Government Digital Analytics Program

Web traffic analysis of government agencies during the time of COVID-19

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Agenda

Background

Research Question

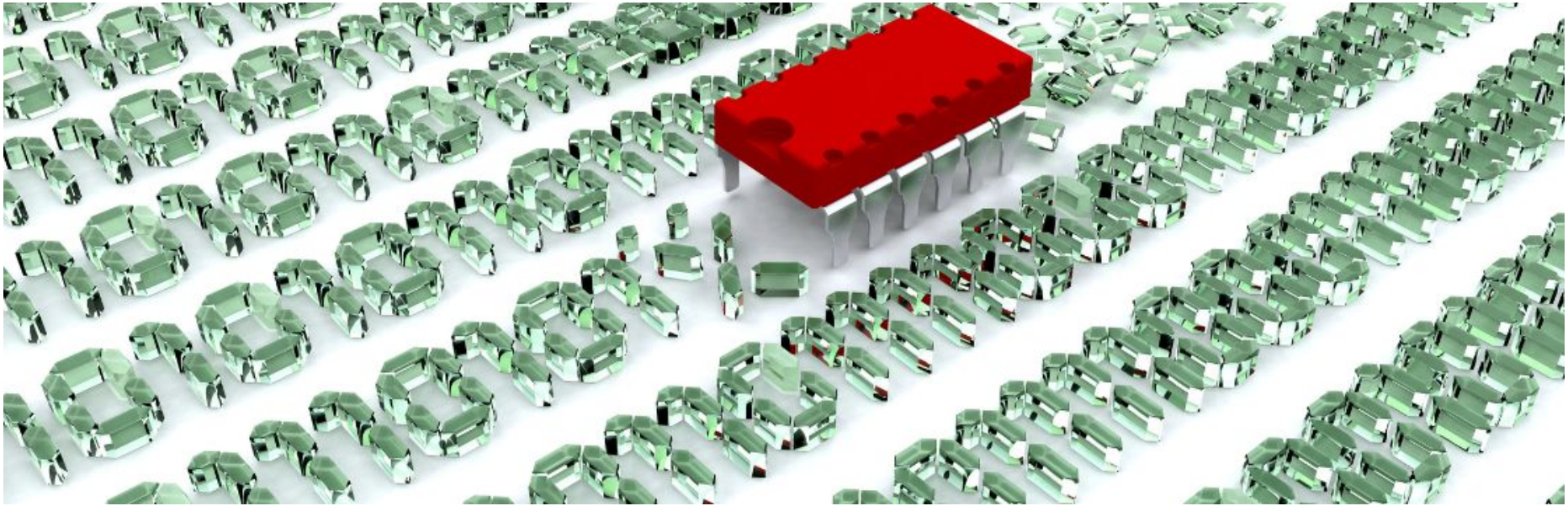
Data collection

Data cleansing

Data exploration

Visualization and analysis

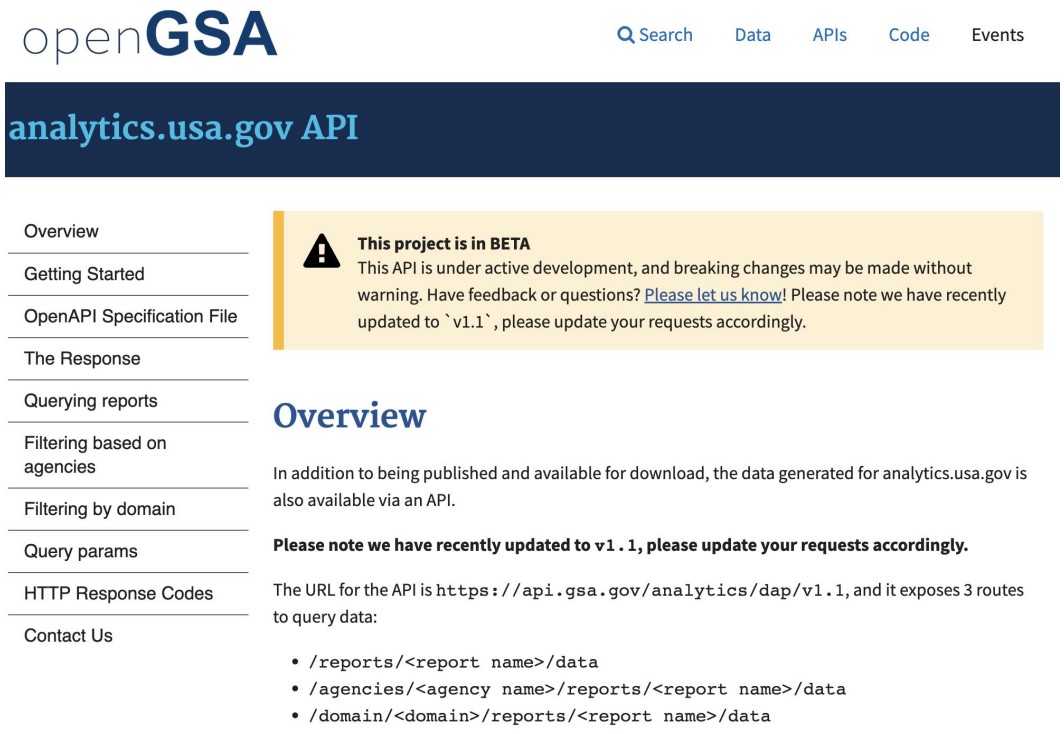
Background



Research Question

- Our primary goal is to assess the veracity of the data
- Secondary goal is to get insights such as:
  - Exploring seasonal patterns in the data
  - Most visited domains for a specific timeframe
  - Most common sources of traffic and how they've changed over time
  - How many languages are supported by websites from different agencies

Data Collection (1/2)



Response Query


```
{
  "id": 60716,
  "report_name": "today",
  "report_agency": "justice",
  "date_time":
"2017-04-07T14:00:00.000Z",
  "data": {
    "visits": "4240"
  },
  "created_at":
"2017-04-07T04:23:55.792Z",
  "updated_at":
"2017-04-07T04:23:55.792Z"
}
```

Data Collection (2/2) - Response

Reports for Agencies: Health & Human Services, Postal Service, Social Security Admin, Treasury			
Reports	**Site**	**Traffic Sources**	**Language**
# of Samples	667,504	161,296	978,426
Date Range	01/01/2020 to 04/17/2023	03/23/2020 to 04/18/2023	01/01/2020 to 04/17/2023
Unique Columns	domain	source, has_social_referral	language
Shared Columns	Id, date, report_name,report_agencies, visits		

Data Cleansing

- ✗ Missing & NaN values
- ✓ Duplicate values
- ✓ Trimmed time-range
- ✓ Checked for string formatting
- ✓ Dropped unnecessary columns

Cleansing Stats and Deltas

Reports for Agencies: Health & Human Services, Postal Service, Social Security Admin, Treasury			
Reports	**Site**	**Traffic Sources**	**Language**
# of Samples Rem	458,489	152,618	487,053
# Sample Loss	209,015	8,678	491,373
Time Lost	3 months	1 day	3 months

Data Exploration

- How many sites and agencies do the reports contain information about?
- Any important gaps in the data?
- Do we understand the meaning of all columns?
- Do aggregate visit values fall within expectations?
- Are there any unexpected values?
- Outliers analysis

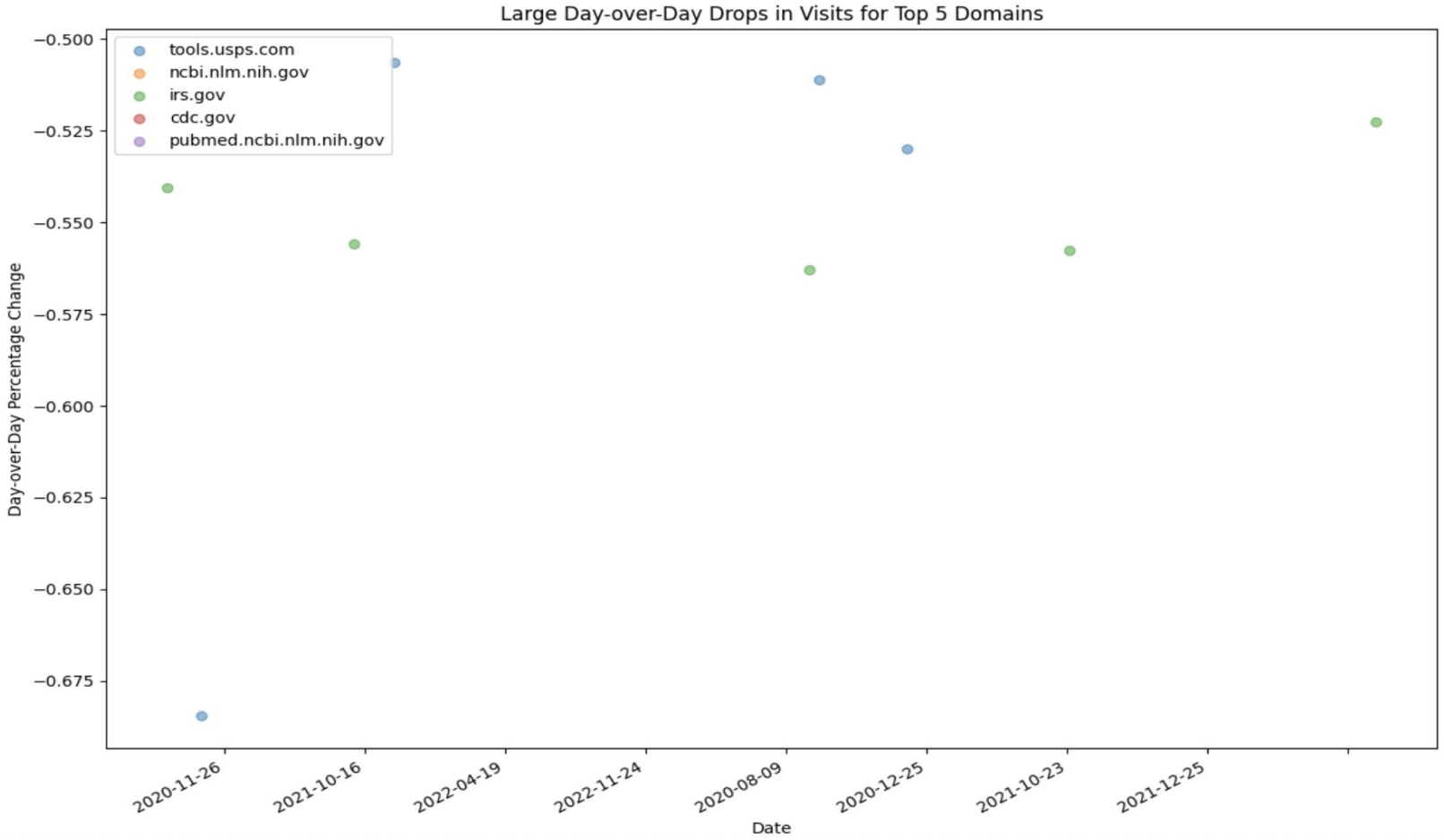
Example: do we understand the meaning of all columns?

- **Visits**: number of visits to each individual domain.
  - ! visits across sites and days (and even within the same day) are not de-duplicated for users
- **Source**: page where the visit originated from.
- **Language**: likely a combination of site and user generated signals

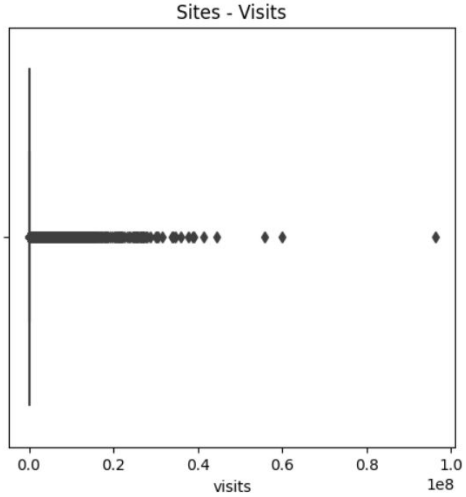
Example: do aggregate values fall within expectations?

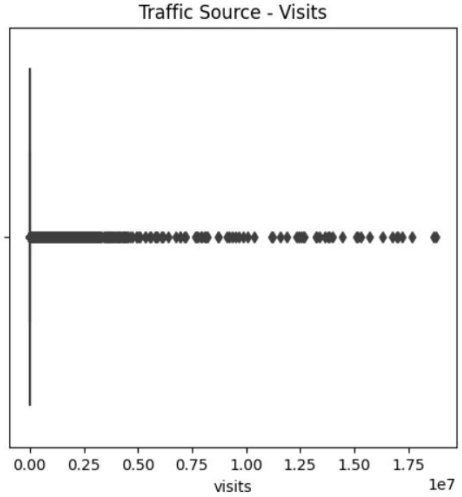
```
Visits per agency on 2020-03-26 00:00:00
report_agency
health-human-services             28450354
postal-service                    12207292
social-security-administration     1018944
treasury                           6026646
Name: visits, dtype: int64

Visits per agency as percentage of US population on 2020-03-26 00:00:00
report_agency
health-human-services             8.501499
postal-service                    3.647768
social-security-administration    0.304480
treasury                          1.800875
Name: visits, dtype: float64
```

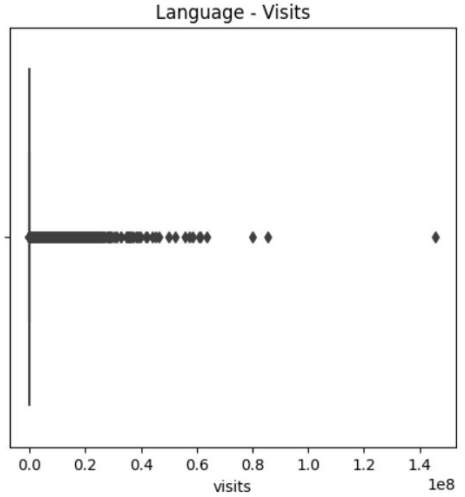
Example: are there any unexpected values?

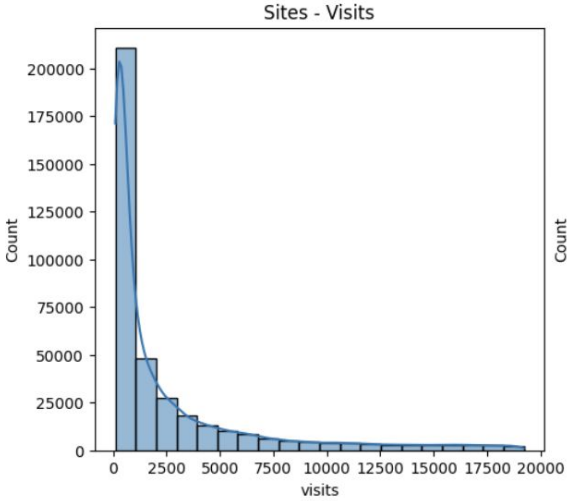


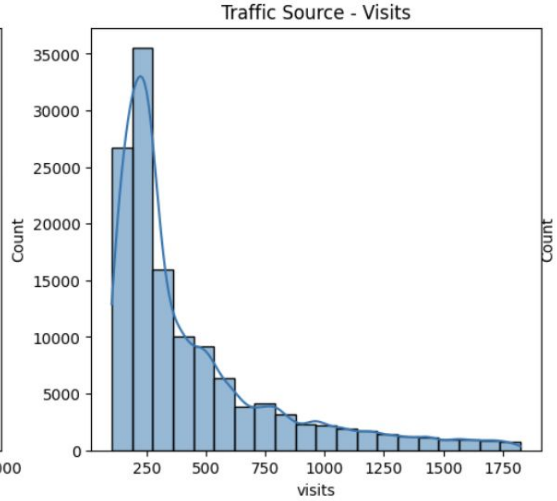
Example: outlier analysis

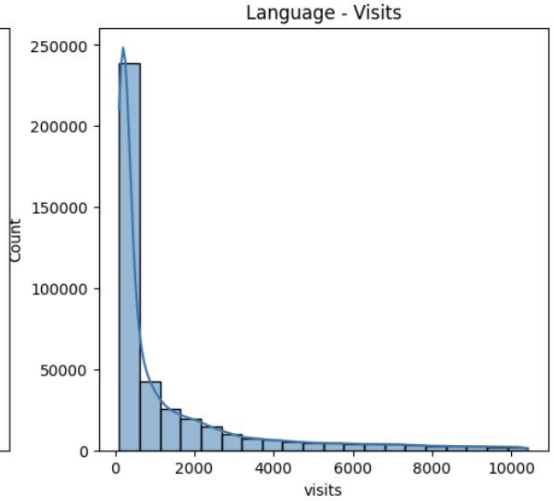








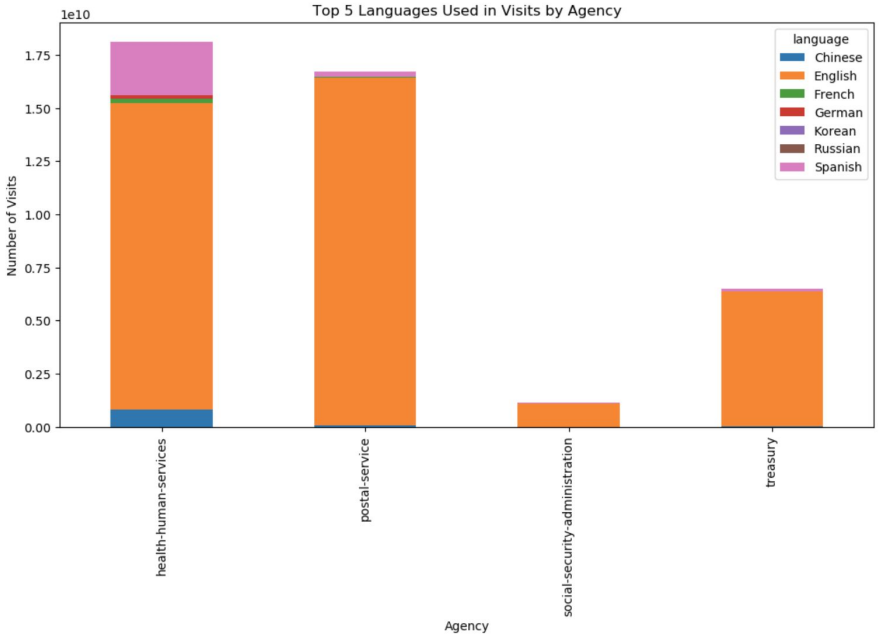


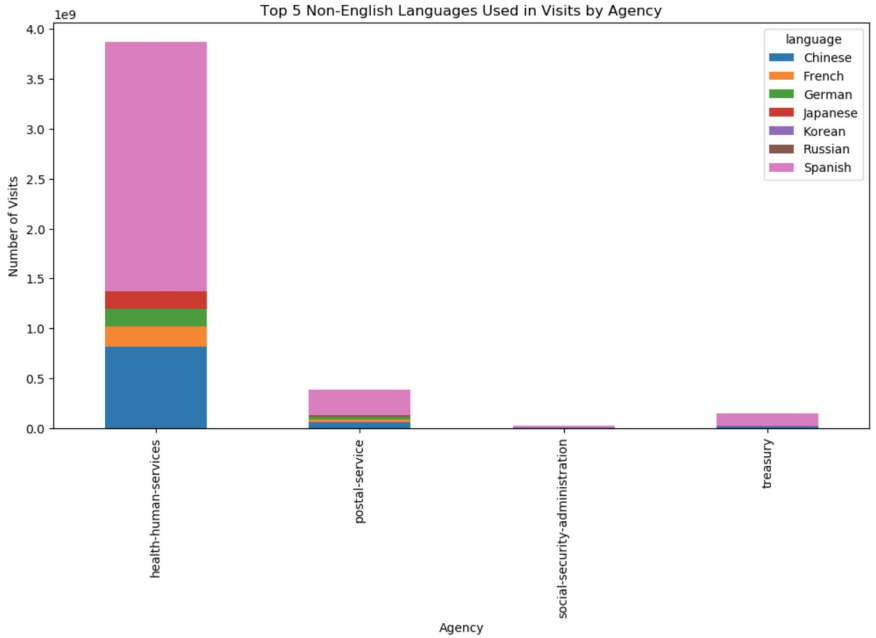


Visualization and Analysis

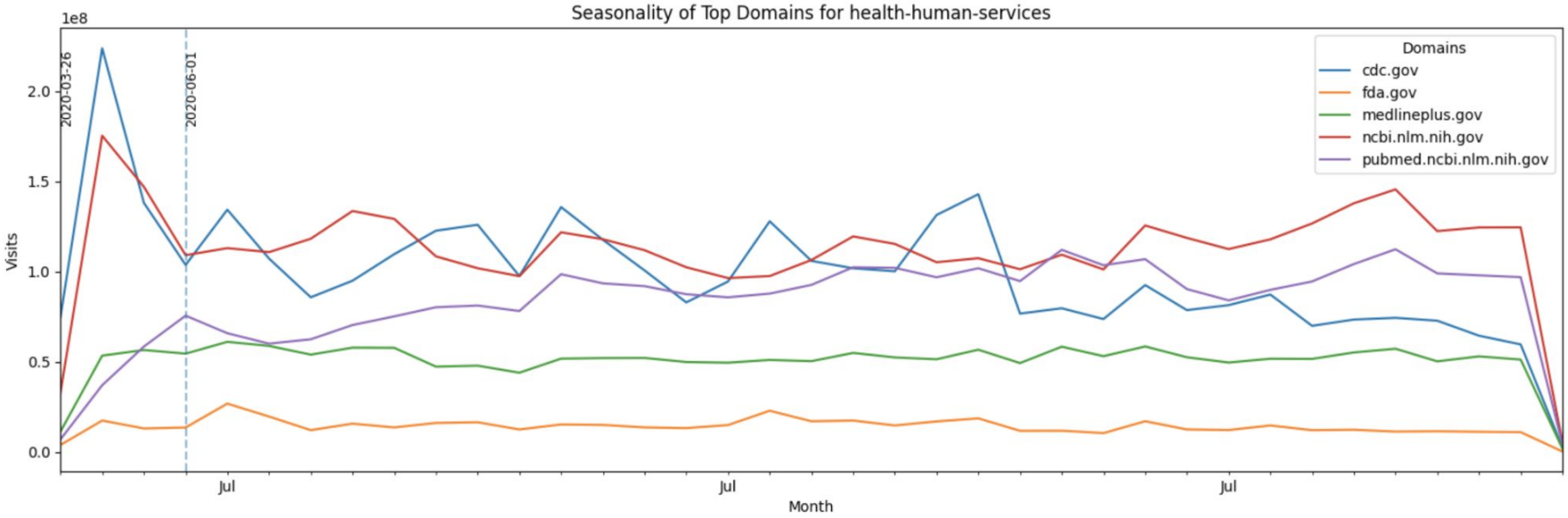
- How many languages are attributed to visits to different websites?
- Exploring seasonal patterns in the data
- Most visited domains for a specific timeframe
- Most common sources of traffic and how they've changed over time

How many languages are attributed to visits to different websites?





Exploring seasonal patterns in the data



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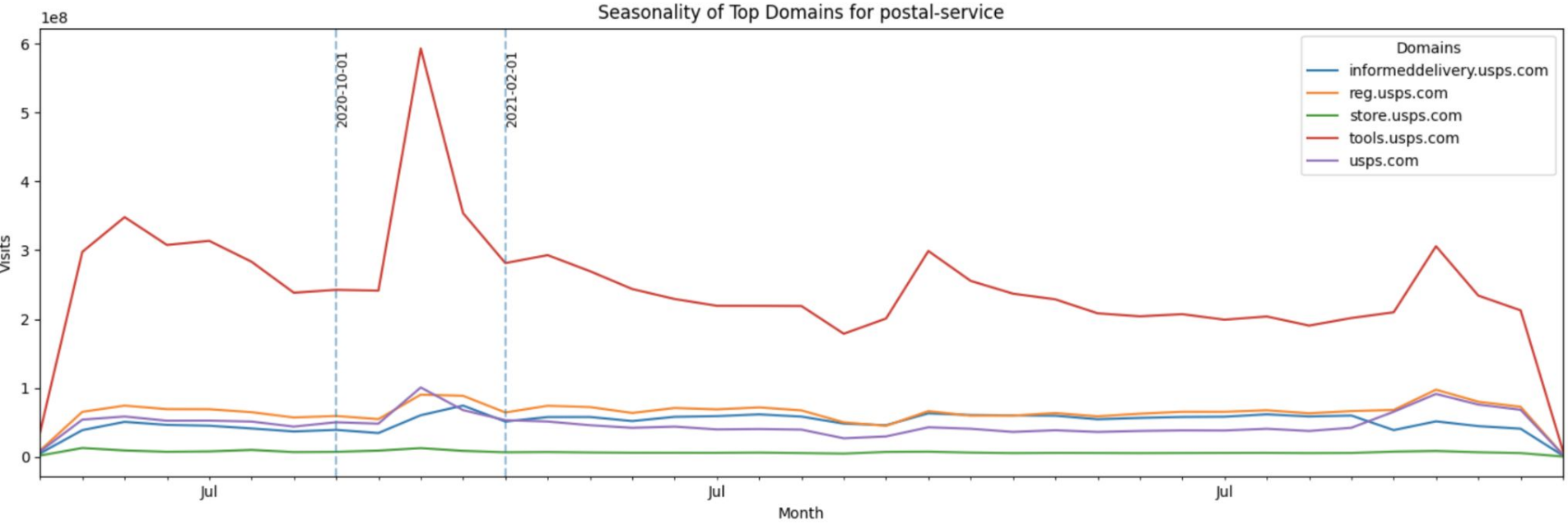

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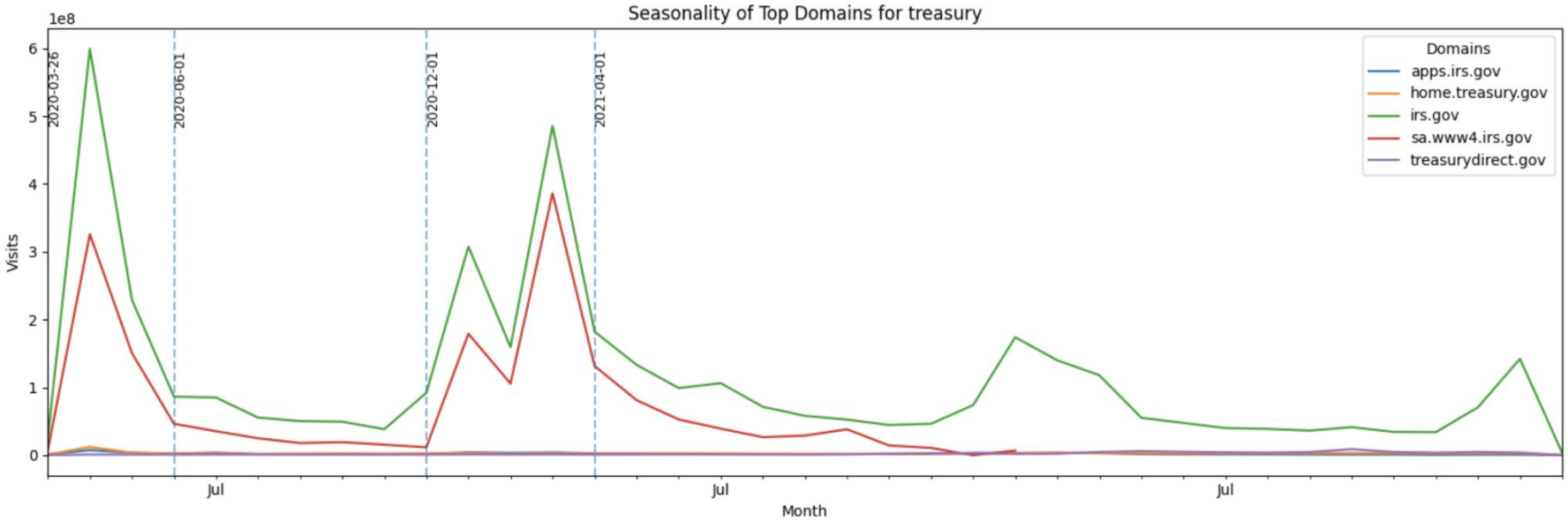

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Conclusion

- Data proved to be reliable enough and usable to generate insights
- With some caveats:
  - Extensive data cleansing is required
  - Preferably wait until API moves to alpha
  - Ideally we'd be provided with documentation