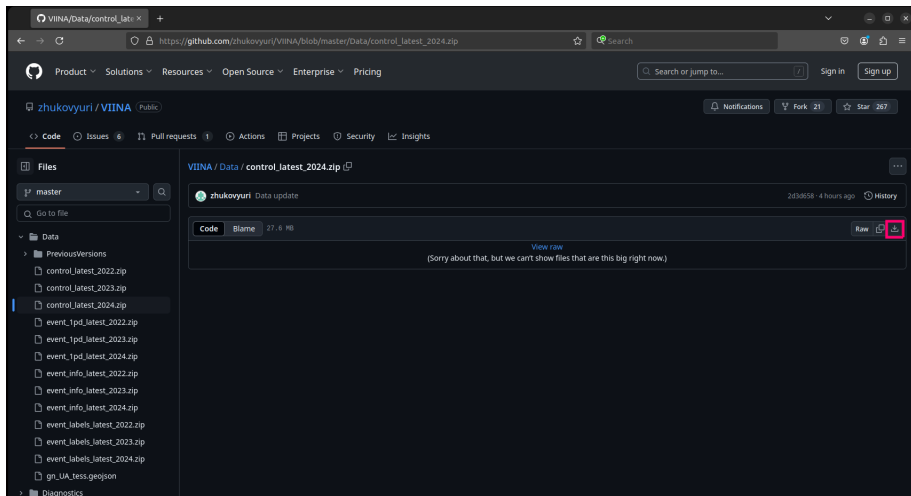
For additional information on VIIINA (1.0) and illustrative analyses, see:

- Zhukov, Yuri (2023). "Near-Real Time Analysis of War and Economic Activity during Russia's Invasion of

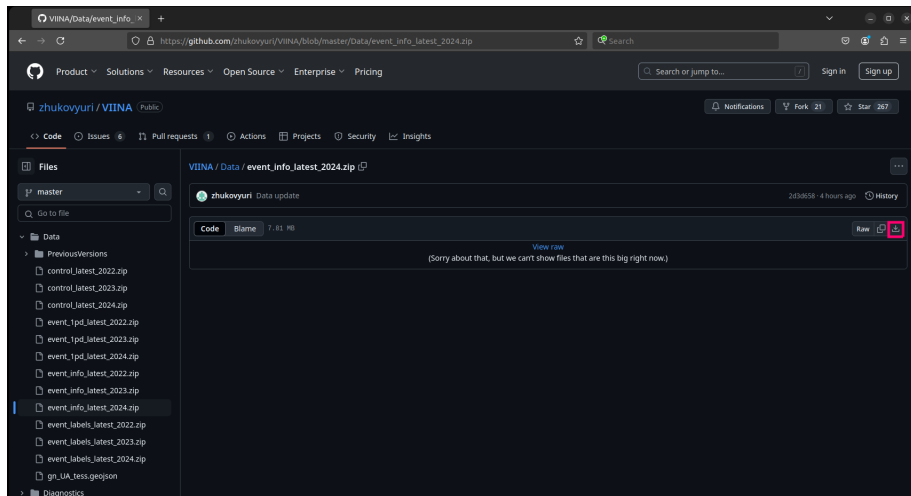
Go to `control_latest_2022.zip` and download the file by clicking on the “Download raw file” button



Do the same thing for control_latest_2024.zip



And again for event_info_latest_2024.zip



While we're here, let's also grab the GIS boundaries for Ukrainian populated places, `gn_UA_tess.geojson`

GitHub - zhukovyuri/VIINA

https://github.com/zhukovyuri/VIINA?tab=readme-ov-file

README

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- [Data/gn_UA_tess.geojson](#)

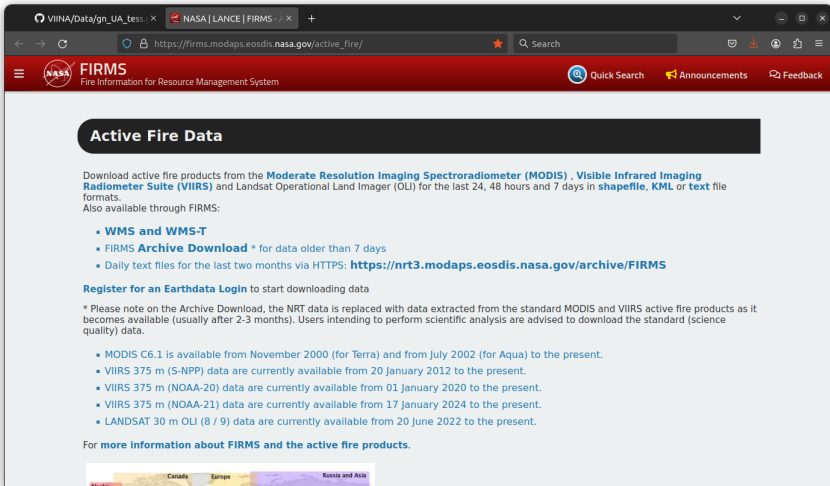
For additional information on VIINA (1.0) and illustrative analyses, see:

- Zhukov, Yuri (2023). "Near-Real Time Analysis of War and Economic Activity during Russia's Invasion of

We can also get this file through the “Download raw file” link

The screenshot shows a web browser displaying the GitHub repository for zhukovyuri/VIINA. The URL in the address bar is https://github.com/zhukovyuri/VIINA/blob/master/Data/gn_UA_tess.geojson. The repository page shows the file `gn_UA_tess.geojson` selected in the file browser on the left. The main content area displays a map of Ukraine with a red line indicating a boundary. The map includes labels for various locations such as Rodynske, Pokrovsk, Novohrodivka, Selydove, Ukrainsk, Kurashove, Avdiivka, Yarmurata, Donetsk, Makivka, Kharivsk, Horlivka, and Yenakiieve. A red line runs from the northwest to the southeast, passing through several of these locations. The file size is 30.2 MB. A download icon (a square with a downward arrow) is visible in the top right corner of the map area, highlighted with a red box.

Let's now get the **FIRMS Active Fires** data from
`firms.modaps.eosdis.nasa.gov/active_fire/`



The screenshot shows a web browser window with the URL `https://firms.modaps.eosdis.nasa.gov/active_fire/`. The page header is red with the NASA logo and the text "FIRMS Fire Information for Resource Management System". Navigation links include "Quick Search", "Announcements", and "Feedback". The main content area has a dark grey header "Active Fire Data". Below this, it states: "Download active fire products from the **Moderate Resolution Imaging Spectroradiometer (MODIS)**, **Visible Infrared Imaging Radiometer Suite (VIIRS)** and Landsat Operational Land Imager (OLI) for the last 24, 48 hours and 7 days in **shapefile**, **KML** or **text** file formats. Also available through FIRMS:

- **WMS and WMS-T**
- **FIRMS Archive Download** * for data older than 7 days
- Daily text files for the last two months via HTTPS: <https://nrt3.modaps.eosdis.nasa.gov/archive/FIRMS>

Register for an [Earthdata Login](#) to start downloading data

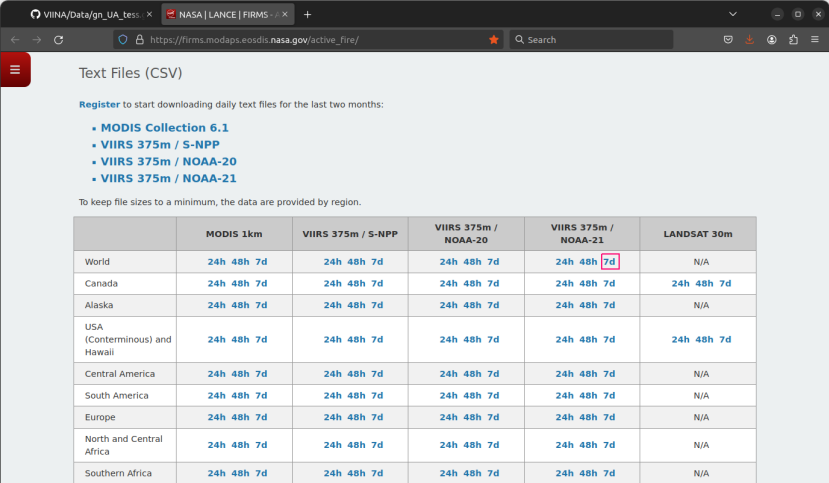
* Please note on the Archive Download, the NRT data is replaced with data extracted from the standard MODIS and VIIRS active fire products as it becomes available (usually after 2-3 months). Users intending to perform scientific analysis are advised to download the standard (science quality) data.

- MODIS C6.1 is available from November 2000 (for Terra) and from July 2002 (for Aqua) to the present.
- VIIRS 375 m (S-NPP) data are currently available from 20 January 2012 to the present.
- VIIRS 375 m (NOAA-20) data are currently available from 01 January 2020 to the present.
- VIIRS 375 m (NOAA-21) data are currently available from 17 January 2024 to the present.
- LANDSAT 30 m OLI (8 / 9) data are currently available from 20 June 2022 to the present.

For [more information about FIRMS and the active fire products](#).

At the bottom, there is a small map showing the locations of the sensors: Canada, Europe, Russia and Asia.

Scroll down to “Text Files (CSV)” and download the latest weekly (7d) data for “World” from “VIIRS 375m/NOAA-21”



Text Files (CSV)

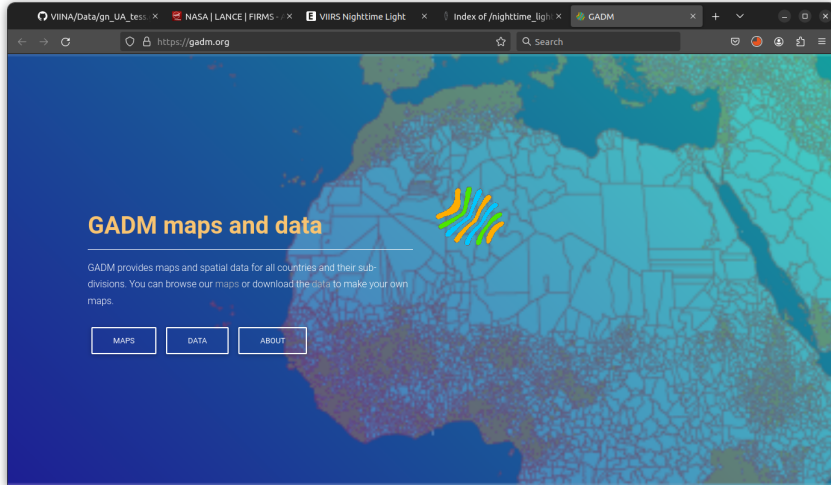
[Register](#) to start downloading daily text files for the last two months:

- [MODIS Collection 6.1](#)
- [VIIRS 375m / S-NPP](#)
- [VIIRS 375m / NOAA-20](#)
- [VIIRS 375m / NOAA-21](#)

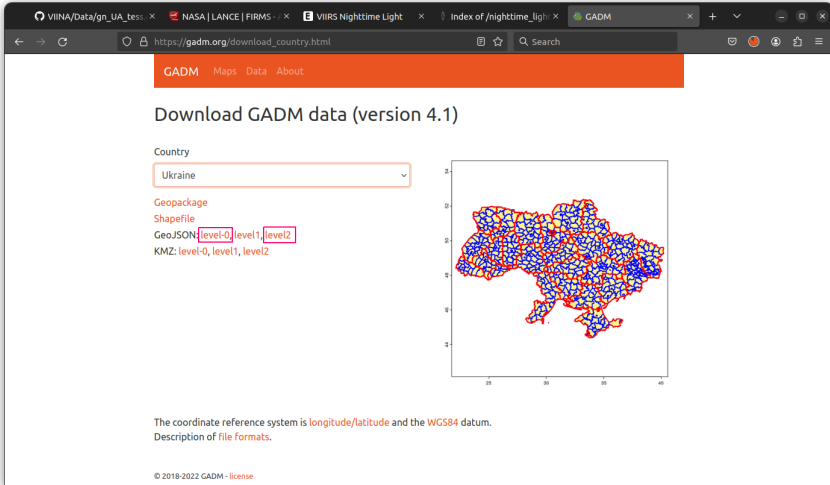
To keep file sizes to a minimum, the data are provided by region.

	MODIS 1km	VIIRS 375m / S-NPP	VIIRS 375m / NOAA-20	VIIRS 375m / NOAA-21	LANDSAT 30m
World	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d	N/A
Canada	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d
Alaska	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d	N/A
USA (Conterminous) and Hawaii	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d
Central America	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d	N/A
South America	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d	N/A
Europe	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d	N/A
North and Central Africa	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d	N/A
Southern Africa	24h 48h 7d	24h 48h 7d	24h 48h 7d	24h 48h 7d	N/A

We will use **country-level** and **district-level boundaries** data from `gadm.org`



Download the level-0 and level-1-2 files for Ukraine, in GeoJSON format



The screenshot shows a web browser window with the URL https://gadm.org/download_country.html. The page has an orange header with the GADM logo and navigation links: GADM, Maps, Data, About. The main heading is "Download GADM data (version 4.1)". Below this, there is a "Country" dropdown menu with "Ukraine" selected. To the right of the dropdown is a map of Ukraine with its administrative boundaries highlighted in red and blue. Below the dropdown, the available file formats are listed: Geopackage, Shapefile, GeoJSON (with level-0, level1, and level2 options), and KMZ (with level-0, level1, and level2 options). At the bottom, a note states: "The coordinate reference system is longitude/latitude and the WGS84 datum. Description of file formats." and a copyright notice: "© 2018-2022 GADM - license".

Country:

Geopackage
Shapefile
GeoJSON: level-0, level1, level2
KMZ: level-0, level1, level2

The coordinate reference system is longitude/latitude and the WGS84 datum.
Description of file formats.

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Here is the full list of data sources and links:

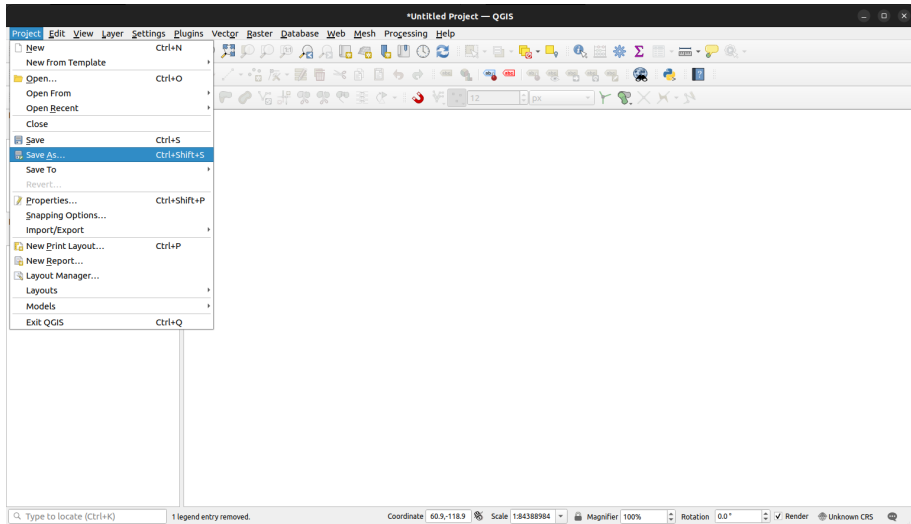
Category	Type	Format	Data source
Territorial control	Vector (polygons)	.csv, .geojson	VIINA
Media event reports	Vector (points)	.csv	VIINA
Active fires	Vector (points)	.csv	NASA FIRMS
Administrative borders	Vector (polygons)	.geojson	GADM

These are all in the Lab12WT04.zip file posted on Canvas.

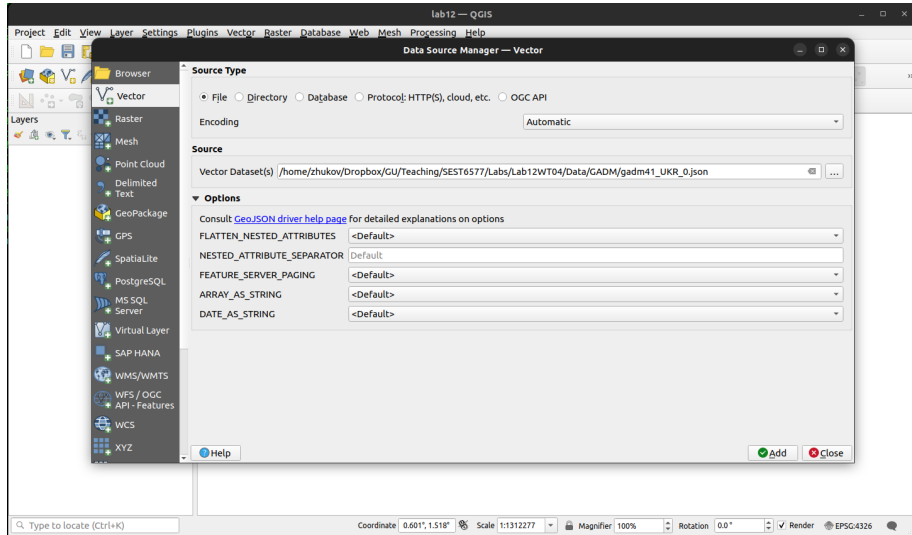
How much of Ukraine's territory does Russia occupy?

Always save your progress!

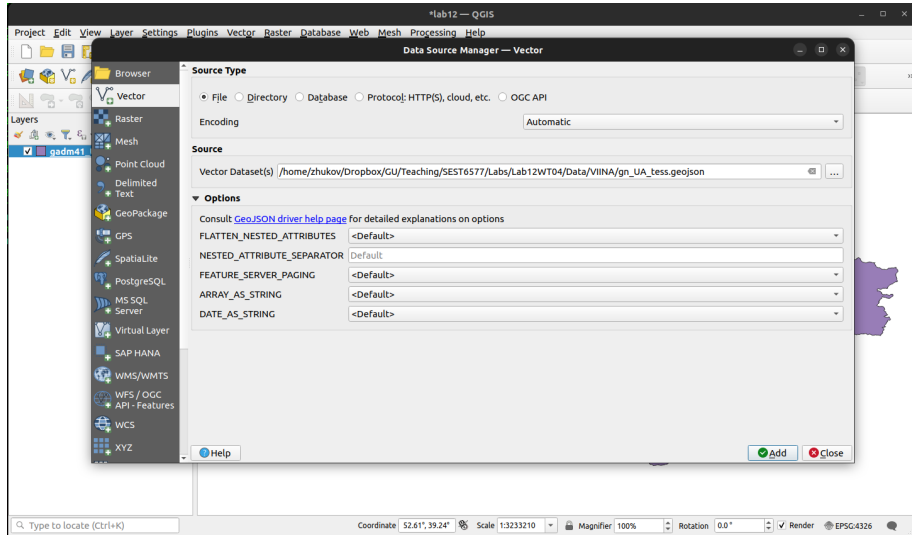
Go to Project → Save As...



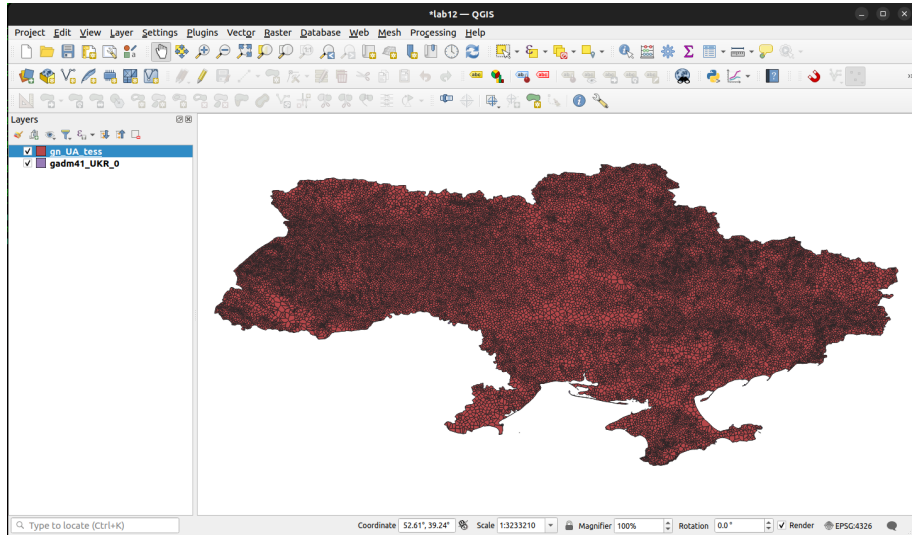
Vignette 1. Load *Ukraine's national borders* (Layer → Add Layer → Add Vector Layer). gadm41_UKR_0.json file in Data/GADM



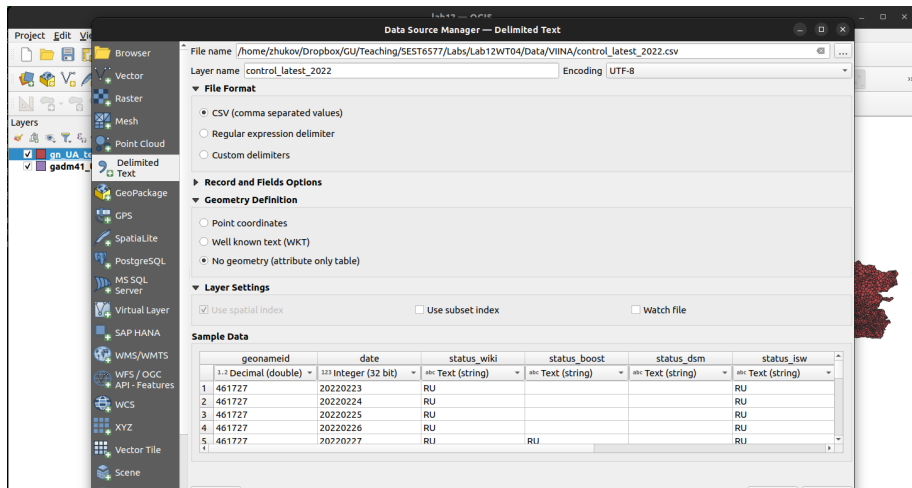
Also load the *populated place borders* (Layer → Add Layer → Add Vector Layer). gn_UA_tess.geojson file in Data/VIINA



There are 33,141 populated places in Ukraine. This is the level at which territorial control is measured



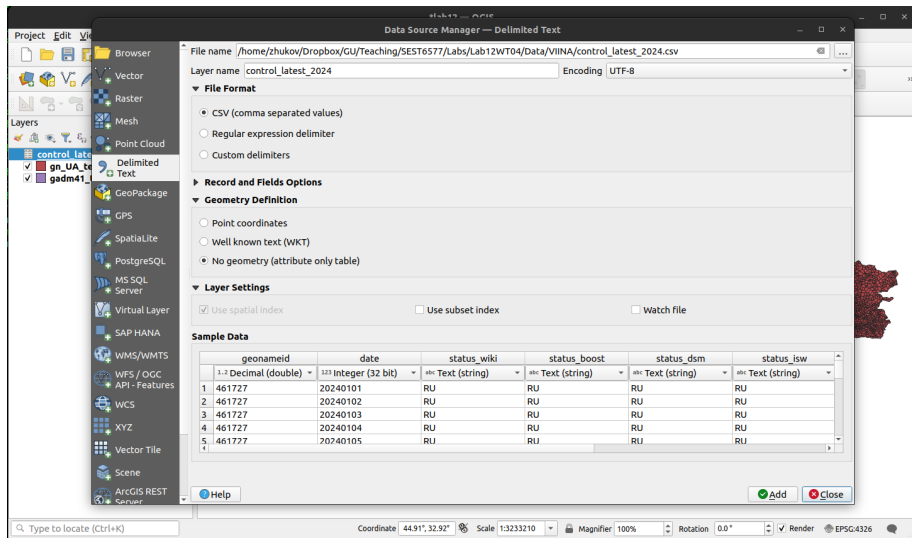
Load the *territorial control data for 2022* (control_latest_2022.csv) as a delimited text file with no geometries. This is a HUGE table (> 10M rows), of which we'll be using only a small part. Take a note of how the date field is formatted (YYYYMMDD)



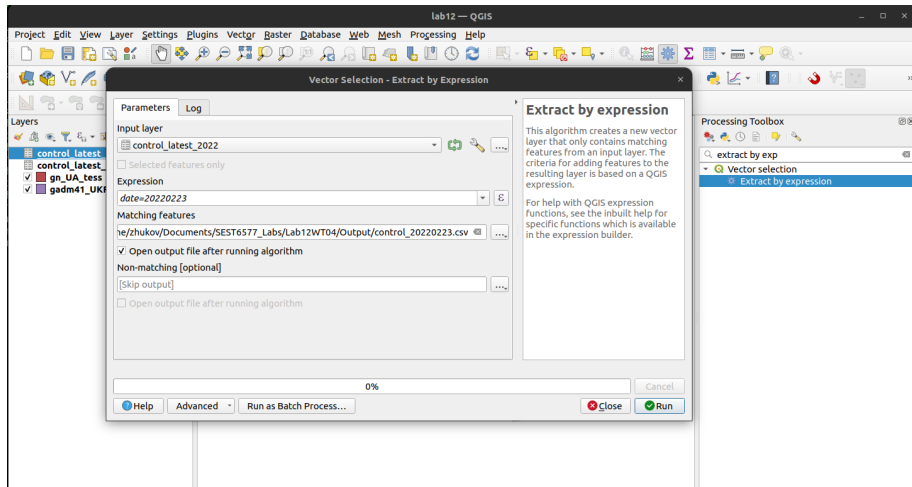
The screenshot shows the QGIS Data Source Manager dialog box for a Delimited Text file. The file name is `/home/zhukov/Dropbox/GU/Teaching/SEST6577/Labs/Lab12WT04/Data/VIINA/control_latest_2022.csv` and the layer name is `control_latest_2022`. The encoding is UTF-8. The file format is CSV (comma separated values). The record and fields options are set to 'No geometry (attribute only table)'. The layer settings include 'Use spatial index' and 'Watch file'. The sample data table is shown below.

	geonameid	date	status_wiki	status_boost	status_dsm	status_isw
	1.2 Decimal (double)	323 Integer (32 bit)	abc Text (string)	abc Text (string)	abc Text (string)	abc Text (string)
1	461727	20220223	RU			RU
2	461727	20220224	RU			RU
3	461727	20220225	RU			RU
4	461727	20220226	RU			RU
5	461727	20220227	RU	RU		RU

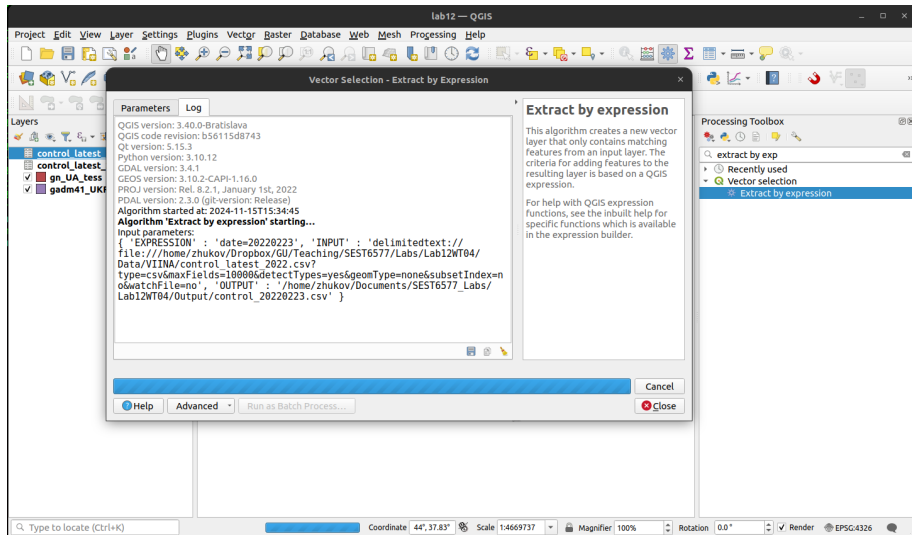
Also load the territorial control data for 2024 (`control_latest_2024.csv`) as a delimited text file with no geometries.



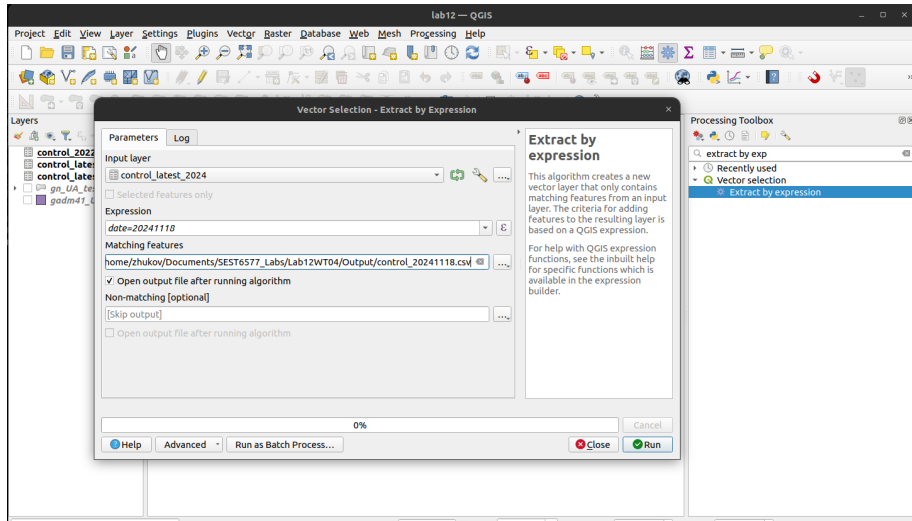
Let's take a subset of this file by date, starting with the day before the full scale invasion (23 Feb 2022). Go to the “*Extract by Expression*” tool in “Processing Toolbox” → “Vector selection”. Set Input layer: control_latest and set Expression: date=20220223. Save as control_20220223.csv



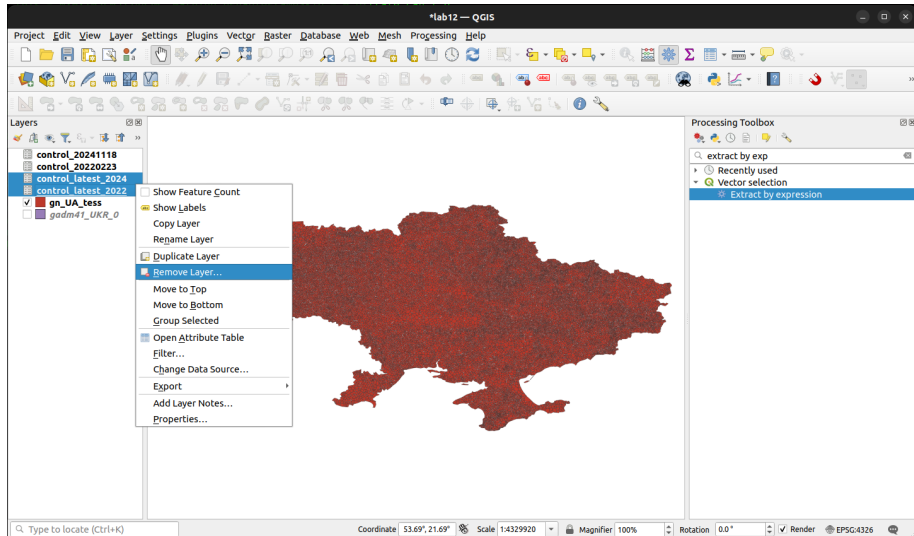
This will take a few minutes to run due to the file size.



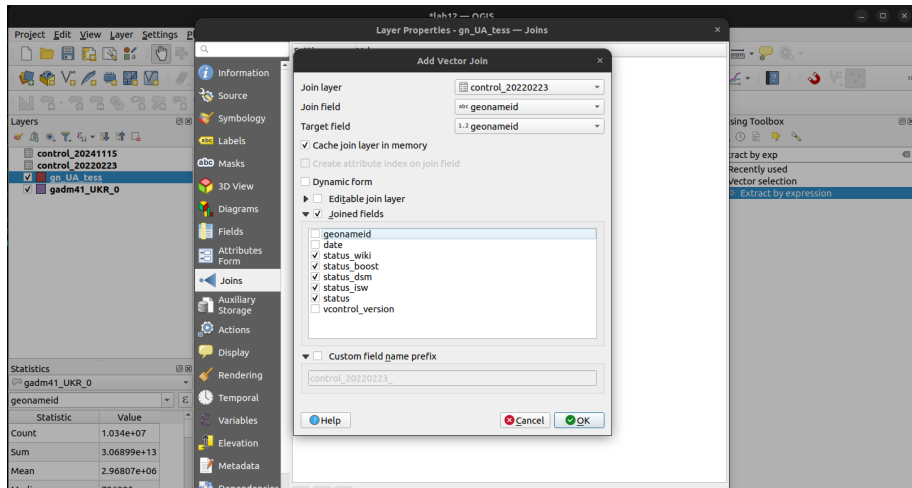
Repeat this process for the most recent date (18 Nov 2024). Set Input layer: control_latest_2024 and Expression: date=20241118. Save as control_20241118.csv



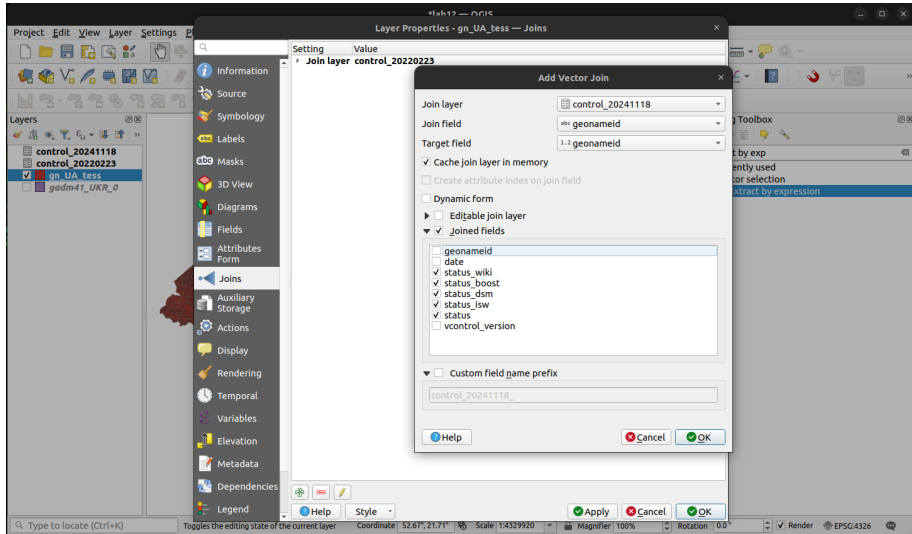
Once both subset tables are loaded, you can remove the original `control_latest_2022` and `control_latest_2024` from memory



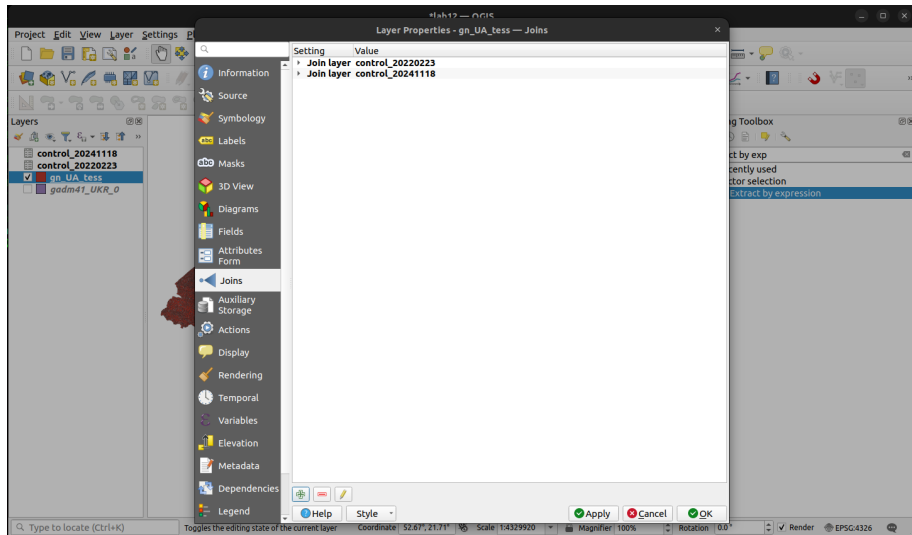
Let's now join the two subset tables to the populated place geometries. Go to the "Joins" tab in layer "Properties" for gn_UA_tess, and add a new join with Join layer = control_20220223 and geonameid as the Join field and Target field. Select the four status* fields as Joined fields.



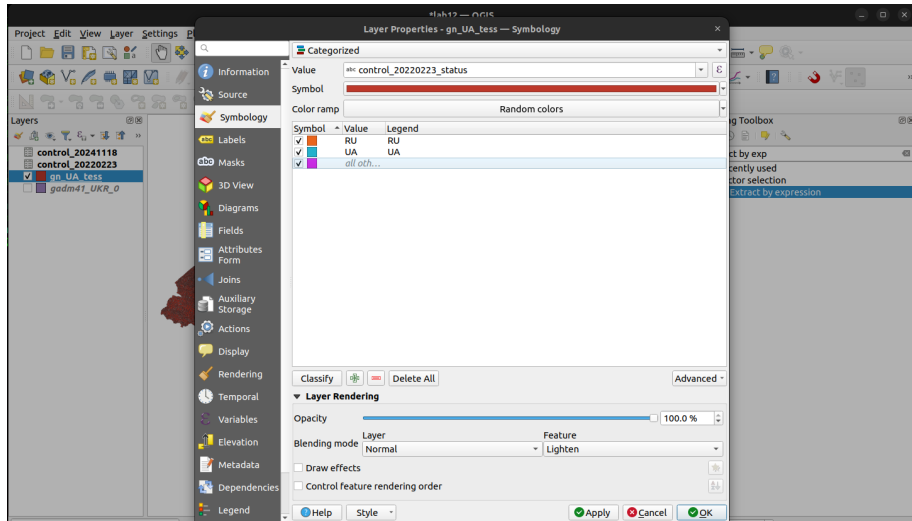
Add a second join with control_20241118 as Join layer



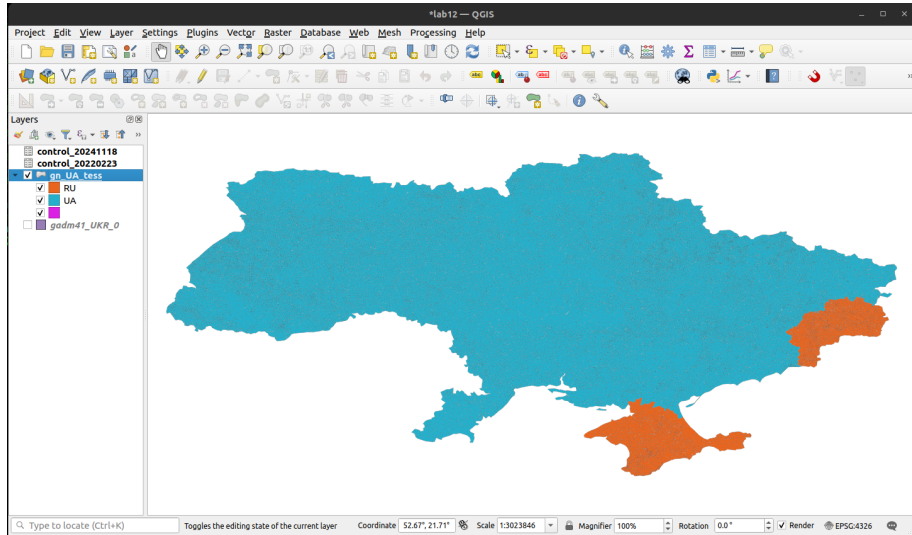
The two join layers should now appear in the “Joins” tab



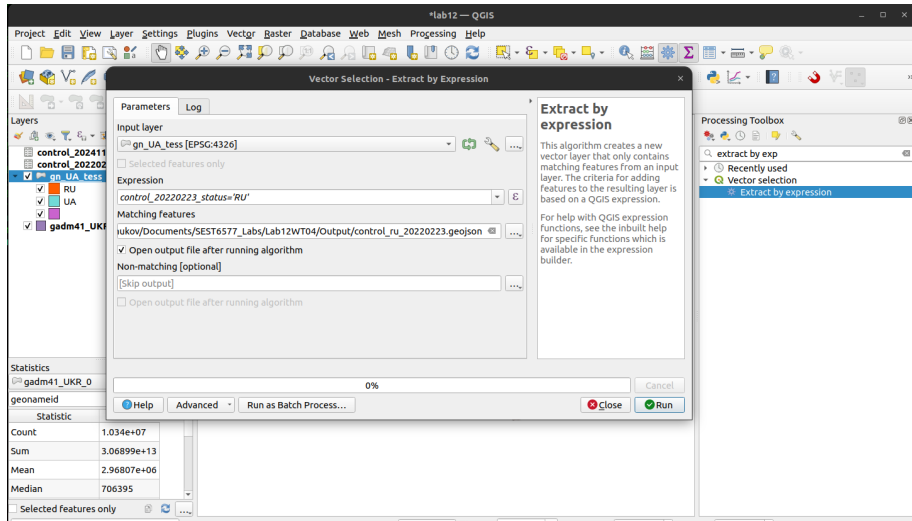
Let's visualize the control status, to make sure everything is right. Change to symbology to Categorized with Value = control_20220223_status and click Classify and OK



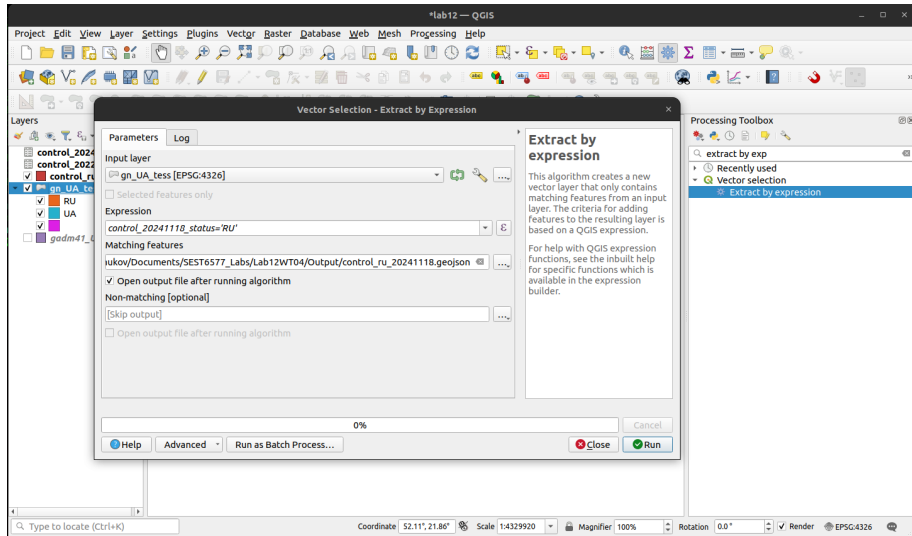
This looks about right. Now we just need to extract these occupied areas and calculate how much of Ukraine's territory they represent



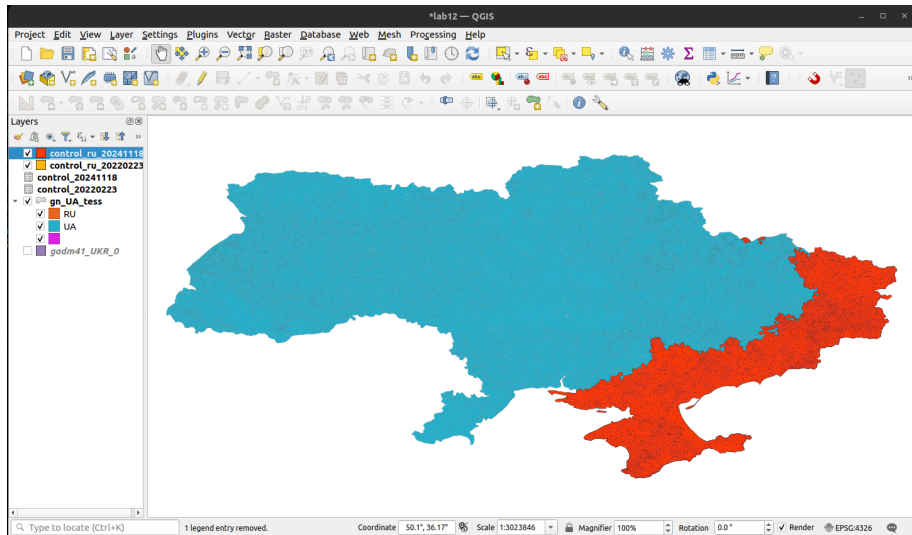
Go back to the “Extract by Expression” tool, with Input layer: gn_UA_tess and Expression: `control_20220223_status='RU'`. Save the output as `control_ru_20220223.geojson`



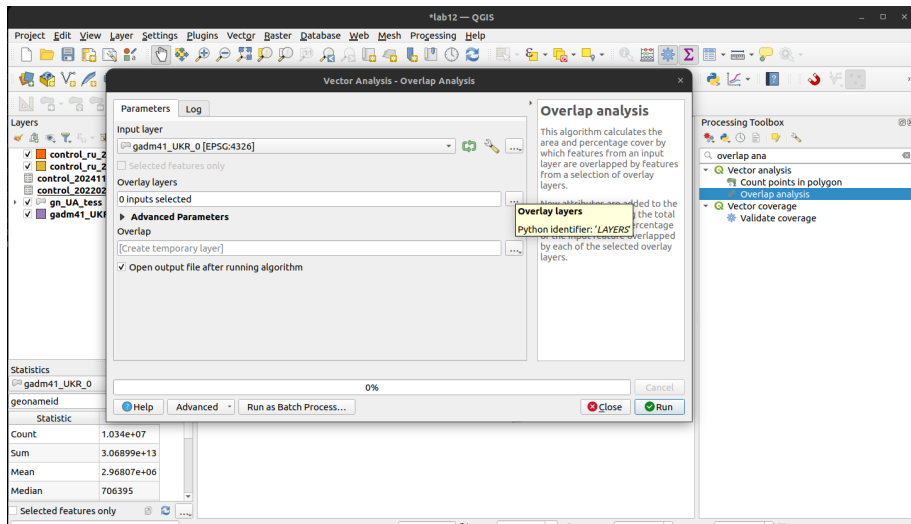
Repeat for the latest date, with Expression: `control_20241118_status='RU'`.
Save the output as `control_ru_20241118.geojson`



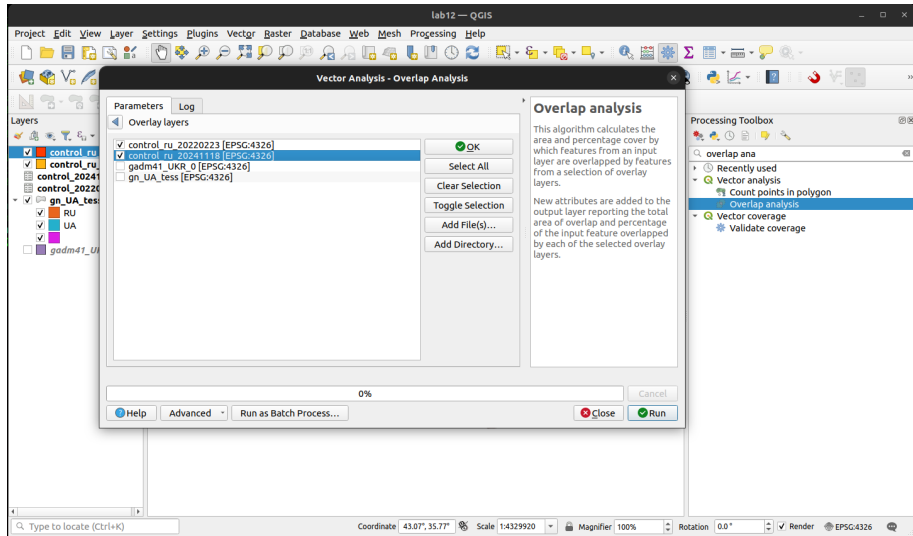
The extracted areas should appear in the project window.



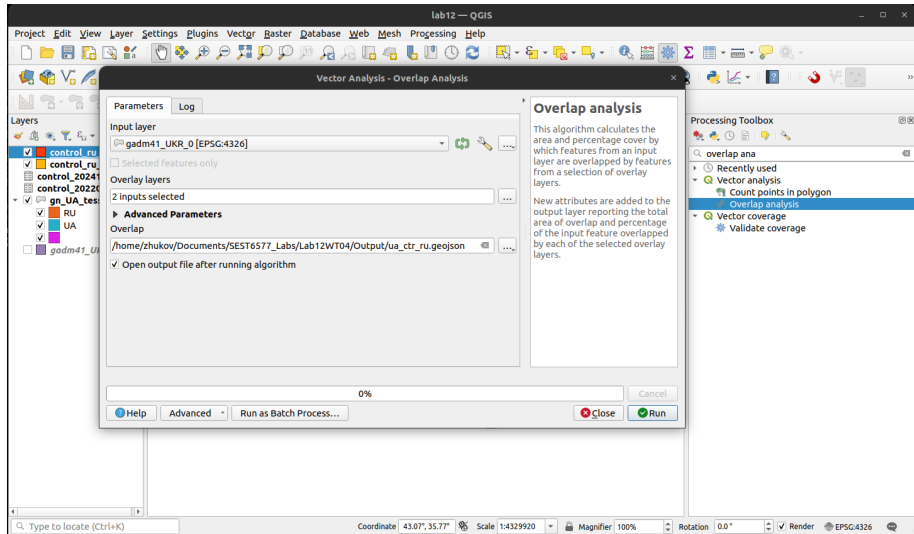
Go to the “Overlap Analysis” tool in “Processing Toolbox” → “Vector analysis”. Set Input layer: gadm41_UKR_0 (country-level borders). Click on the ... button next to Overlay layers



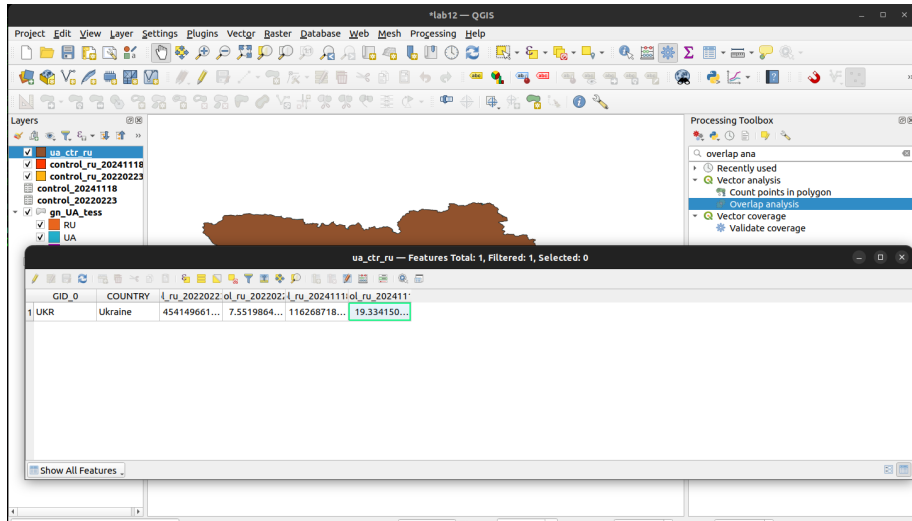
Select control_ru_20220223 and control_ru_20241118 as Overlay layers.
Click OK



Save the output as `ua_ctr_ru.geojson`

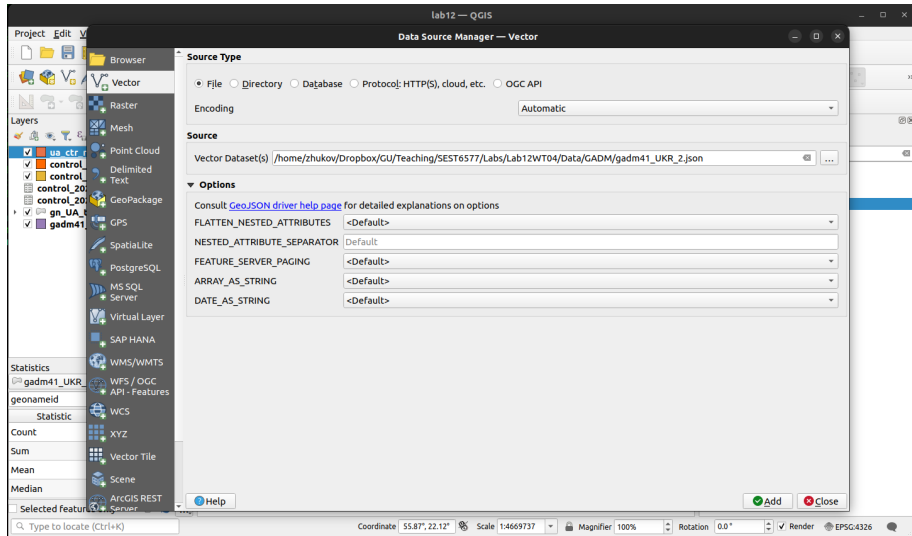


Open the attribute table for the newly-created `ua_ctr_ru` layer. The `*_pc` variables indicate that Russia occupied 7.55% of Ukraine's territory on 23 Feb 2024 and 19.33% on 18 Nov 2024



Comparing media event reports to remote sensing data on fires

Vignette 2! Let's load *Ukrainian district borders*: gadm41_UKR_2.json from Data/GADM. These will be our spatial units of analysis



Load *active fires data* as delimited text: J2_VIIRS_C2_Global_7d.csv. Make sure the X and Y fields are properly specified, check box next to ✓ Use spatial index

Data Source Manager — Delimited Text

File name: /home/zhukov/Dropbox/GU/Teaching/SEST6577/Labs/Lab12WT04/Data/Fires/J2_VIIRS_C2_Global_7d.csv

Layer name: J2_VIIRS_C2_Global_7d Encoding: UTF-8

File Format

- ☒ CSV (comma separated values)
- ☐ Regular expression delimiter
- ☐ Custom delimiters

Record and Fields Options

Geometry Definition

- ☒ Point coordinates X field: longitude Z field:
- ☐ Well known text (WKT) Y field: latitude M field:
- ☐ No geometry (attribute only table)

☐ DMS coordinates Geometry CRS: EPSG:4326 - WGS 84

Layer Settings

- ☒ Use spatial index
- ☐ Use subset index
- ☐ Watch file

Sample Data

	latitude	longitude	bright_t14	scan	track	acq_date
	1.2 Decimal (double)	1.2 Decimal (double)	1.2 Decimal (double)	1.2 Decimal (double)	1.2 Decimal (double)	Date
1	48.52068	34.63292	295.81	0.75	0.77	2024-11-08
2	68.64477	57.96288	303.6	0.35	0.56	2024-11-08
3	47.86777	33.44978	327.38	0.71	0.75	2024-11-08
4	68.64169	57.95131	308.49	0.35	0.56	2024-11-08

Buttons: Add, Close

Status bar: 1 legend entry removed. Coordinate: 51.6°, 21.8°. Scale: 1:3233210. Magnifier: 100%. Rotation: 0.0°. Render: EPSG:4326

Load *media event reports* as delimited text: `event_info_latest_2024.csv`. Here, too, specify the X and Y fields and check the box next to ☒ Use spatial index

Data Source Manager — Delimited Text

File name: `/home/zhukov/Dropbox/GU/Teaching/SEST6577/Labs/Lab12WT04/Data/VIINA/event_info_latest_2024.csv`

Layer name: `event_info_latest_2024` Encoding: `UTF-8`

File Format

- ☒ CSV (comma separated values)
- ☐ Regular expression delimiter
- ☐ Custom delimiters

Record and Fields Options

Geometry Definition

- ☒ Point coordinates X field: `longitude` Z field:
- ☐ Well known text (WKT) Y field: `latitude` M field:
- ☐ No geometry (attribute only table) ☐ DMS coordinates

Geometry CRS: `EPSG:4326 - WGS 84`

Layer Settings

- ☒ Use spatial index
- ☐ Use subset index
- ☐ Watch file

Sample Data

	viina_version	event_id	event_id_1pd	date	time	geonameid
	abbr Text (string)	123 Integer (32 bit)	123 Integer (32 bit)	123 Integer (32 bit)	abbr Text (string)	123 Integer (32 bit)
1	bert_20241115024615	866715	105722	20240101	02:06	698740
2	bert_20241115024615	869460	282456	20240101	01:53	709717
3	bert_20241115024615	869461	70621	20240101	01:59	694423
4	bert_20241115024615	869462	282447	20240101	02:20	709717

Statistics

- gad41
- WFS / OGC API - Features
- WCS
- XYZ
- Vector Tile
- Scene
- ArcGIS REST

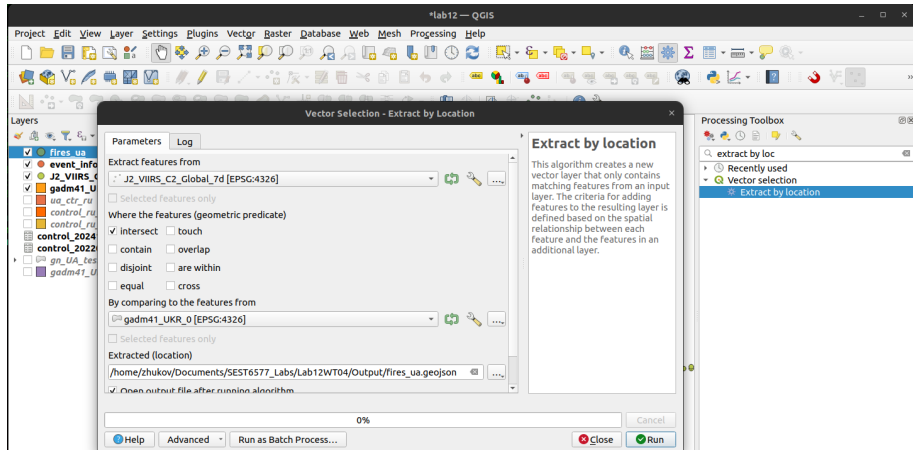
Selected Features only

Type to locate (Ctrl+K)

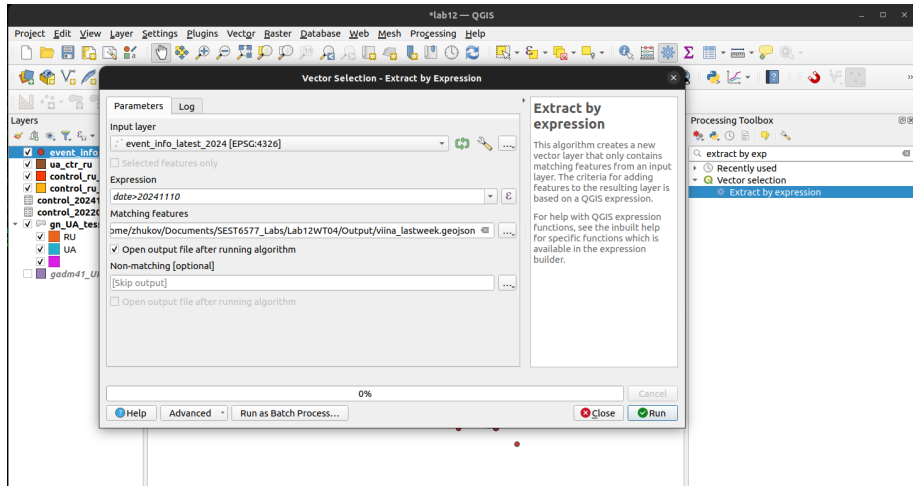
1 legend entry removed.

Coordinate: `53.61°, 22.07°` Scale: `1:3233210` Magnifier: `100%` Rotation: `0.0°` Render: `EPSG:4326`

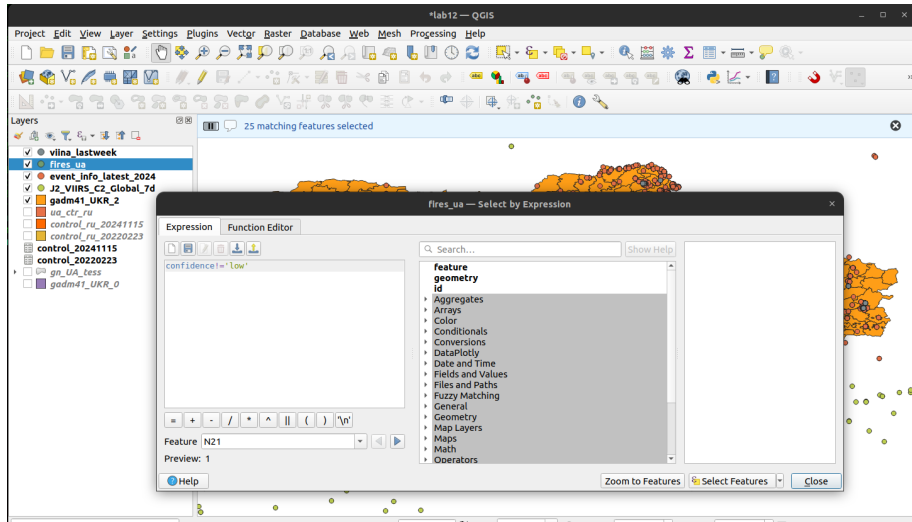
Let's extract just the fires inside of Ukraine. Go to the "Extract by Location" tool in "Processing Toolbox" → "Vector selection". Set Extract features from: J2_VIIRS_C2_Global_7d, check ☒ Intersect, By comparing to the features from: gadm41_UKR_0. Save the extracted features as fires_ua.geojson



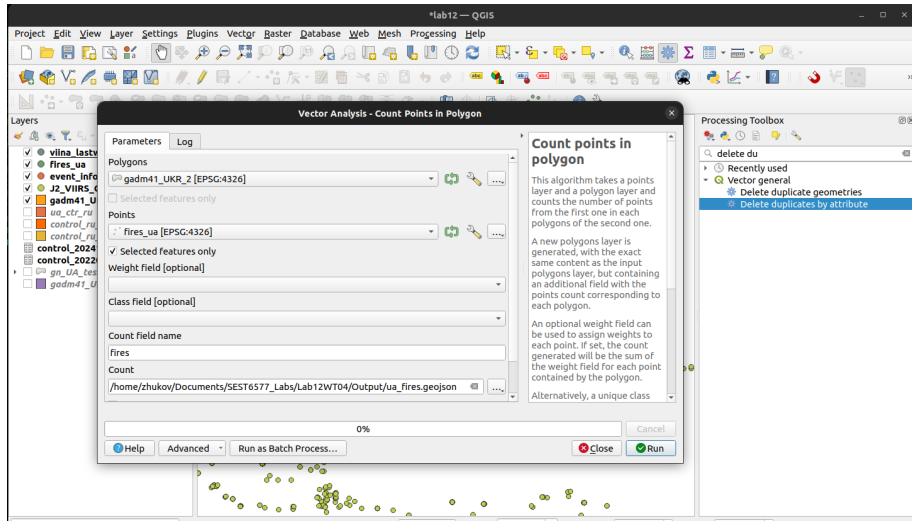
Let's also extract the media reports for the same time period as the fires (last week). Go to the "Extract by Expression" tool and set Input layer: `event_info_latest_2024`, and Expression: `date>20241110`. Save the extracted features as `viina_lastweek.geojson`



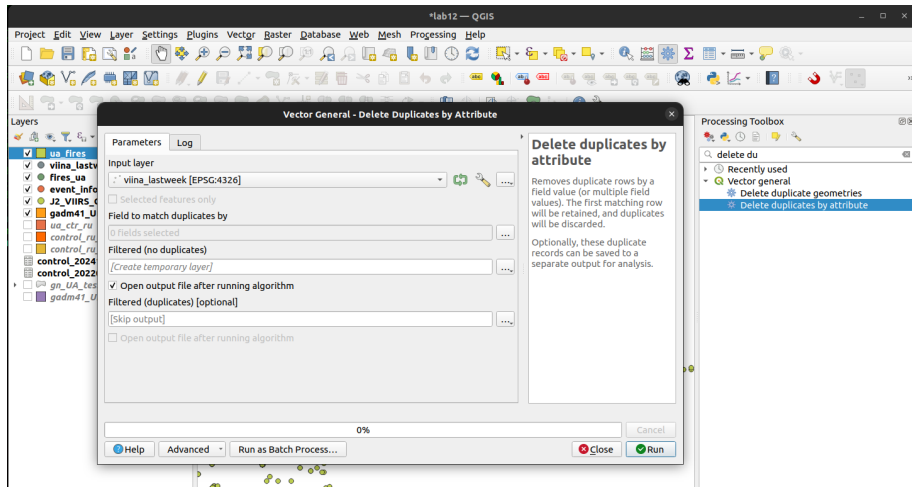
Before counting the fires, let's remove the “low confidence” fire anomalies. With fires_ua as the active layer, go to Select by Expression, with Expression: `confidence != 'low'` (`!=` means “ $\neq$ ”).



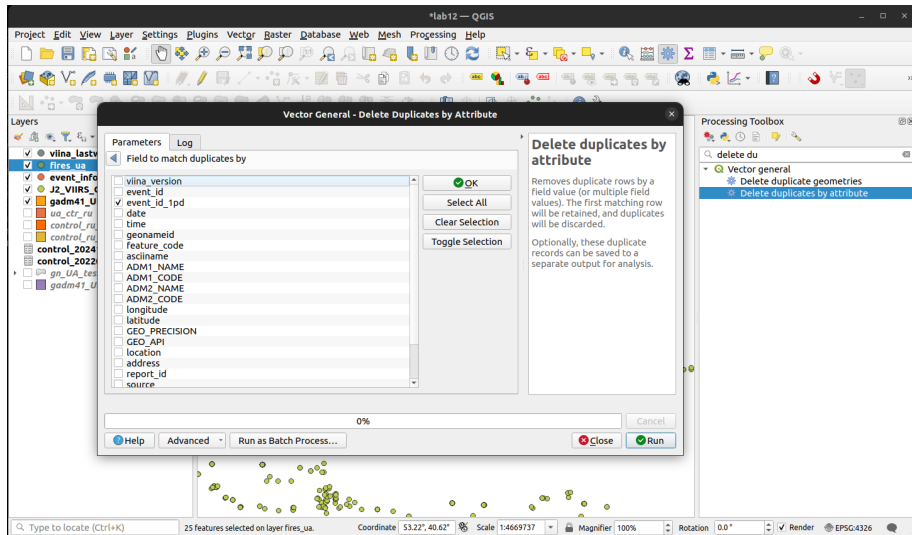
Open the “Count Points in Polygon” tool, set Polygons: gadm41_UKR_2, Points: fires_ua, check the box ☒ Selected features only, name the count field fires and save the output as ua_fires.geojson



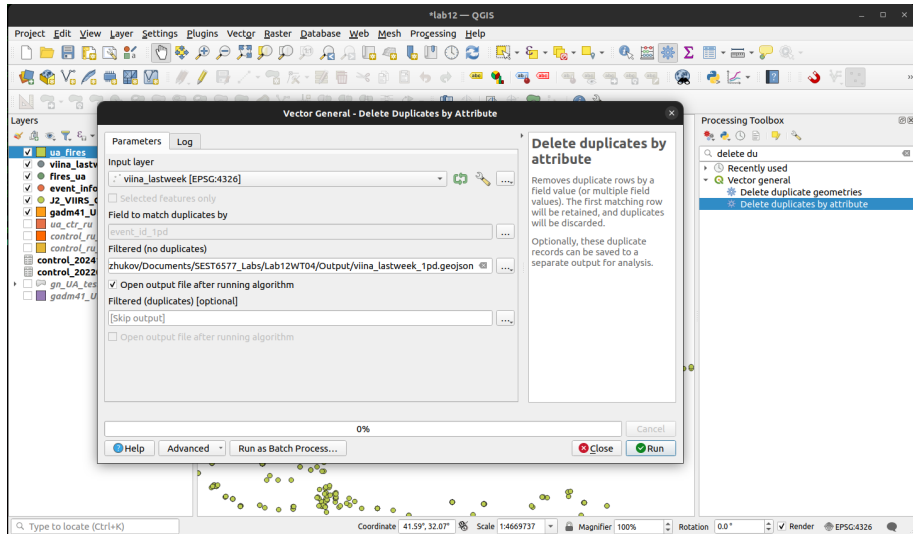
Before counting the media reports, let's remove the obvious duplicates. Open the "*Delete Duplicates by Attribute*" tool in "Processing Toolbox" → "Vector general". Set Input layer: `viina_lastweek`. Click the ... button next to Field to match duplicates by to match duplicates by



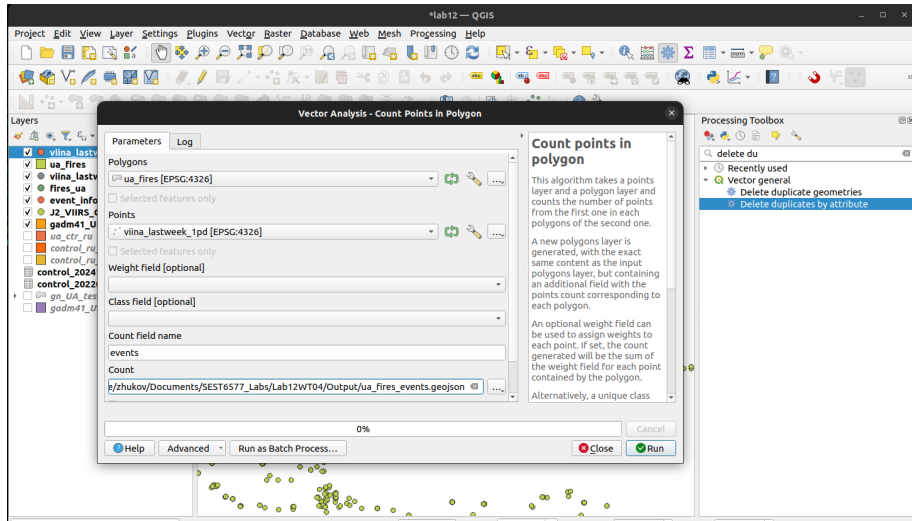
Select event_id_1pd as the field, click OK



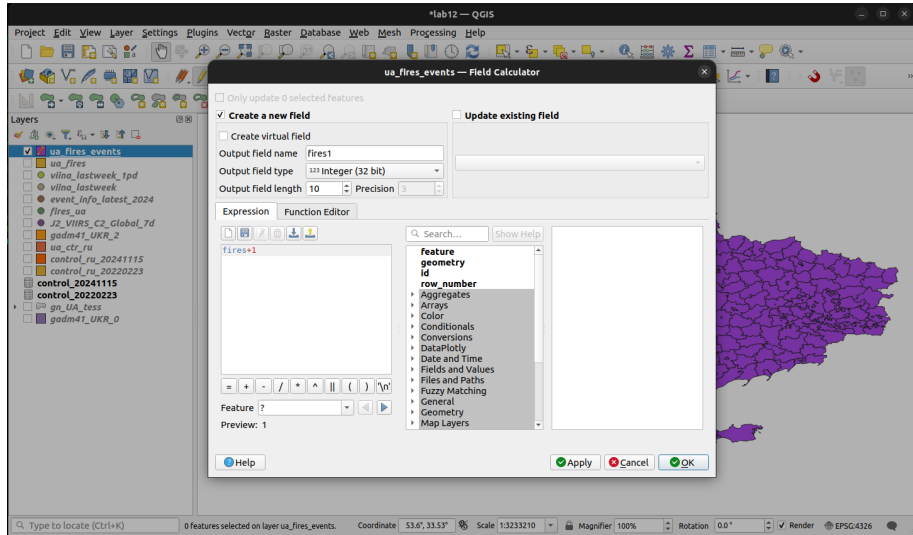
Save the deduplicated output as `viina_lastweek_1pd.geojson`



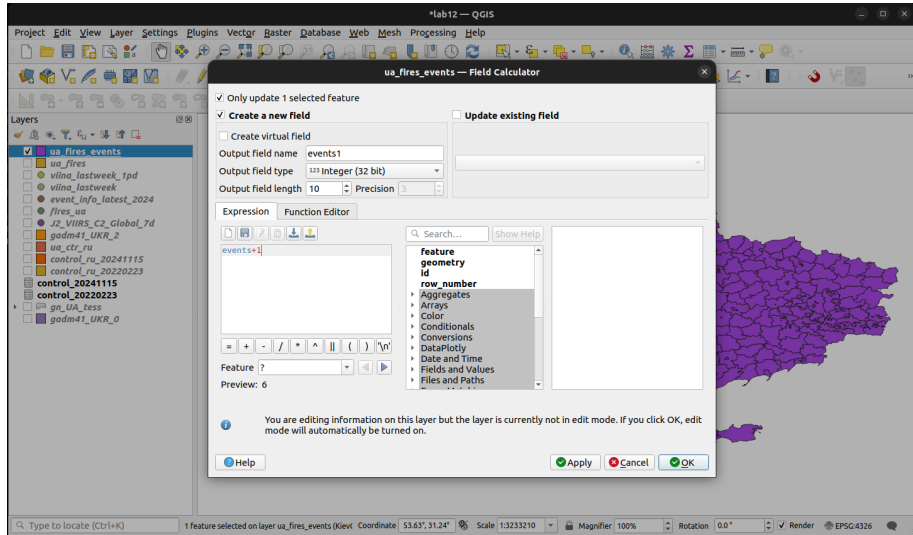
Go back to “Count points in polygon”. Set Polygons: `ua_fires`, Points: `viina_lastweek_1pd`. Name the count field events and save as `ua_fires_events.geojson`



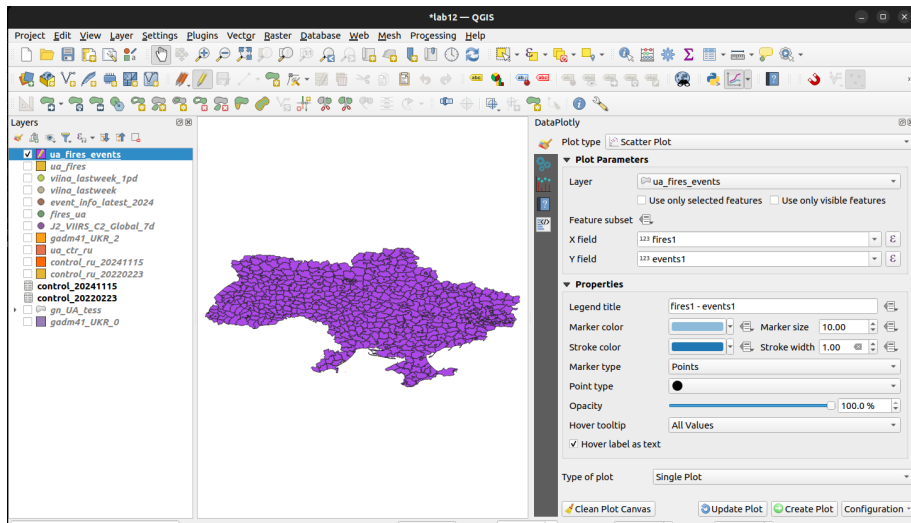
Add a new field to `ua_fires_events` called `fires1` (Integer), with Expression `fires + 1`



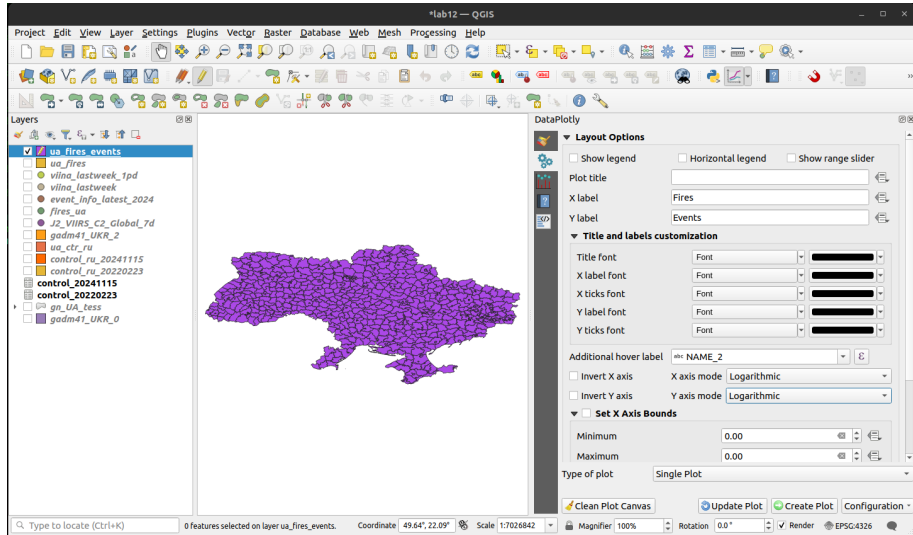
Add another new field to `ua_fires_events` called `events1` (Integer), with Expression `events + 1`



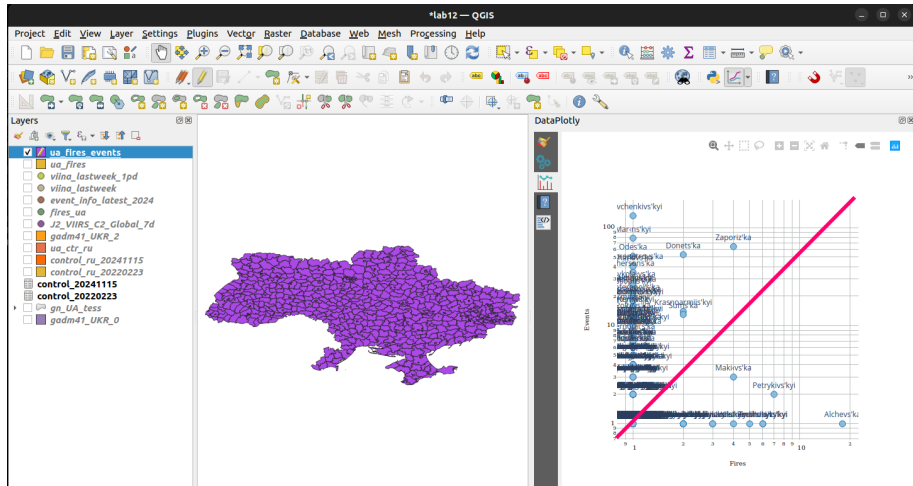
Open the Plotly tool. Set Plot type = Scatter Plot, Layer = ua_fires_events, X field = fires1, Y field = events1. Check the box next to ✓ Hover label as text



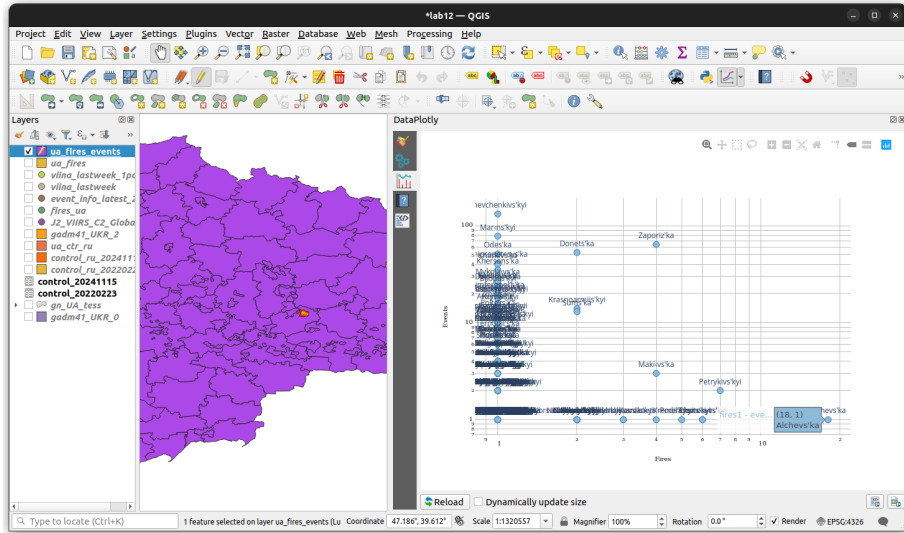
In “Layout Options”, uncheck the box next to ☐ Show legend. Change the X and Y axis mode to Logarithmic



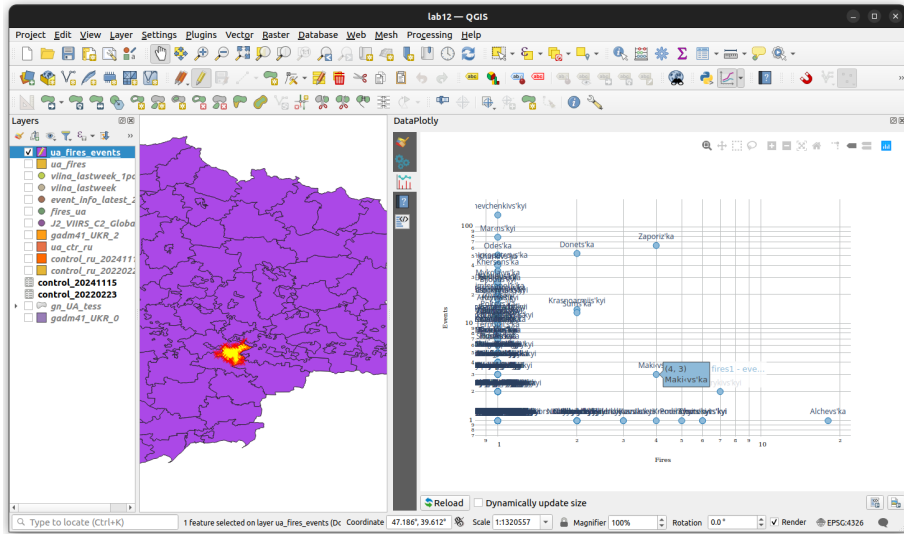
You can think of the points falling along the (imaginary) red line here as locations where both active fires data and media reports captured the same number of incidents. Points below (above) this line are ones where the fires data caught more (fewer) incidents than media reports



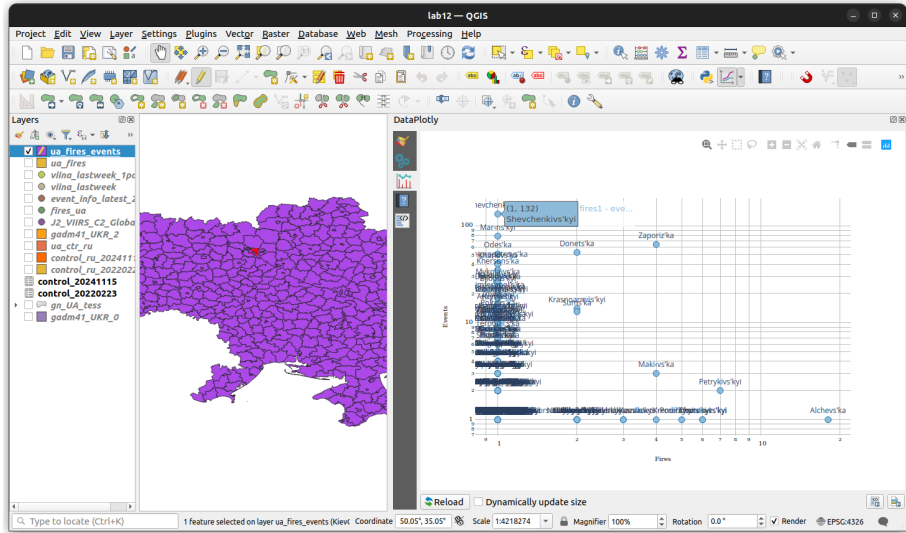
Locations with more active fires than media reports include places like Alchevs'k...



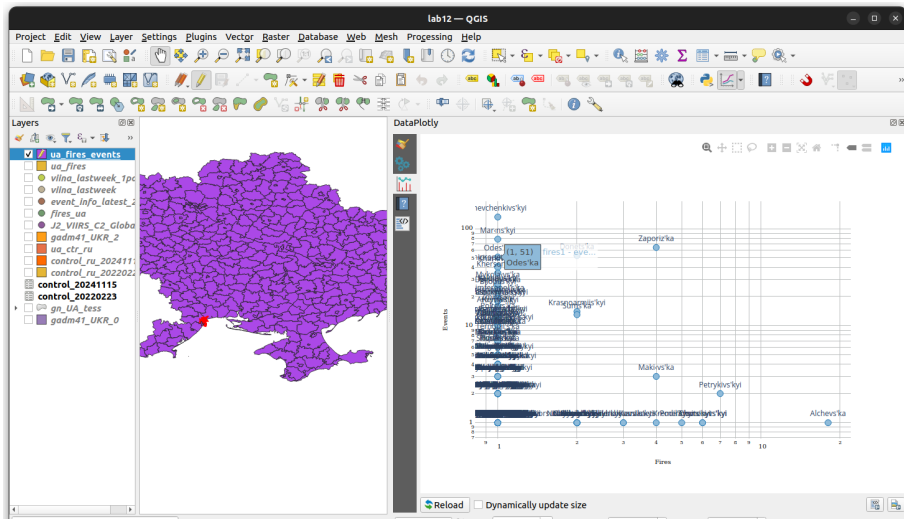
... and Makiyivka. These are mostly-destroyed front line towns that are hard for journalists to access



Places where media reports capture more incidents include the Shevchenkivskiy district of Kyiv (Ukraine's largest city, under Ukrainian control)...



...and Odesa (another province capital near the front line, but under Ukrainian control). Both of these places are far easier for journalists to access than the “no man’s land” towns in the lower-right corner



You can perform all these steps in R
(see replication code `wt04_demo.R` in `Lab12WT04.zip`)

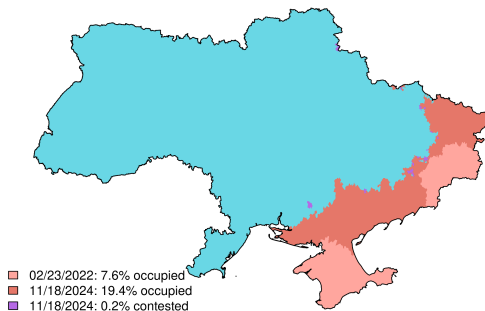


Figure 13: Vignette 1

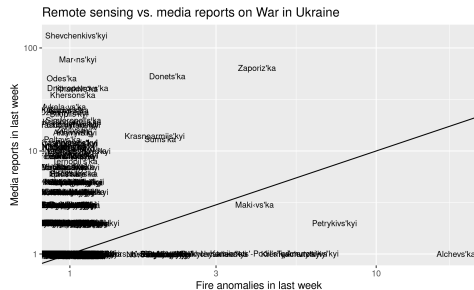


Figure 14: Vignette 2