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Visualization One : Geo Mapping

What can we learn from the visualization?

To plot the oldest location on Geo Map along with all locations plotting on the same map.

Description:

Data is aggregated by category to generate a map with oldest locations in given data set. The main point of this visualization is to locates all and focusing on which are oldest locations i.e which has least minDate in given data set onto the Geo map based on latitude and longitude which are also present in data set as reprLat and reprLong category. Here from Geo map we can observe that most oldest locations that are pointed as orange points are located in Europe and few in Africa continent.

What is the name for the type of visualization(s) used?

Geo Mapping with equirectangular world map.

coding part

```
import altair as alt
import pandas as pd
from vega_datasets import data
alt.data_transformers.disable_max_rows()

places = pd.read_csv('pleiades-places-latest.csv')
locations=pd.read_csv('pleiades-locations-latest.csv')
names=pd.read_csv('pleiades-names-latest.csv')

oldest =  places[places['minDate']==-2600000]

countries = alt.topo_feature(data.world_110m.url, 'countries')
places = pd.read_csv('pleiades-places-latest.csv')
locations=pd.read_csv('pleiades-locations-latest.csv')
names=pd.read_csv('pleiades-names-latest.csv')

brush = alt.selection_interval()

background = alt.Chart(countries).mark_geoshape(
    fill='black',
    stroke='darkgrey',
).project(
    "equirectangular"
).properties(
    width=700,
    height=400
)
points = alt.Chart(places).mark_circle().encode(
    color=alt.Color('minDate:N'),
    longitude='reprLong:Q',
    latitude='reprLat:Q',
    size=alt.value(1),
    tooltip=['title','minDate']

)
points_old = alt.Chart(oldest).mark_circle(opacity=1.0,
    stroke='red',strokeWidth=1).encode(
    color=alt.Color('oldest location:N'),
    longitude='reprLong:Q',
    latitude='reprLat:Q',
    size=alt.value(100),
    tooltip=['title','minDate','authors','bbox','currentVersion','timePeriodsKeys']

)
(background + points + points_old)
```

Visual Outputs :

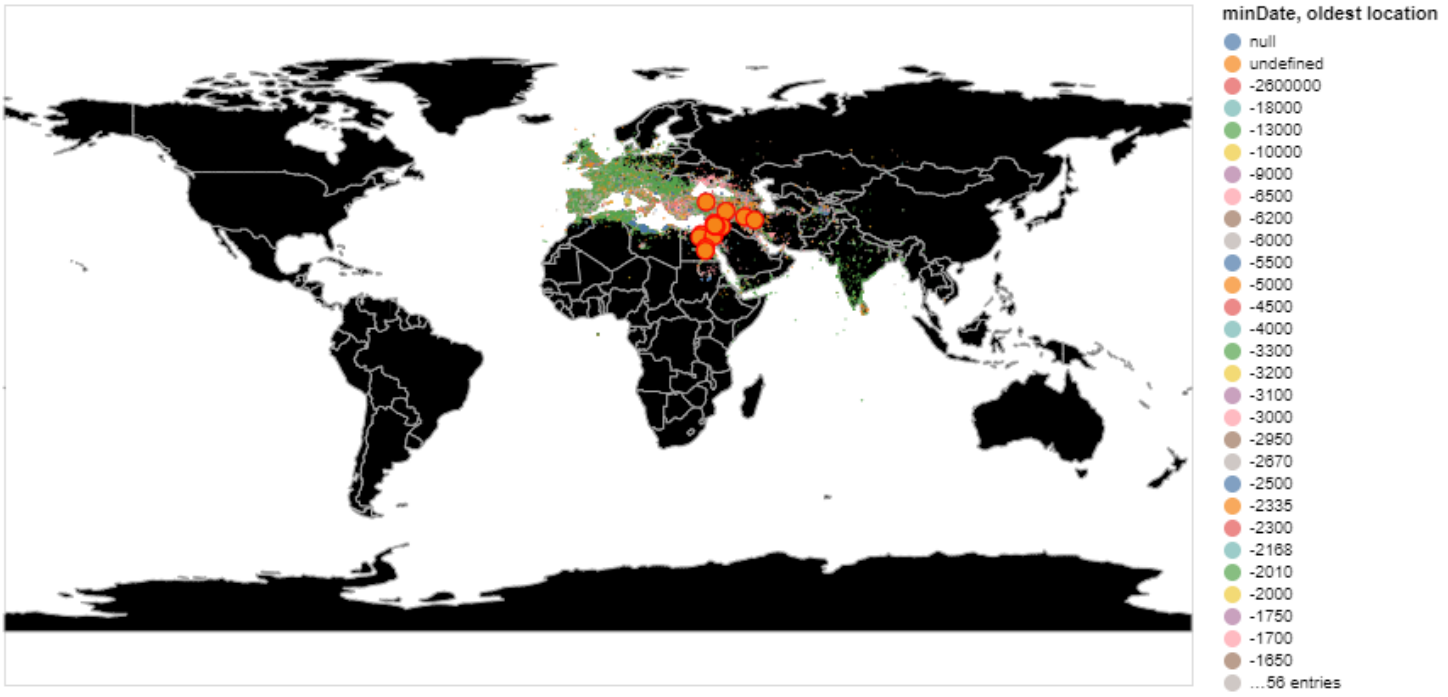


Fig 1: mapping all locations on world map

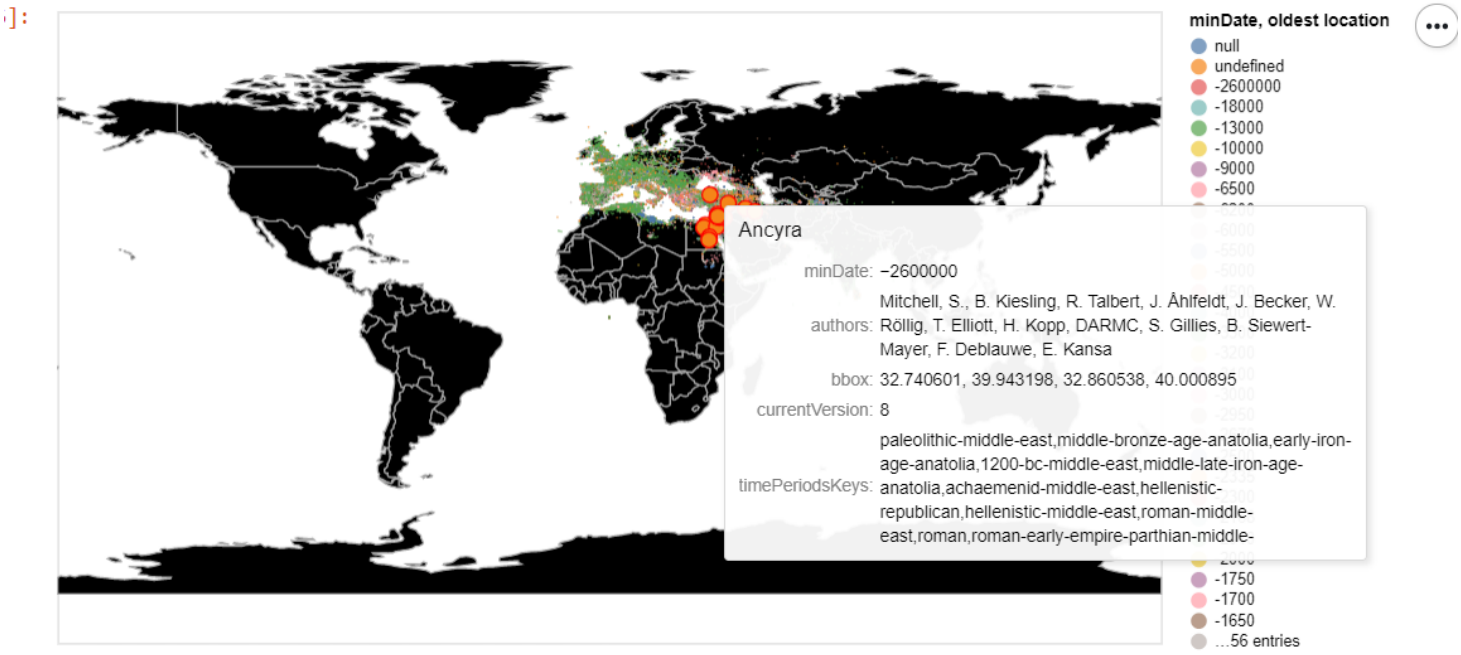


Fig 2: interaction with one of oldest location

What are all visual mappings used?

mapping the location points based on reprLong category and reprLat category
X-position : reprLat category
Y-position : reprLong category
oldest location color: orange with red strokes
other locations: different color range

Was there any special data preparation done?

No data has modified but minimum value is taken from minDate category and based on that required points are plotted (orange points on map) onto the Geo Map.

What are the limitations of your design?

Mostly focus on the oldest locations on map(orange points) but all locations are also plotted along with it.

Visualization Two : Case Study with Bubble Plot

What can we learn from the visualization?

To provide count of each of particular featureTypes in a set that are counted based on different timePeriods category.

Description:

Data is aggregated by category to generate a visualization that gives comparison between the count of different featureType's that are based on timePeriods category. We can observe from the plot that in following time periods settlement types dominates all other feature types and highest settlement count can be observed in 'HRL' and 'RL' time periods.

What is the name for the type of visualization(s) used?

Case Study Bubble plot (visualization reference is taken from Altair example gallery page in section of Case study of Natural disasters example)

coding part

```
import altair as alt
import pandas as pd
from vega_datasets import data
alt.data_transformers.disable_max_rows()

places = pd.read_csv('pleiades-places-latest.csv')
locations=pd.read_csv('pleiades-locations-latest.csv')
names=pd.read_csv('pleiades-names-latest.csv')

from altair import datum

alt.Chart(locations).mark_circle(
    opacity=1.0,
    stroke='black',
    strokeWidth=1
).encode(
    alt.X('timePeriods:O', axis=alt.Axis(labelAngle=0)),
    alt.Y('featureType:N'),
    alt.Size('count()',
        legend=alt.Legend(title='Count of feature Types')
    ),
    alt.Color('featureType:N', legend=None)
).properties(
    width=450,
    height=320
).transform_filter(
    alt.FieldOneOfPredicate(field='timePeriods', oneOf=['T','O','A','C','H','R','L','M','E','N',
).transform_filter(
    alt.FieldOneOfPredicate(field='featureType', oneOf=['villa','temple-2','tunnel','theatre','p
                                                        ,'cairn','stoa','settlement-modern','sett
                                                        ,'garden-hordus','road','shrine','pyramic
                                                        'canal','cistern','bath','palace-complex'
)
```

Visual Outputs :

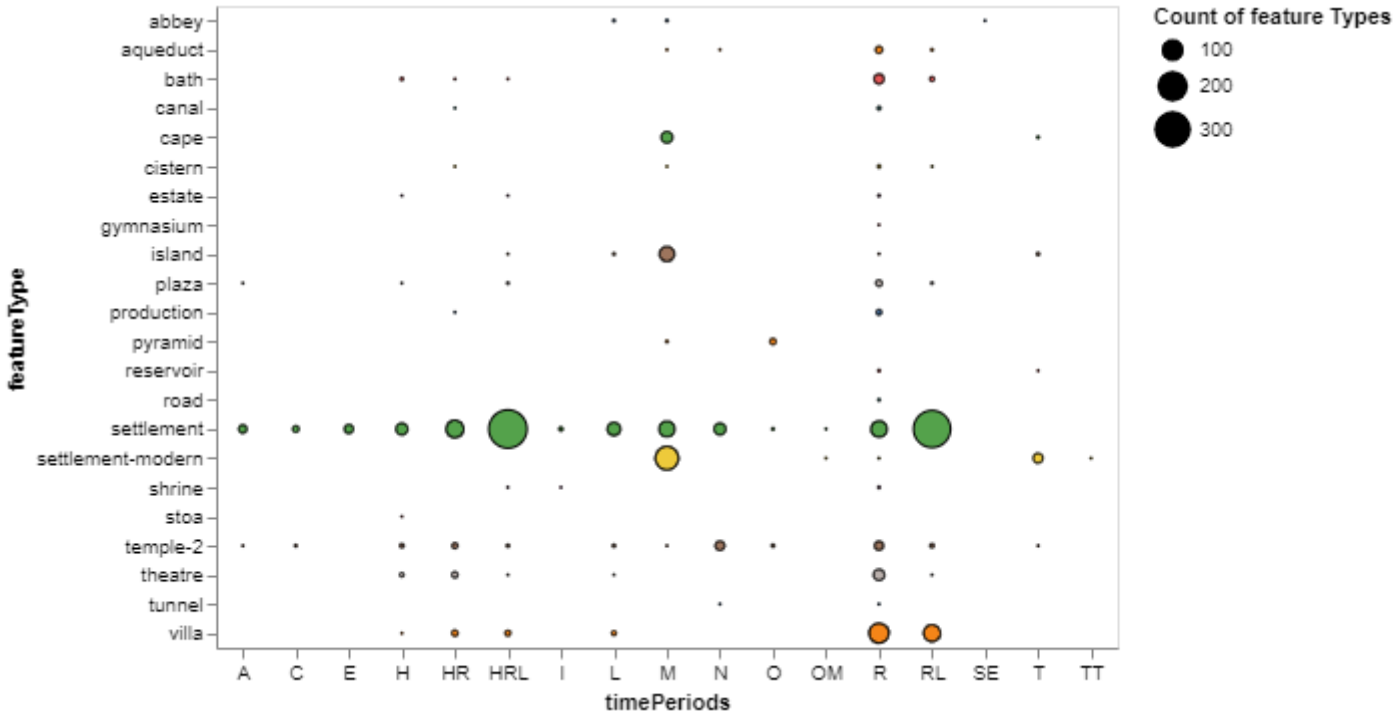


Fig 3: Count and Compsrison of featureTypes variables based on timePeriods

What are all visual mappings used?

X – position: set of different variables of timePeriods Category

Y- position: set of different variables of featuretype category

size of bubble: count of each variable of featureType category from considered set.

Was there any special data preparation done?

No data has modified but a set of different variables of featureType and timePeriods category are considered to show the comparison between the counts of each featureType to create a visualization. Data is taken form location data set.

Set that are taken for the comparison are

featureType variables:

villa ,temple-2, tunnel, theatre, plaza , aqueduct, tell, stadium, cairn, stoa ,settlement-modern, settlement, island ,abbey , nuraghe, reservoir ,production, price ,garden-hordus, road, shrine, pyramid, estate , gymnasium, estuary ,cape , canal, cistern, bath, palace-complex.

timePeriods variables:

T, , O, A, C, H, R, L, M, E, N, I, TT, MT, SE, PM, OM, HR, HRL, RL.

What are the limitations of your design?

Compares the count of different featureType variables based on different timePeriods variables.

Visualization Three : Box Plot with Minimum/Maximum Whiskers

What can we learn from the visualization?

To give outliners from the data set based on locationPrecision and maxDate category for better analysis and further research purpose.

Description:

A visualization has been developed based on locationPrecision and maxDate categories to show the outliners of data set. For better analysis of the data we can now able to consider these outliners as useful data or not for the required research. Even the whiskers help us for better understanding of useful data.

What is the name for the type of visualization(s) used?

Box Plot with Min / Max whiskers.

coding part

```
import altair as alt
import pandas as pd
from vega_datasets import data
alt.data_transformers.disable_max_rows()

places = pd.read_csv('pleiades-places-latest.csv')
locations=pd.read_csv('pleiades-locations-latest.csv')
names=pd.read_csv('pleiades-names-latest.csv')

alt.Chart(places).mark_boxplot(size=50,extent=2).encode(
    x='locationPrecision:N',
    y='maxDate:Q',
    color=alt.Color('locationPrecision:N',
                    scale=alt.Scale(scheme='reds'))
    ).properties(
    width=450,
    height=320
```

Visual Outputs :

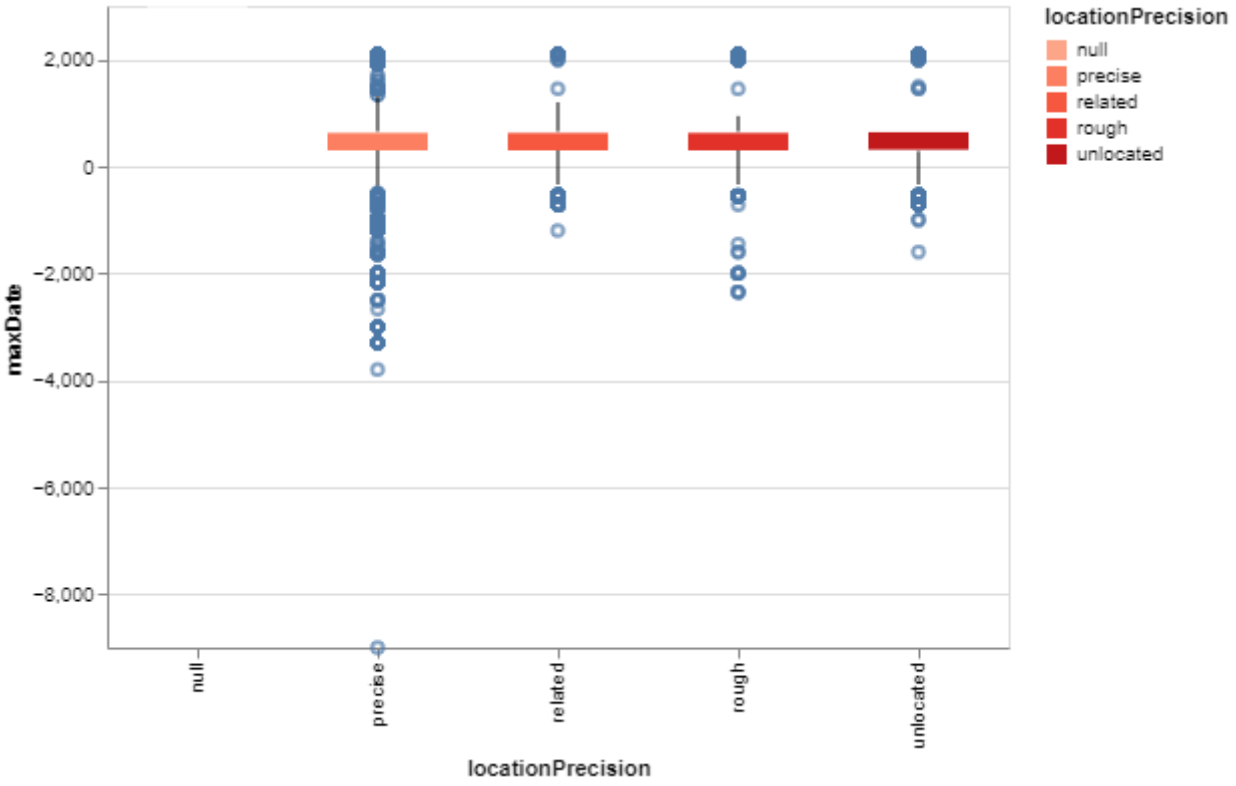


Fig 4: shows outliners for Places data set

What are all visual mappings used?

X-position: locationPrecision category

Y-position: maxDate category

box color : red with scales range

Was there any special data preparation done?

No data has modified and projections are made directly using original data set.

Data is taken from 'places' data set.

What are the limitations of your design?

Gives details about outliners along with minimum and maximum values of whiskers for useful data.

Visualization Four : Scatter plot with Bar chart interaction

What can we learn from the visualization?

To give count of each feature type and compare the count values between them based on the selection in a group .

Description:

This Visualization shows the differences between a set of count of feature type in a bar graph where the set of feature types are selected on a scatter plot. As we select on a scatter plot the count values are shown in a bar graph and we can compare between the selected set of feature type where we can get useful information for further research purpose.

What is the name for the type of visualization(s) used?

Scatter plot with Bar chart interaction

coding part

```
iimport altair as alt
import pandas as pd
from vega_datasets import data
alt.data_transformers.disable_max_rows()
brush = alt.selection_interval()

places = pd.read_csv('pleiades-places-latest.csv')
locations=pd.read_csv('pleiades-locations-latest.csv')
names=pd.read_csv('pleiades-names-latest.csv')

bind = alt.selection_interval(bind='scales')
place_scatter=alt.Chart(places).mark_circle().encode(
        x="reprLong:Q",
        y="reprLat:Q",
        color=alt.condition(brush,'featureTypes:N',alt.value('gray')),
        tooltip = ['title','currentVersion']                    ).add_selection(
            bind,brush)
place_bar=alt.Chart(places).mark_bar().encode(
           y='featureTypes:N',
           color='featureTypes:N',
           x='count(featureTypes):Q').transform_filter(brush)

place_scatter & place_bar
```

Visual Outputs :

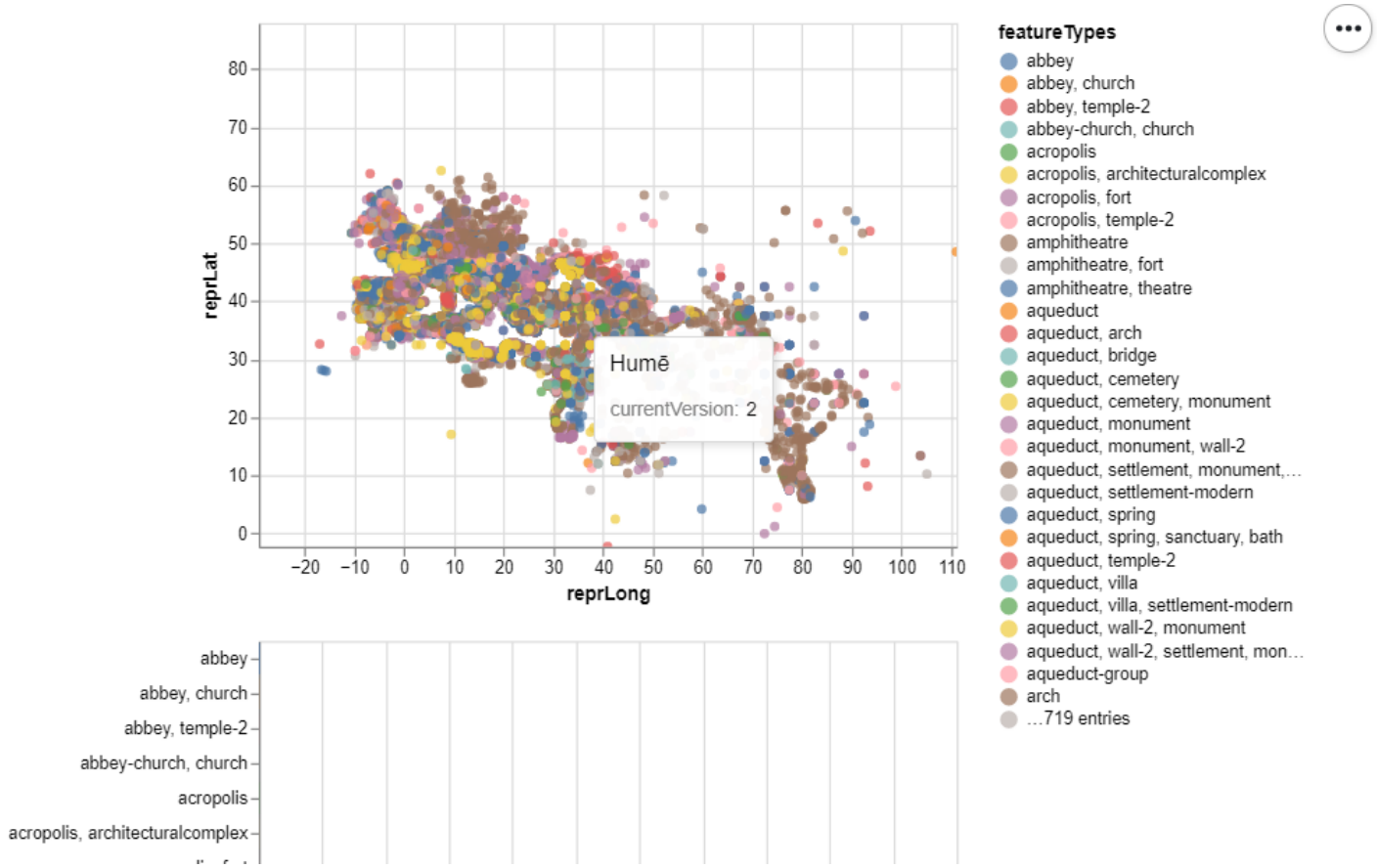


Fig 5: one of the two plots: scatter plot

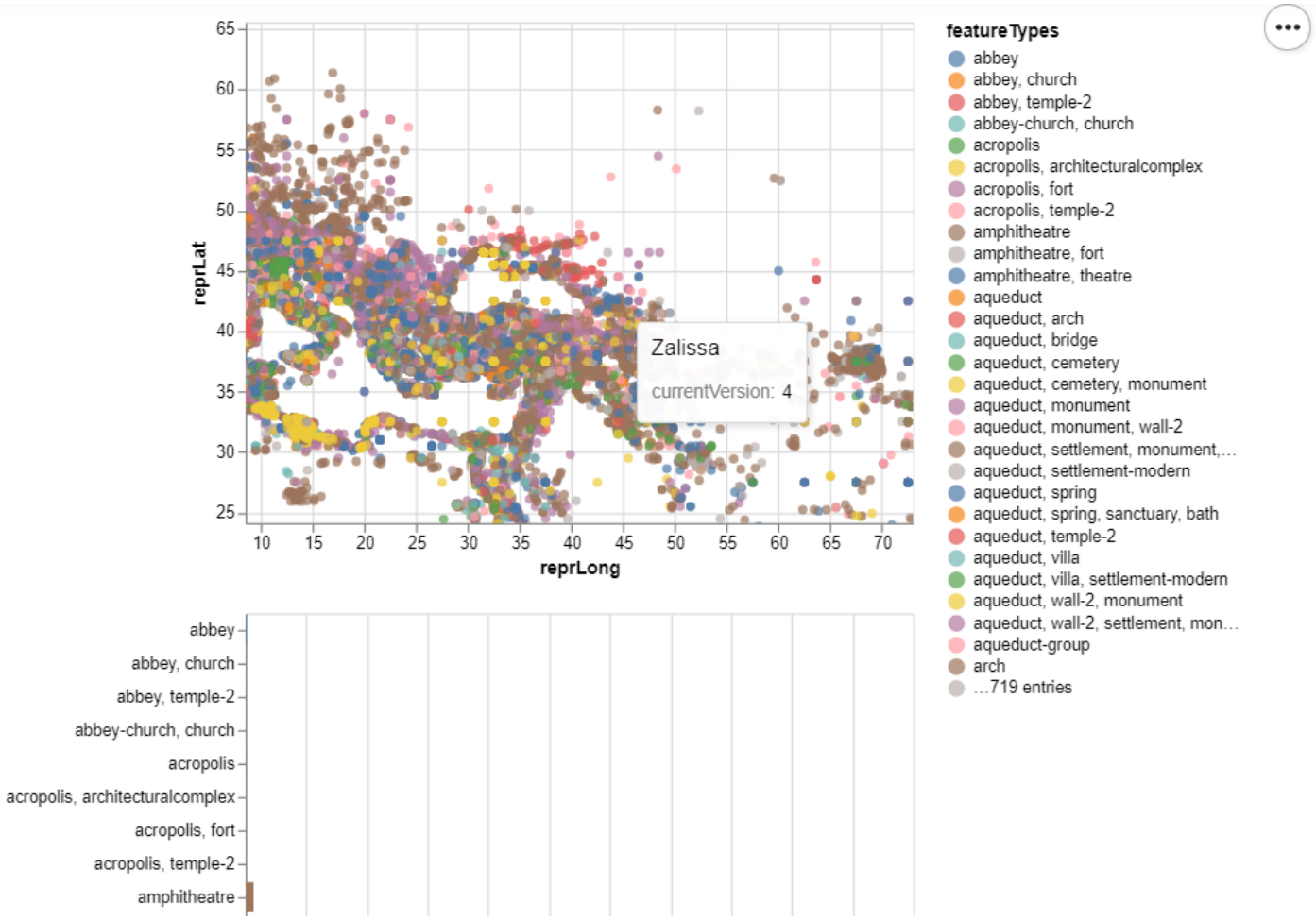
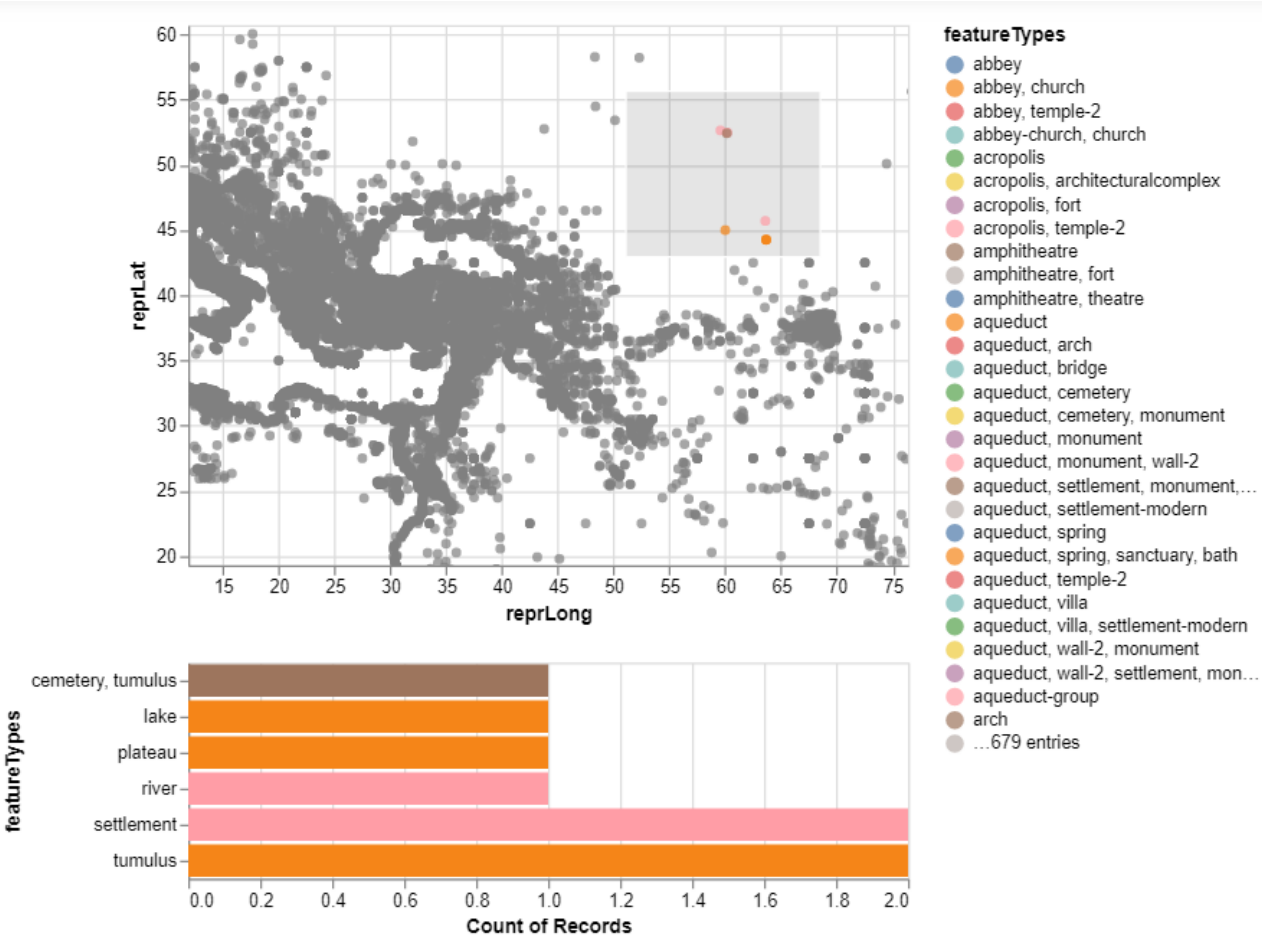


Fig 6: scatter plot with zoom in/out interaction


reprLat
reprLong
60
55
50
45
40
35
30
25
20
15
20
25
30
35
40
45
50
55
60
65
70
75
featureTypes
abbey
abbey, church
abbey, temple-2
abbey-church, church
acropolis
acropolis, architecturalcomplex
acropolis, fort
acropolis, temple-2
amphitheatre
amphitheatre, fort
amphitheatre, theatre
aqueduct
aqueduct, arch
aqueduct, bridge
aqueduct, cemetery
aqueduct, cemetery, monument
aqueduct, monument
aqueduct, monument, wall-2
aqueduct, settlement, monument,…
aqueduct, settlement-modern
aqueduct, spring
aqueduct, spring, sanctuary, bath
aqueduct, temple-2
aqueduct, villa
aqueduct, villa, settlement-modern
aqueduct, wall-2, monument
aqueduct, wall-2, settlement, mon…
aqueduct-group
arch
…679 entries
featureTypes
cemetery, tumulus
lake
plateau
river
settlement
tumulus
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Count of Records

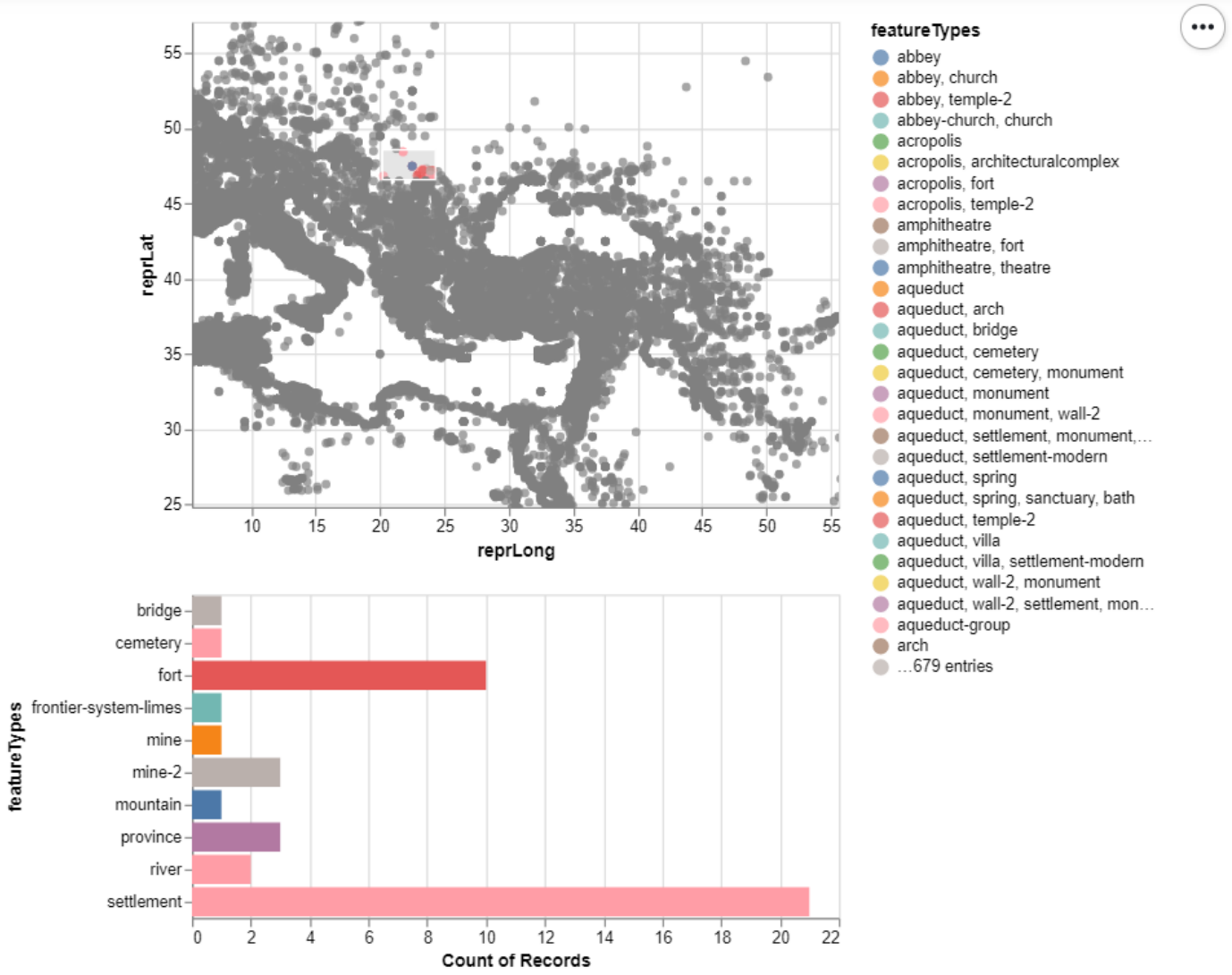
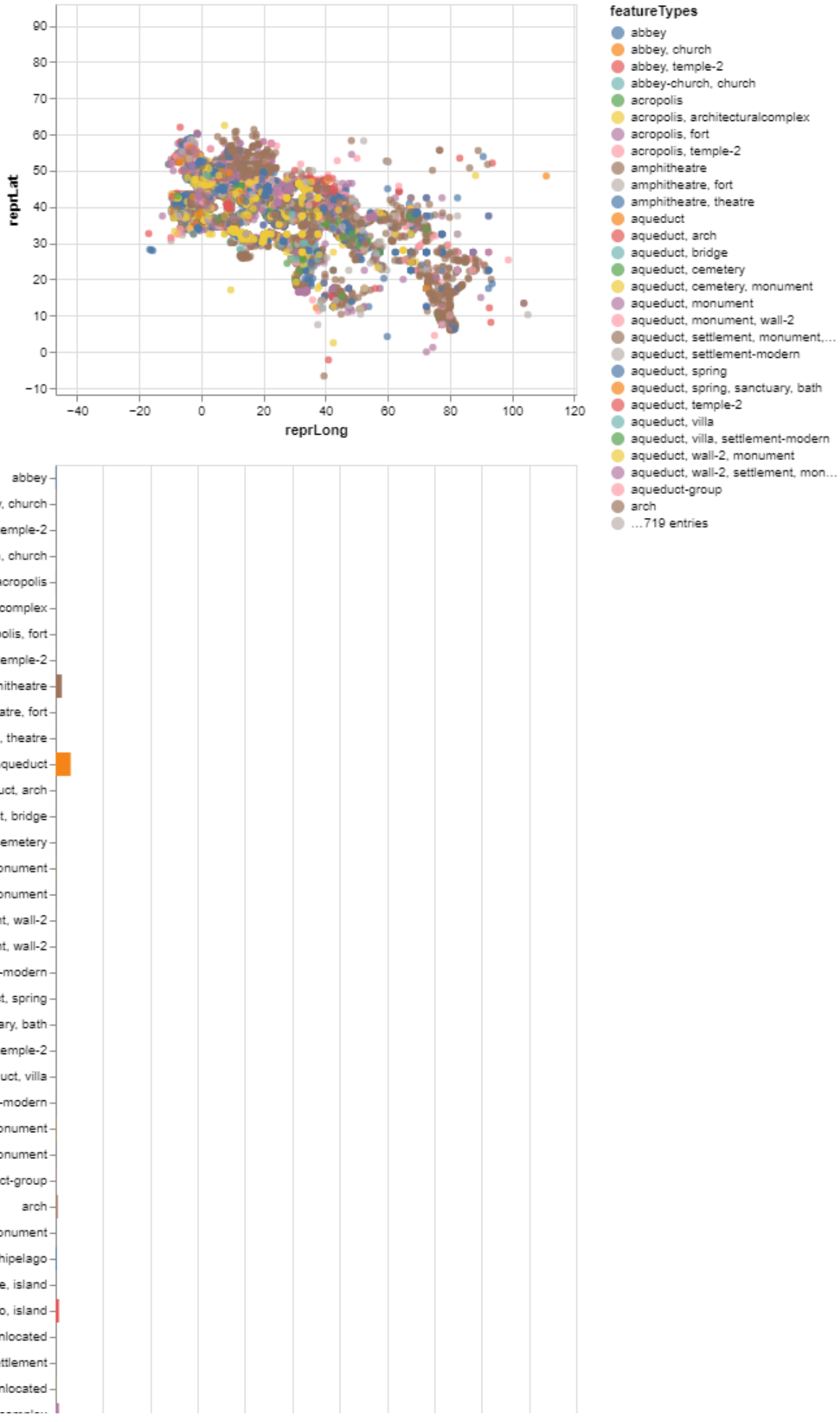
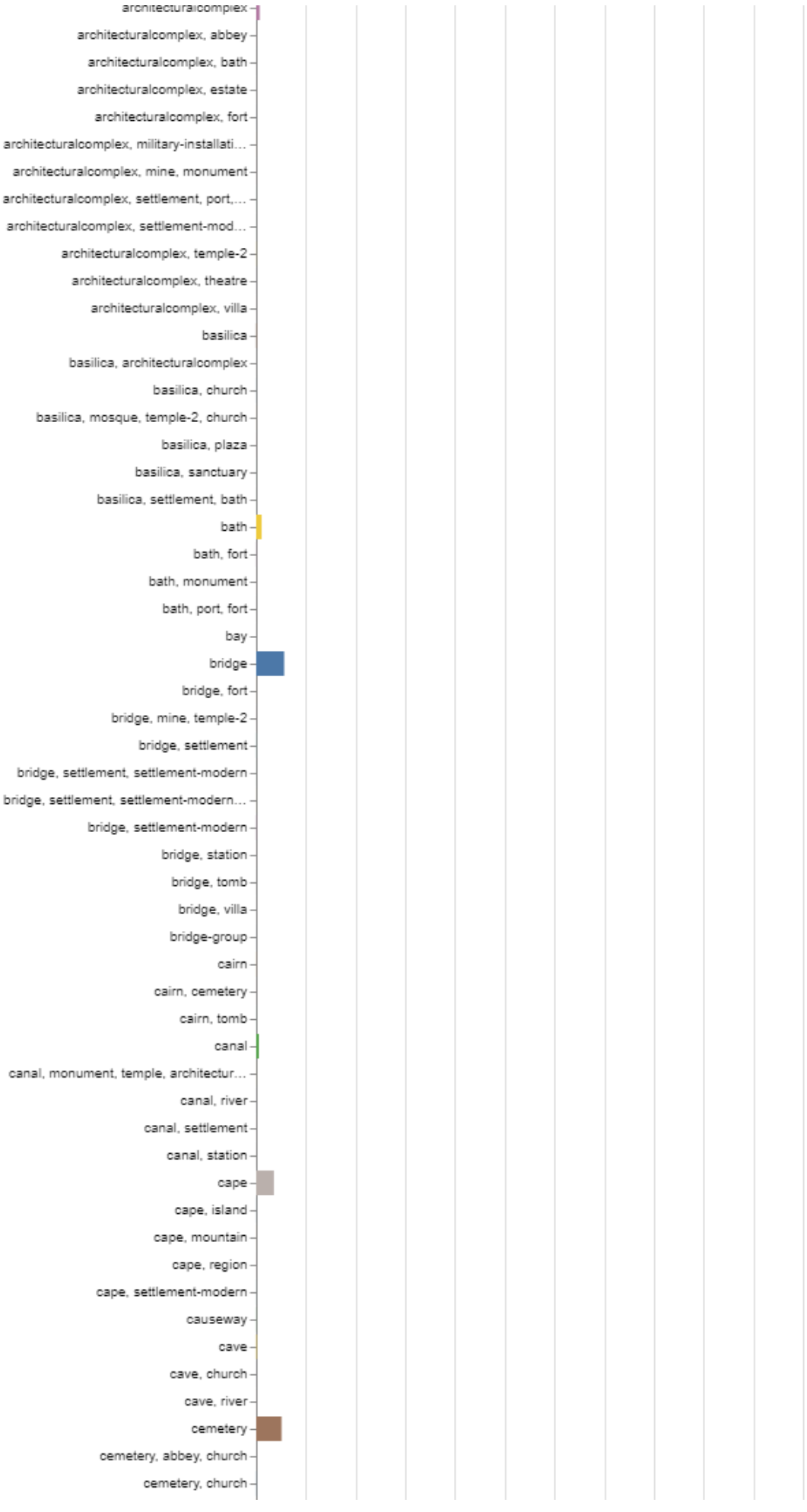
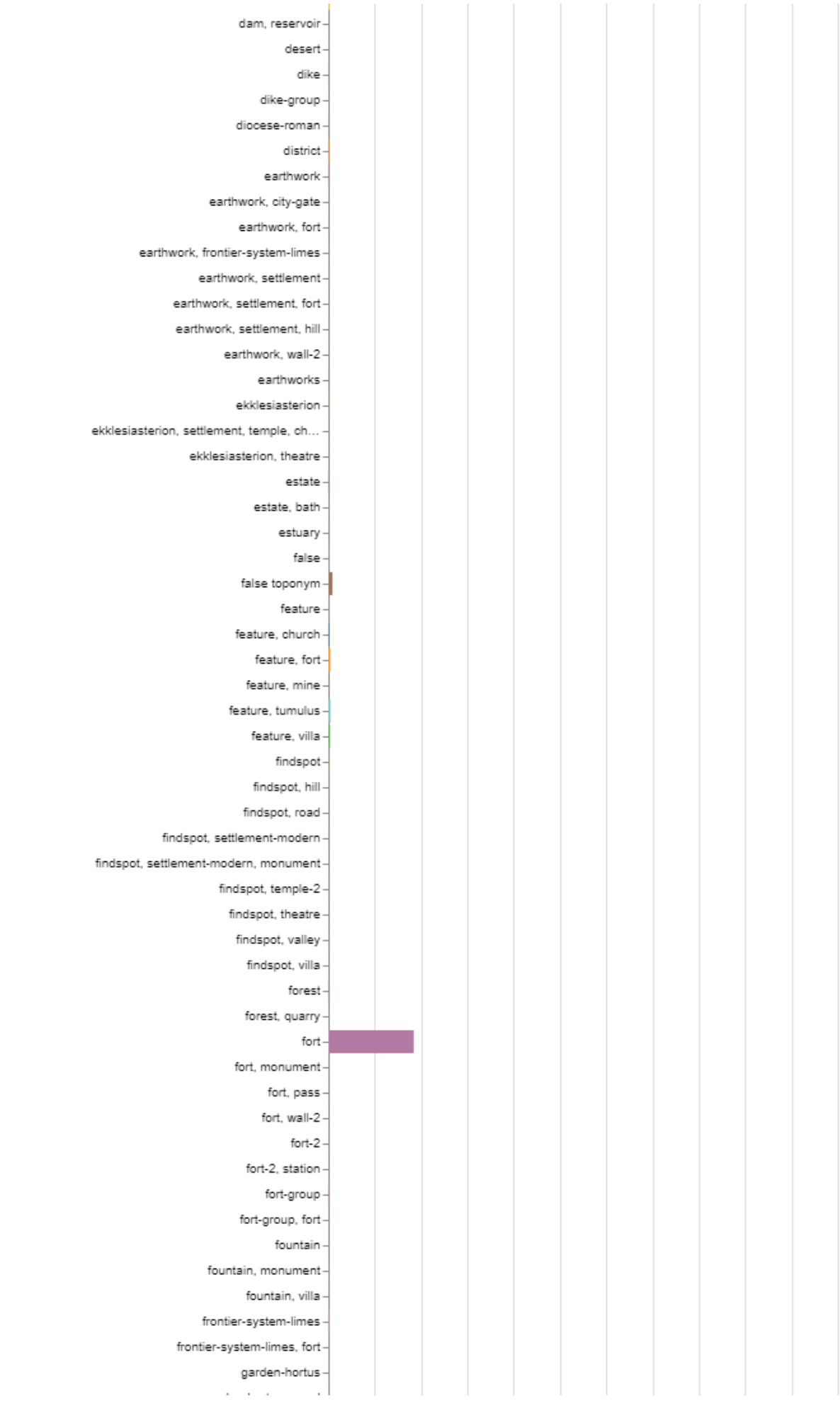


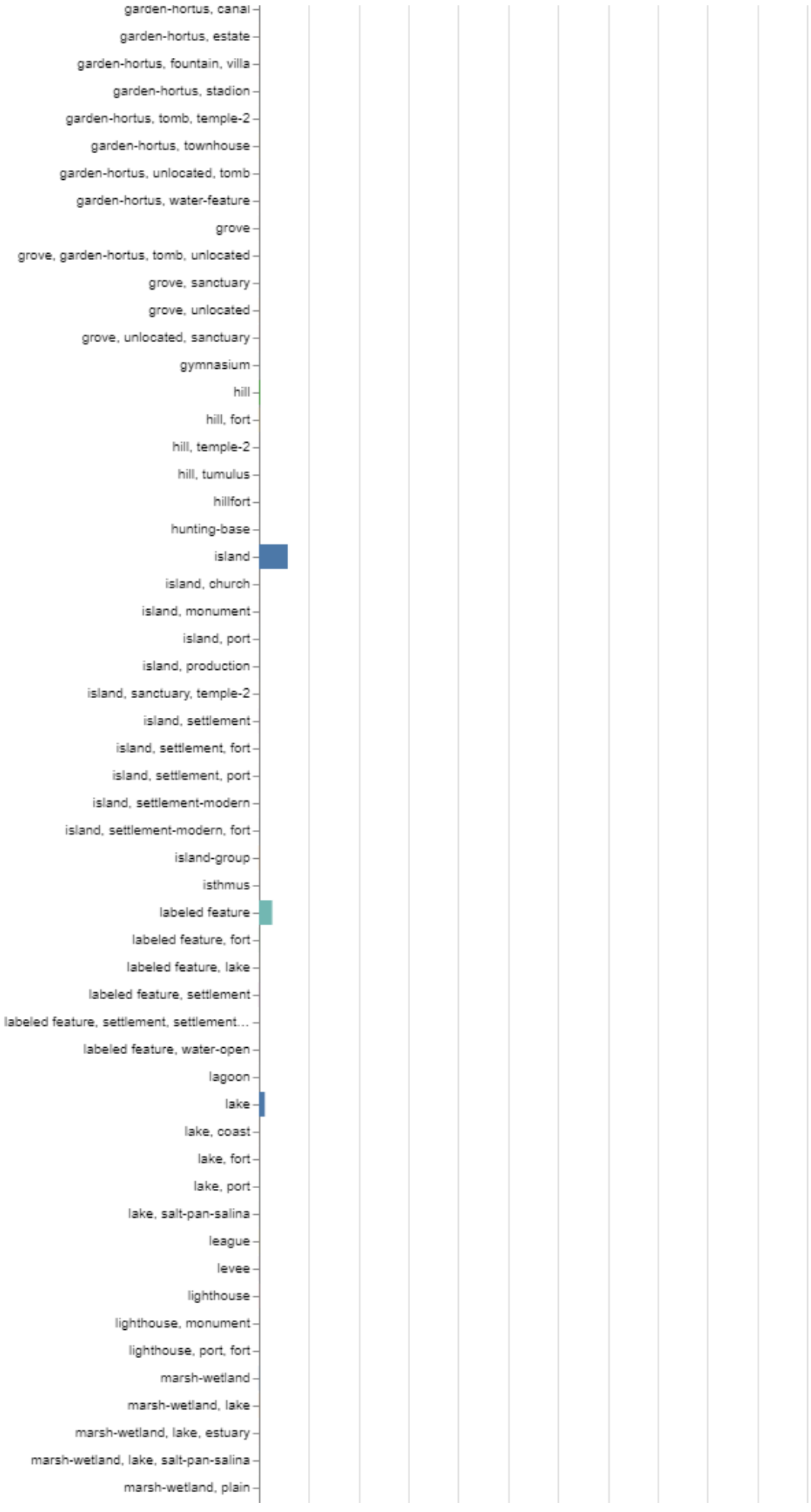
Fig 7: scatter plot with box selection interaction

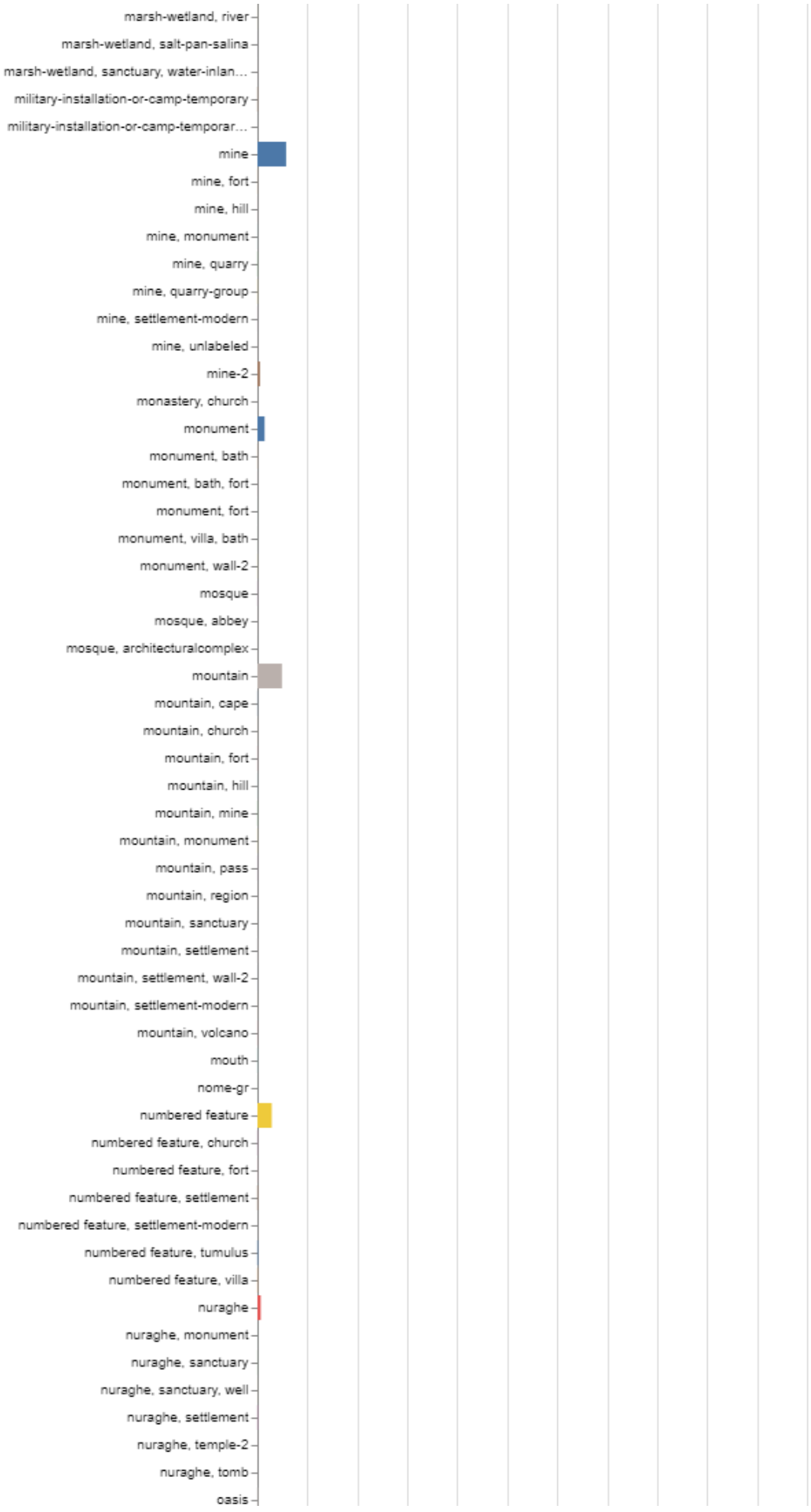

reprLat
reprLong
90
80
70
60
50
40
30
20
10
0
−10
−40
−20
0
20
40
60
80
100
120
featureTypes
abbey
abbey, church
abbey, temple-2
abbey-church, church
acropolis
acropolis, architecturalcomplex
acropolis, fort
acropolis, temple-2
amphitheatre
amphitheatre, fort
amphitheatre, theatre
aqueduct
aqueduct, arch
aqueduct, bridge
aqueduct, cemetery
aqueduct, cemetery, monument
aqueduct, monument
aqueduct, monument, wall-2
aqueduct, settlement, monument,...
aqueduct, settlement-modern
aqueduct, spring
aqueduct, spring, sanctuary, bath
aqueduct, temple-2
aqueduct, villa
aqueduct, villa, settlement-modern
aqueduct, wall-2, monument
aqueduct, wall-2, settlement, mon...
aqueduct-group
arch
...719 entries
abbey
abbey, church
abbey, temple-2
abbey-church, church
acropolis
acropolis, architecturalcomplex
acropolis, fort
acropolis, temple-2
amphitheatre
amphitheatre, fort
amphitheatre, theatre
aqueduct
aqueduct, arch
aqueduct, bridge
aqueduct, cemetery
aqueduct, cemetery, monument
aqueduct, monument
aqueduct, monument, wall-2
aqueduct, settlement, monument, wall-2
aqueduct, settlement-modern
aqueduct, spring
aqueduct, spring, sanctuary, bath
aqueduct, temple-2
aqueduct, villa
aqueduct, villa, settlement-modern
aqueduct, wall-2, monument
aqueduct, wall-2, settlement, monument
aqueduct-group
arch
arch, monument
archipelago
archipelago, cape, island
archipelago, island
archipelago, island, unlocated
archipelago, settlement
archipelago, unlocated

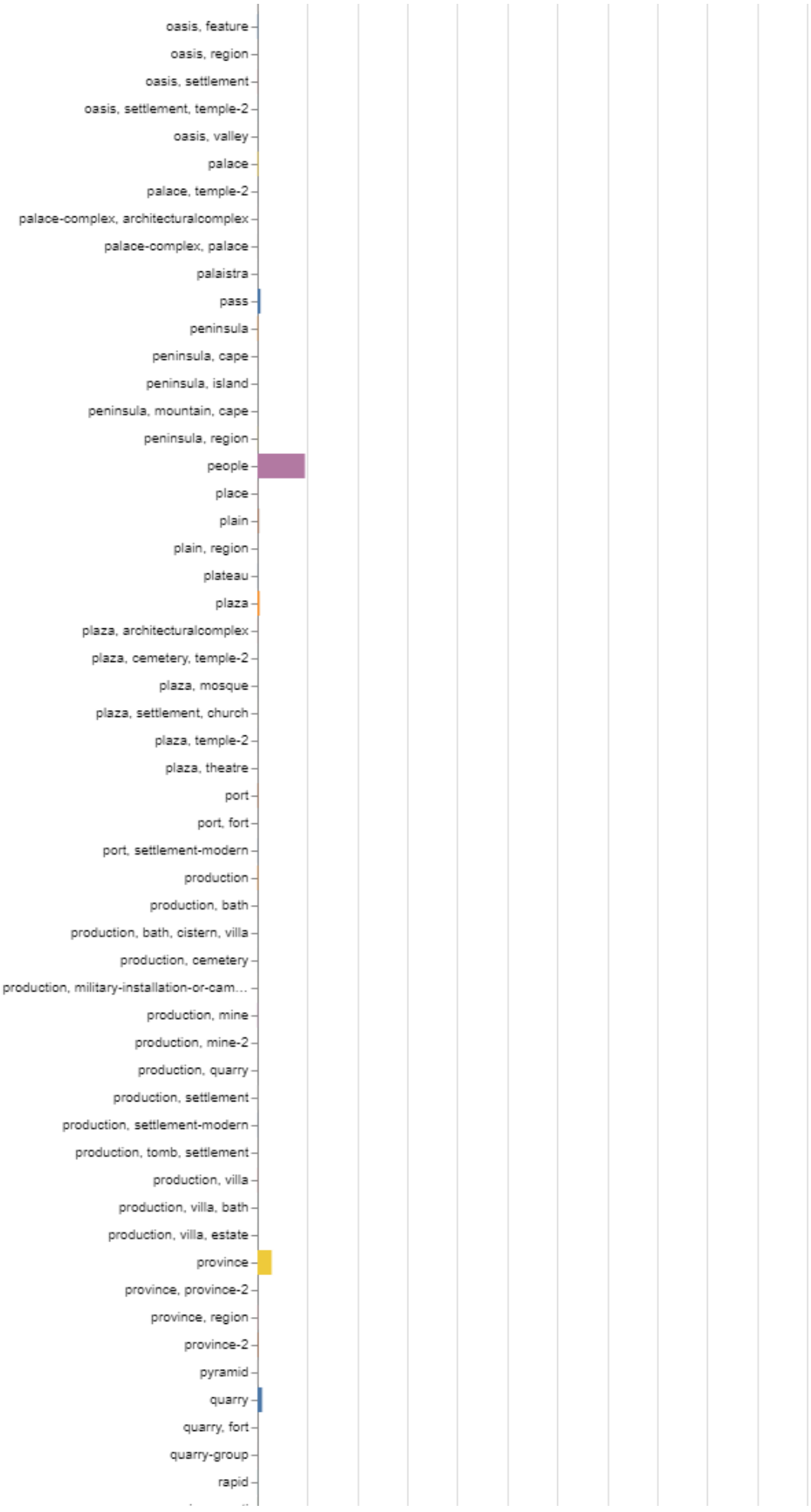

architecturalcomplex
architecturalcomplex, abbey
architecturalcomplex, bath
architecturalcomplex, estate
architecturalcomplex, fort
architecturalcomplex, military-installati…
architecturalcomplex, mine, monument
architecturalcomplex, settlement, port,…
architecturalcomplex, settlement-mod…
architecturalcomplex, temple-2
architecturalcomplex, theatre
architecturalcomplex, villa
basilica
basilica, architecturalcomplex
basilica, church
basilica, mosque, temple-2, church
basilica, plaza
basilica, sanctuary
basilica, settlement, bath
bath
bath, fort
bath, monument
bath, port, fort
bay
bridge
bridge, fort
bridge, mine, temple-2
bridge, settlement
bridge, settlement, settlement-modern
bridge, settlement, settlement-modern…
bridge, settlement-modern
bridge, station
bridge, tomb
bridge, villa
bridge-group
cairn
cairn, cemetery
cairn, tomb
canal
canal, monument, temple, architectur…
canal, river
canal, settlement
canal, station
cape
cape, island
cape, mountain
cape, region
cape, settlement-modern
causeway
cave
cave, church
cave, river
cemetery
cemetery, abbey, church
cemetery, church

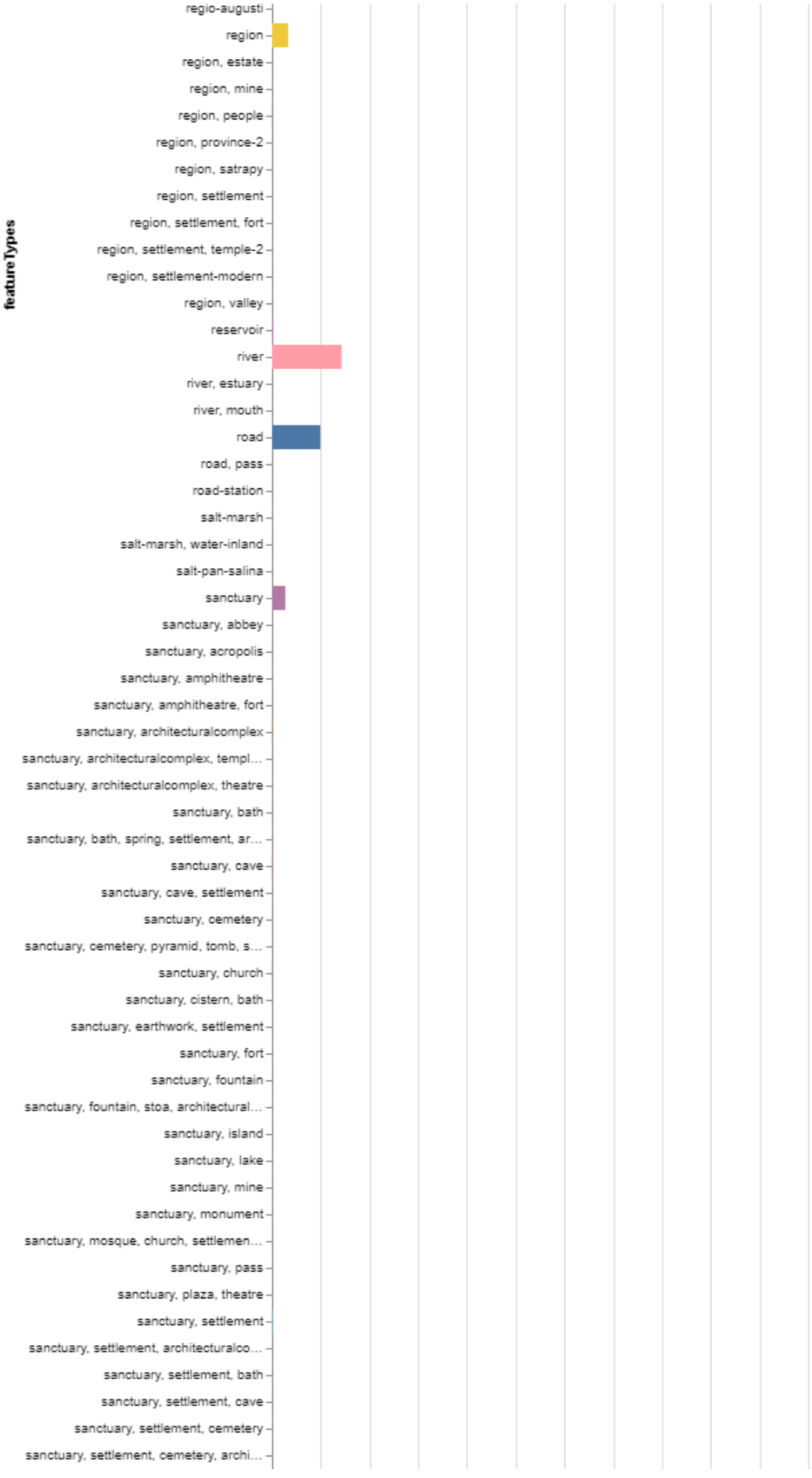

cemetery, fort
cemetery, hill
cemetery, monument
cemetery, reservoir
cemetery, settlement, mosque, shrine
cemetery, settlement-modern
cemetery, temple
cemetery, temple-2
cemetery, tumulus
cemetery, unlabeled
cemetery, villa
cemetery, villa, bath
cemetery, villa, vicus
centuriation
church
church, sanctuary, settlement, bath
church-2
church-2, abbey
church-2, abbey-church
church-2, acropolis, city-wall, plaza, ci…
church-2, architecturalcomplex, abbey
church-2, basilica, settlement
church-2, church
church-2, mosque
church-2, mountain, temple-2
church-2, peninsula, cemetery, villa, port
church-2, sanctuary
church-2, station
church-2, temple-2
church-2, tomb
church-2, tomb, church
church-2, townhouse
church-2, villa
church-2, villa, bath
circus
circus, monument
circus, villa
cistern
city-gate
city-gate, city-wall
city-gate, fort
city-wall
city-wall, fort
city-wall, settlement
city-wall, settlement, cemetery
city-wall, settlement, cistern, plaza
city-wall, settlement, fort
city-wall, settlement-modern, fort
city-wall, wall-2
coast
coast, fort-group
coastal-change
cultural-landscape
dam
dam, feature


dam, reservoir
desert
dike
dike-group
diocese-roman
district
earthwork
earthwork, city-gate
earthwork, fort
earthwork, frontier-system-limes
earthwork, settlement
earthwork, settlement, fort
earthwork, settlement, hill
earthwork, wall-2
earthworks
ekklesiasterion
ekklesiasterion, settlement, temple, ch…
ekklesiasterion, theatre
estate
estate, bath
estuary
false
false toponym
feature
feature, church
feature, fort
feature, mine
feature, tumulus
feature, villa
findspot
findspot, hill
findspot, road
findspot, settlement-modern
findspot, settlement-modern, monument
findspot, temple-2
findspot, theatre
findspot, valley
findspot, villa
forest
forest, quarry
fort
fort, monument
fort, pass
fort, wall-2
fort-2
fort-2, station
fort-group
fort-group, fort
fountain
fountain, monument
fountain, villa
frontier-system-limes
frontier-system-limes, fort
garden-hortus


garden-hortus, canal
garden-hortus, estate
garden-hortus, fountain, villa
garden-hortus, stadion
garden-hortus, tomb, temple-2
garden-hortus, townhouse
garden-hortus, unlocated, tomb
garden-hortus, water-feature
grove
grove, garden-hortus, tomb, unlocated
grove, sanctuary
grove, unlocated
grove, unlocated, sanctuary
gymnasium
hill
hill, fort
hill, temple-2
hill, tumulus
hillfort
hunting-base
island
island, church
island, monument
island, port
island, production
island, sanctuary, temple-2
island, settlement
island, settlement, fort
island, settlement, port
island, settlement-modern
island, settlement-modern, fort
island-group
isthmus
labeled feature
labeled feature, fort
labeled feature, lake
labeled feature, settlement
labeled feature, settlement, settlement...
labeled feature, water-open
lagoon
lake
lake, coast
lake, fort
lake, port
lake, salt-pan-salina
league
levee
lighthouse
lighthouse, monument
lighthouse, port, fort
marsh-wetland
marsh-wetland, lake
marsh-wetland, lake, estuary
marsh-wetland, lake, salt-pan-salina
marsh-wetland, plain


marsh-wetland, river
marsh-wetland, salt-pan-salina
marsh-wetland, sanctuary, water-inlan...
military-installation-or-camp-temporary
military-installation-or-camp-temporar...
mine
mine, fort
mine, hill
mine, monument
mine, quarry
mine, quarry-group
mine, settlement-modern
mine, unlabeled
mine-2
monastery, church
monument
monument, bath
monument, bath, fort
monument, fort
monument, villa, bath
monument, wall-2
mosque
mosque, abbey
mosque, architecturalcomplex
mountain
mountain, cape
mountain, church
mountain, fort
mountain, hill
mountain, mine
mountain, monument
mountain, pass
mountain, region
mountain, sanctuary
mountain, settlement
mountain, settlement, wall-2
mountain, settlement-modern
mountain, volcano
mouth
nome-gr
numbered feature
numbered feature, church
numbered feature, fort
numbered feature, settlement
numbered feature, settlement-modern
numbered feature, tumulus
numbered feature, villa
nuraghe
nuraghe, monument
nuraghe, sanctuary
nuraghe, sanctuary, well
nuraghe, settlement
nuraghe, temple-2
nuraghe, tomb
oasis


oasis, feature
oasis, region
oasis, settlement
oasis, settlement, temple-2
oasis, valley
palace
palace, temple-2
palace-complex, architecturalcomplex
palace-complex, palace
palaistra
pass
peninsula
peninsula, cape
peninsula, island
peninsula, mountain, cape
peninsula, region
people
place
plain
plain, region
plateau
plaza
plaza, architecturalcomplex
plaza, cemetery, temple-2
plaza, mosque
plaza, settlement, church
plaza, temple-2
plaza, theatre
port
port, fort
port, settlement-modern
production
production, bath
production, bath, cistern, villa
production, cemetery
production, military-installation-or-cam…
production, mine
production, mine-2
production, quarry
production, settlement
production, settlement-modern
production, tomb, settlement
production, villa
production, villa, bath
production, villa, estate
province
province, province-2
province, region
province-2
pyramid
quarry
quarry, fort
quarry-group
rapid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river
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river, mouth
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road-station
salt-marsh
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salt-pan-salina
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sanctuary, acropolis
sanctuary, amphitheatre
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sanctuary, cemetery
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sanctuary, church
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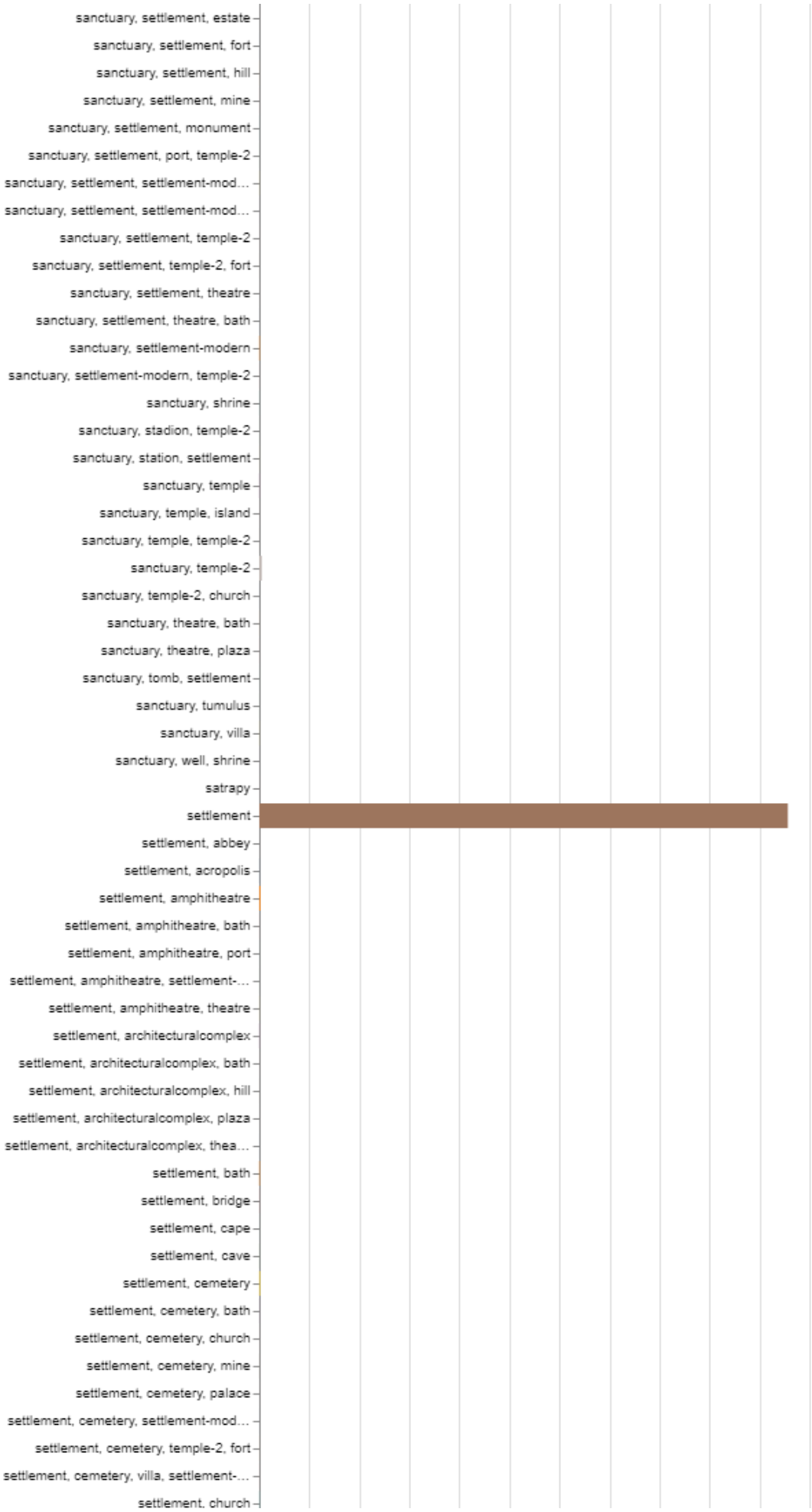
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sanctuary, tomb, settlement
sanctuary, tumulus
sanctuary, villa
sanctuary, well, shrine
satrapy
settlement
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settlement, acropolis
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settlement, cave
settlement, cemetery
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settlement, cemetery, church
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settlement, cemetery, villa, settlement-…
settlement, church


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settlement, feature
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settlement, road
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settlement, sanctuary, church
settlement, settlement-modern
settlement, settlement-modern, fort
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settlement, station
settlement, station, cape
settlement, tell
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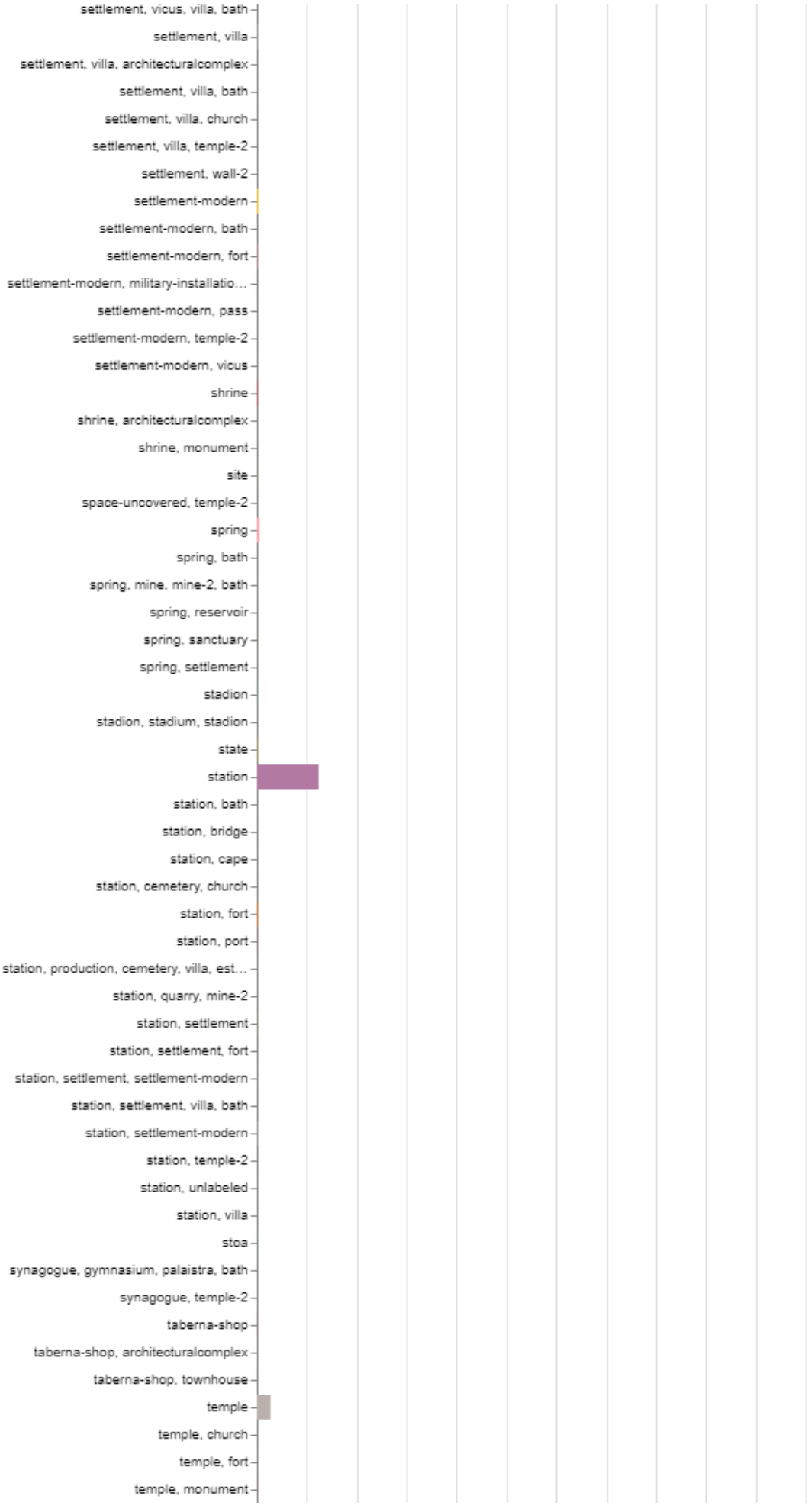
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spring, reservoir
spring, sanctuary
spring, settlement
stadion
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state
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station, bridge
station, cape
station, cemetery, church
station, fort
station, port
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station, temple-2
station, unlabeled
station, villa
stoa
synagogue, gymnasium, palaistra, bath
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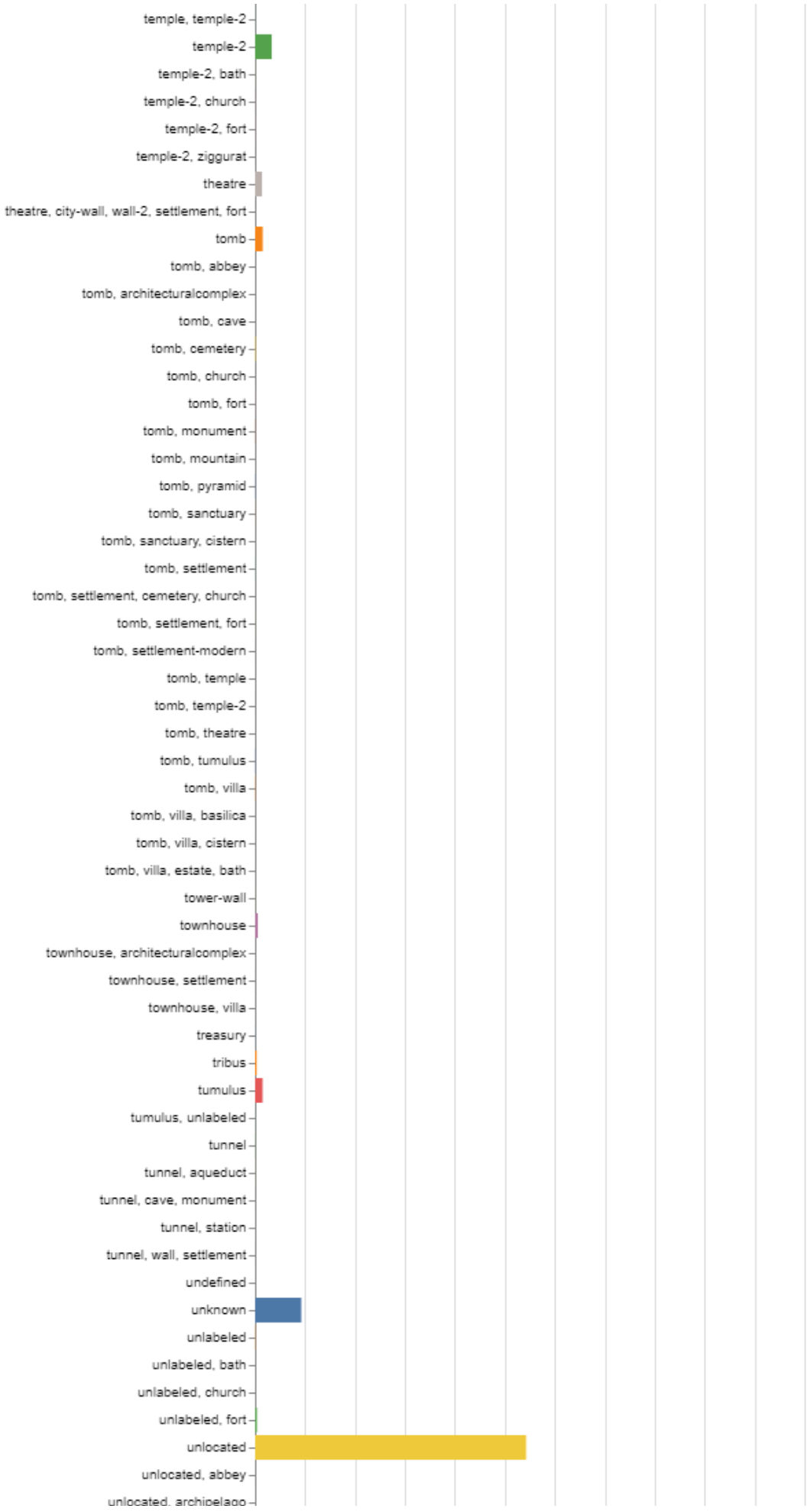
temple, fort
temple, monument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theatre
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tomb
tomb, abbey
tomb, architecturalcomplex
tomb, cave
tomb, cemetery
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tomb, settlement, fort
tomb, settlement-modern
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tomb, temple-2
tomb, theatre
tomb, tumulus
tomb, villa
tomb, villa, basilica
tomb, villa, cistern
tomb, villa, estate, bath
tower-wall
townhouse
townhouse, architecturalcomplex
townhouse, settlement
townhouse, villa
treasury
tribus
tumulus
tumulus, unlabeled
tunnel
tunnel, aqueduct
tunnel, cave, monument
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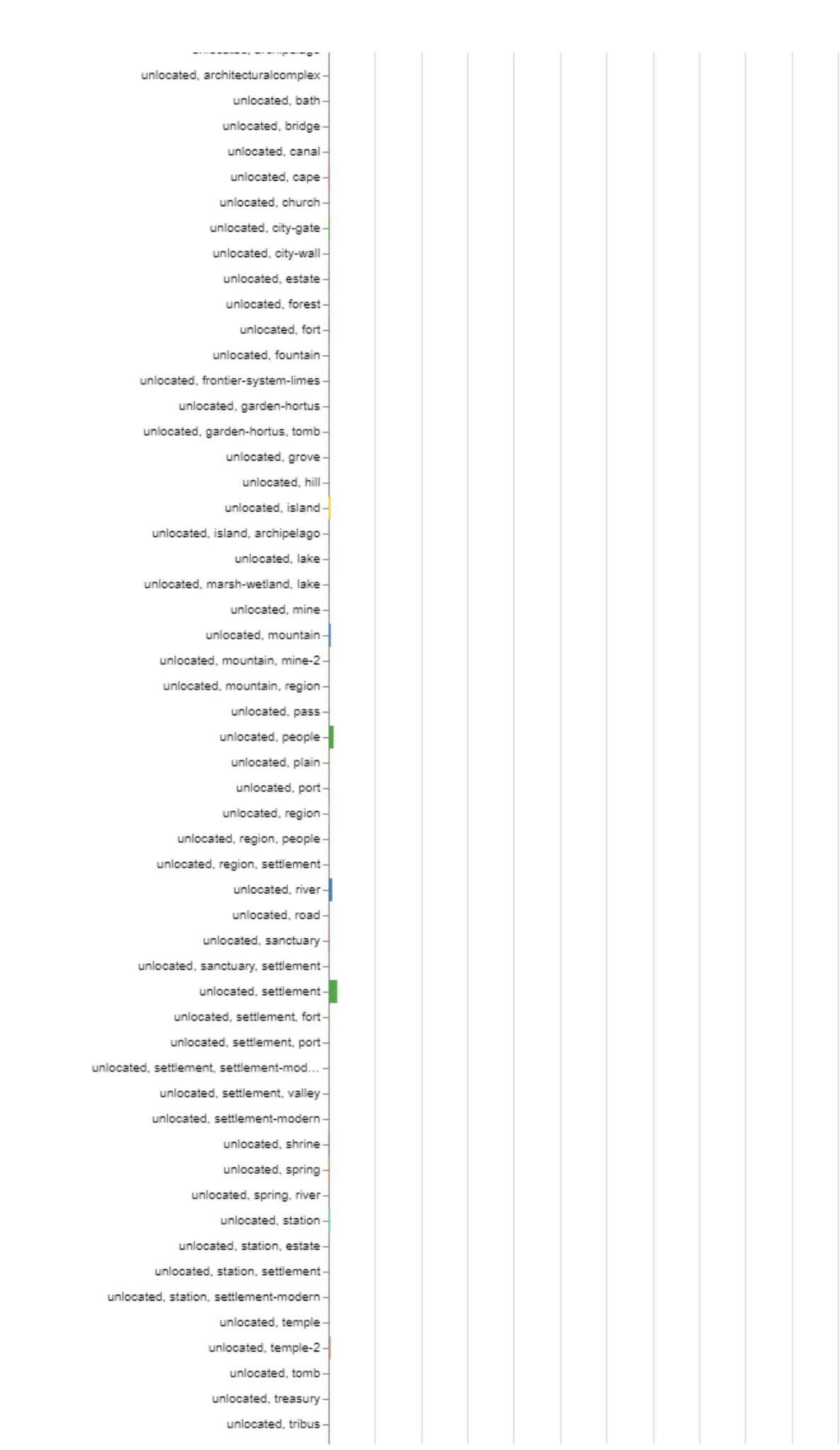
unlocated, abbey
unlocated, archipelago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unlocated, fort
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unlocated, garden-hortus, tomb
unlocated, grove
unlocated, hill
unlocated, island
unlocated, island, archipelago
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unlocated, port
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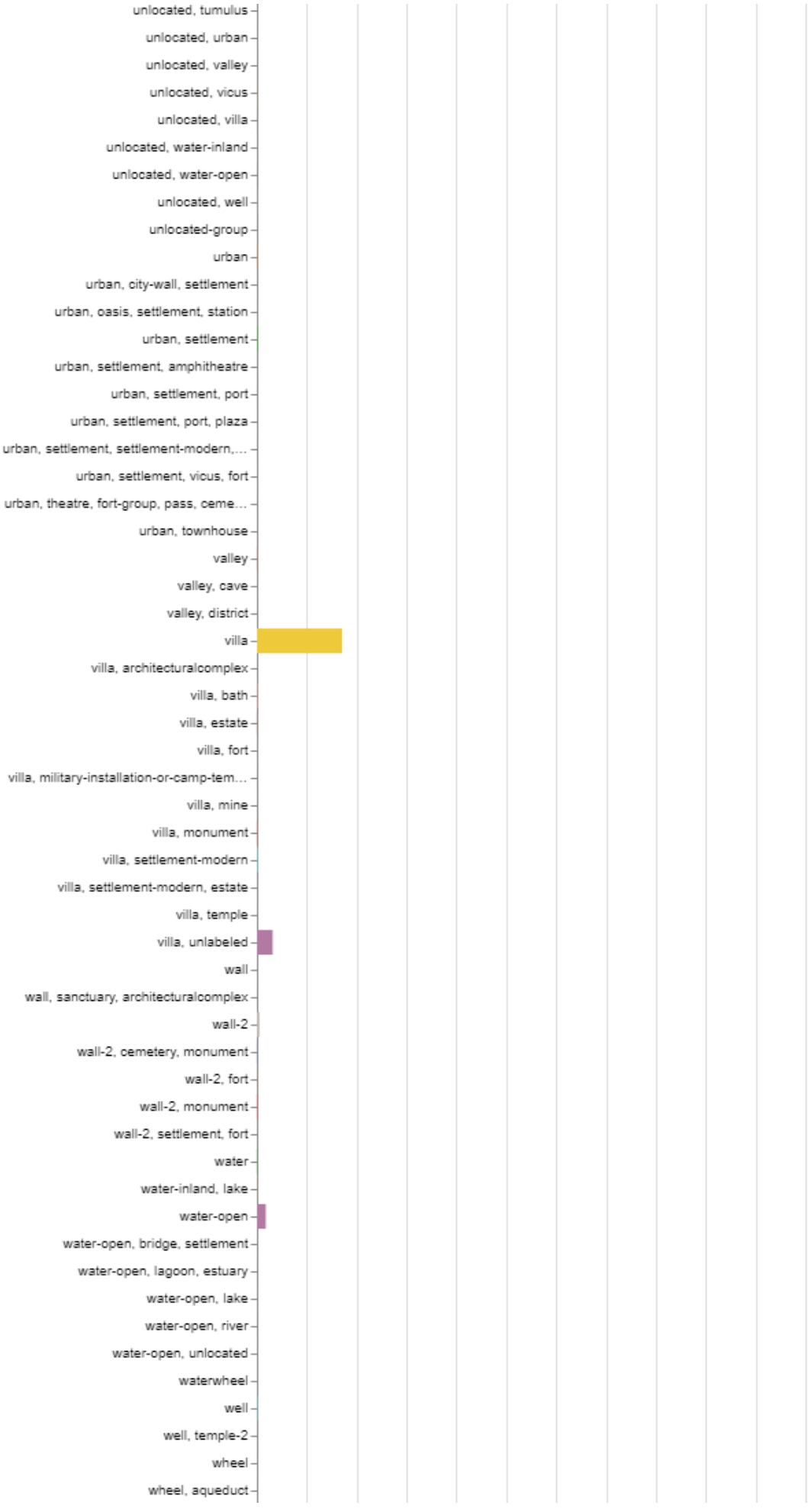
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unlocated, well
unlocated-group
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urban, oasis, settlement, station
urban, settlement
urban, settlement, amphitheatre
urban, settlement, port
urban, settlement, port, plaza
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urban, settlement, vicus, fort
urban, theatre, fort-group, pass, ceme...
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valley
valley, cave
valley, district
villa
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villa, temple
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wall-2
wall-2, cemetery, monument
wall-2, fort
wall-2, monument
wall-2, settlement, fort
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water-open
water-open, bridge, settlement
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wheel, aqueduct

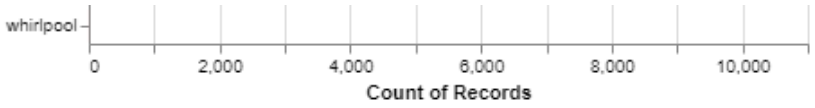

Fig 8: scatter plot with bar graph

What are all visual mappings used?

Scatter plot:

X-position: reprLong category
y- position: reprLat category
color: range of colors

Bar chart:

x-position: count of records (count of each feature type)
y-postion: selected set of feature types.
color: depends upon scatter plot

Was there any special data preparation done?

No data has modified and projections are made directly using original data set.
Data is taken from places data set.

What are the limitations of your design?

This visualization gives only count that are selected as a set in a scatter plot.

Visualization Five : Table Bubble plot

What can we learn from the visualization?

To give comparison between created dates and modified date of the research based on the versions.

Description:

This Visualization gives a statistical comparison and overall view that how many documents are modified based on created values. Each plot individually represents count of created/modified which can be used for further research purpose.

What is the name for the type of visualization(s) used?

Table Bubble plot.

coding part

```
import altair as alt
import pandas as pd
from vega_datasets import data
alt.data_transformers.disable_max_rows()
brush = alt.selection_interval()

places = pd.read_csv('pleiades-places-latest.csv')
locations=pd.read_csv('pleiades-locations-latest.csv')
names=pd.read_csv('pleiades-names-latest.csv')

created=alt.Chart(places).mark_circle().encode(
    x='year(created):O',
    y='month(created):O',
    size='count(currentVersion):Q'
).interactive()
modified=alt.Chart(places).mark_circle().encode(
    x='year(modified):O',
    y='month(modified):O',
    size='count(currentVersion):Q'
)
created | modified
```

Visual Outputs :

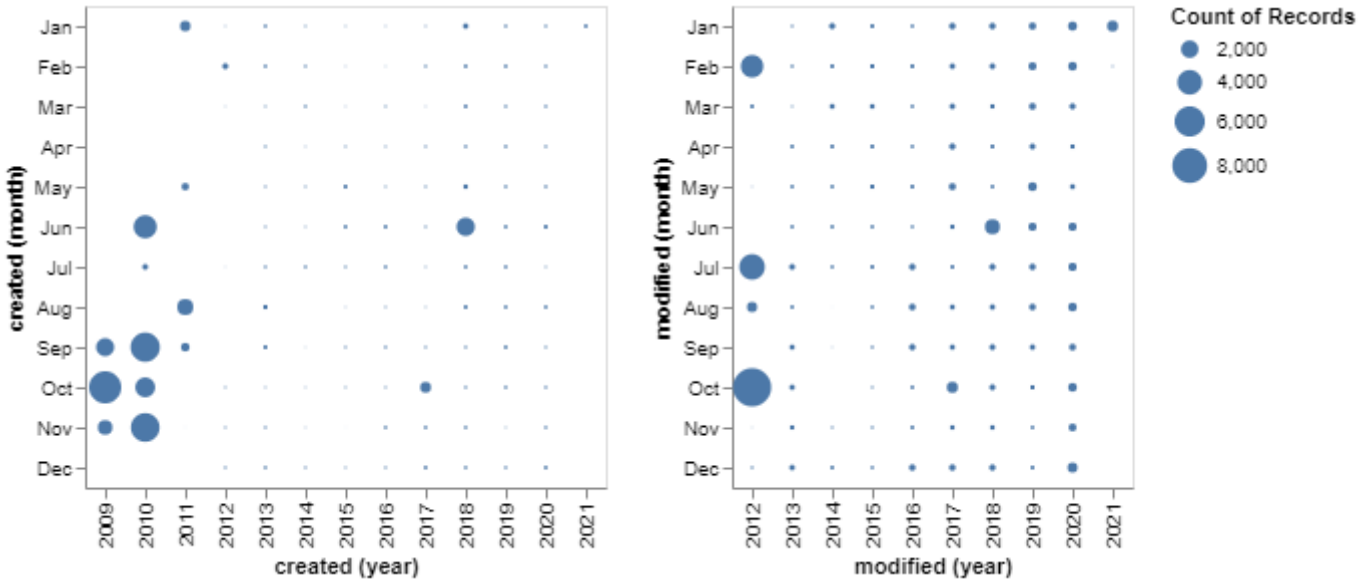

Fig 9: insight of further researches based on created data set

What are all visual mappings used?

Table Bubble plot-1 :

X-position: year of created category
y- position: month of created category
Size of bubble: depends on the count value of currentVersion category

Table Bubble plot-2 :

X-position: year of modified category
y- position: month of modified category
Size of bubble: depends on the count value of currentVersion category

Was there any special data preparation done?

No data has modified and projections are made directly using original data set.
Data is taken from places data set.

What are the limitations of your design?

This visualizations only gives the insight of comparisons of further research took place based created and modified categories.