Università degli Studi di Padova

Dipartimento di Ingegneria dell'Informazione

Graph Databases

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OUR GROUP

Our group aims to leverage the power of graph databases to describe socio-economic aspects related to the COVID pandemic period.

0110 for bitsei

graph-Based InformaTion SystEms for Insights analysis

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ABOUT THE PROJECT

Inspiration, purposes, and employed datasets

1. INSPIRATION AND PURPOSE

Understand the societal effects of COVID pandemic

We identified three distinct datasets connected to the city of Los Angeles spanning the COVID pandemic years. These are:

COVID JOURNAL

A daily journal of COVID-related data.

CRIME EVENTS

Daily logs of crime events.

BUSINESS RECORDS

Records of businesses that opened and closed, updated daily.

1. DATASETS OVERVIEW

COVID JOURNAL

- Date
- *Period*
- Active Cases
- Deaths
- Confirmed Cases
- *Daily Cases*
- *Daily Deaths*

CRIME EVENTS

- Occurred Data:
  - Date - Time
  - *Area* - Location
  - Premise
- Crime Data:
  - Code - Description
  - Modus Operandi
  - Weapon Used
- Victim Data:
  - Sex
  - Age
  - Descent

BUSINESSES RECORDS

- Business Name
- D.B.A. Name
- Location Data:
  - Street Address
  - City
  - Zip Code
  - *Area*
- Naics Data:
  - Code - Description
- Start Date
- End Date

1. ADDITIONAL DATASETS GENERATED

MODUS OPERANDI
- moCode
- moDesc

WEAPON
- weaponCode
- weaponDesc

PREMISE
- premiseCode
- premiseDesc

NAICS
- naicsCode
- naicsDesc

1. ADDITIONAL DATASETS GENERATED

CRIME CATEGORY

- crimeCode
- crimeDesc
- label

AREA

- areaName
- areaAcronym
- areaSurface

PERIOD

- startDate
- endDate
- duration
- label

1. ADDITIONAL DATASETS GENERATED

CRIME CATEGORIES

PROPERTY CRIMES	Involves acts of theft or destruction of property without force against the victim
PUBLIC ORDER CRIMES	Involves acts conflicting with social policies or public opinion
SEXUAL CRIMES	Involves acts with a sexual component, causing physical or emotional harm
VIOLENT CRIMES	Involves acts of using or threatening force against victims
WHITE COLLAR CRIMES	Involves acts of non-violent financial crimes committed by professionals

1. ADDITIONAL DATASETS GENERATED

AREAS

AREA NAME	ACRONYM	BOUNDARIES	SURFACE (Km^2)
Harbor Gateway	HAR	Shape(HAR)	19.073
Palms	PLM	Shape(PLM)	31.064
Bel Air	BAR	Shape(BAR)	57.300
Granada Hills	GHL	Shape(GHL)	61.663
Mission Hills	MSS	Shape(MSS)	44.095
...			

1. ADDITIONAL DATASETS GENERATED

PERIODS

PERIOD LABEL	START DATE	END DATE	DURATION (days)
Covid Starting	2020-01-01	2020-03-10	69
First Lockdown	2020-03-11	2020-05-28	78
First Reopening	2020-05-29	2020-11-16	171
Mask Mandate	2020-11-17	2021-01-24	68
...			
Executive Orders Dropped	2022-02-25	2022-12-01	308

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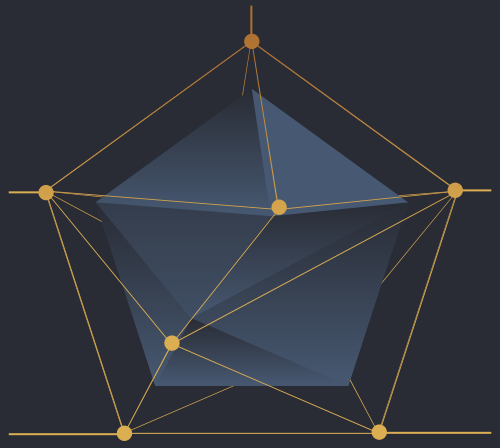
ONTOLOGY DEVELOPMENT

The functioning core of our system

2. REQUIREMENTS ANALYSIS

DOMAIN
What do we want to do and describe with the data?



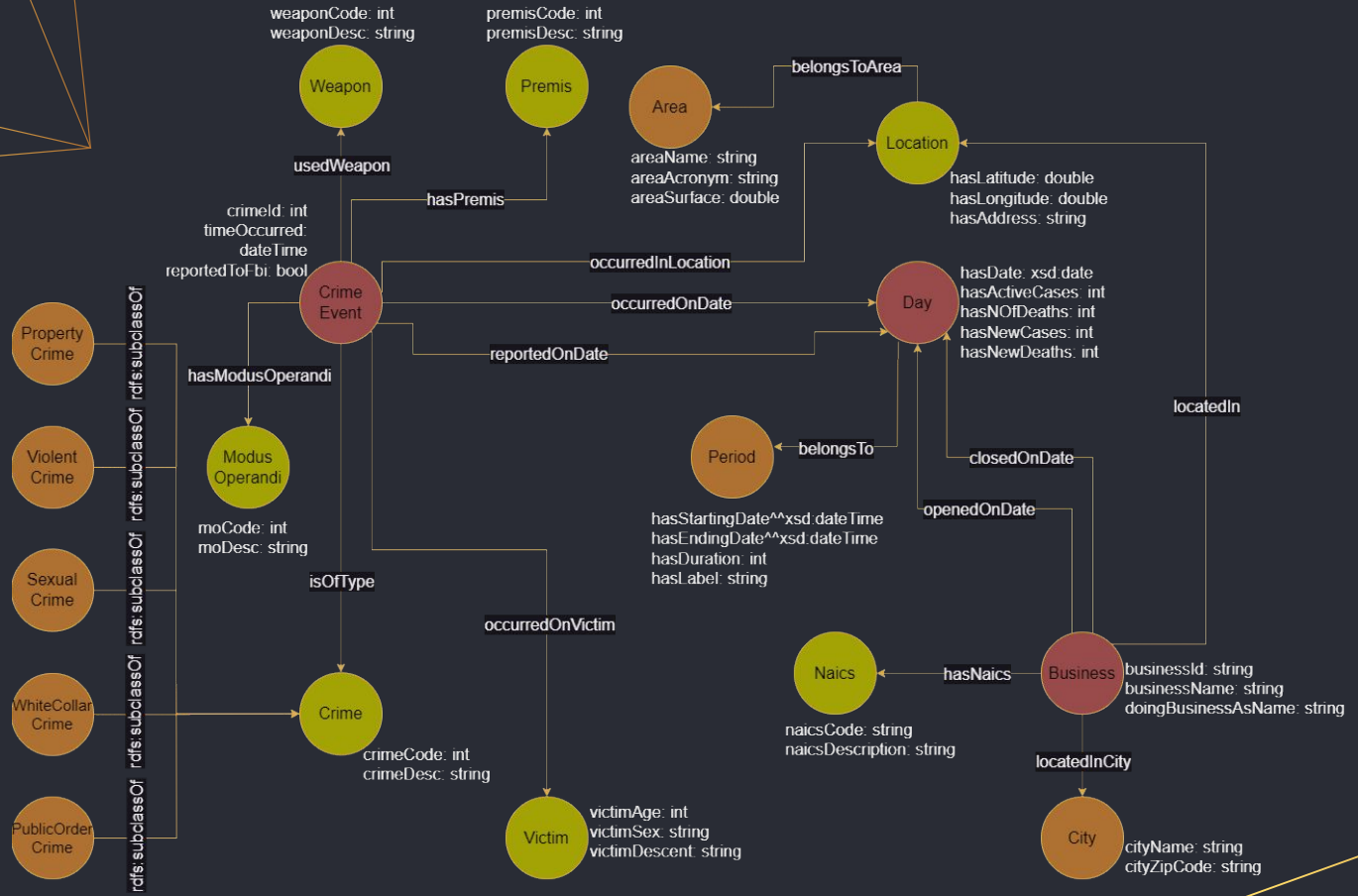
TERMINOLOGY
What are the important terms in the ontology?

CLASSES
What are the classes and their hierarchy?

QUERYING
For what type of questions do we want to provide answers?

PROPERTIES
What are the object and data properties?

2. ONTOLOGY MODELLING



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DATA INGESTION

Processing data integration

3. GRAPH POPULATION

RDFLIB

The vast majority of our data have been serialized using *RdfLib*

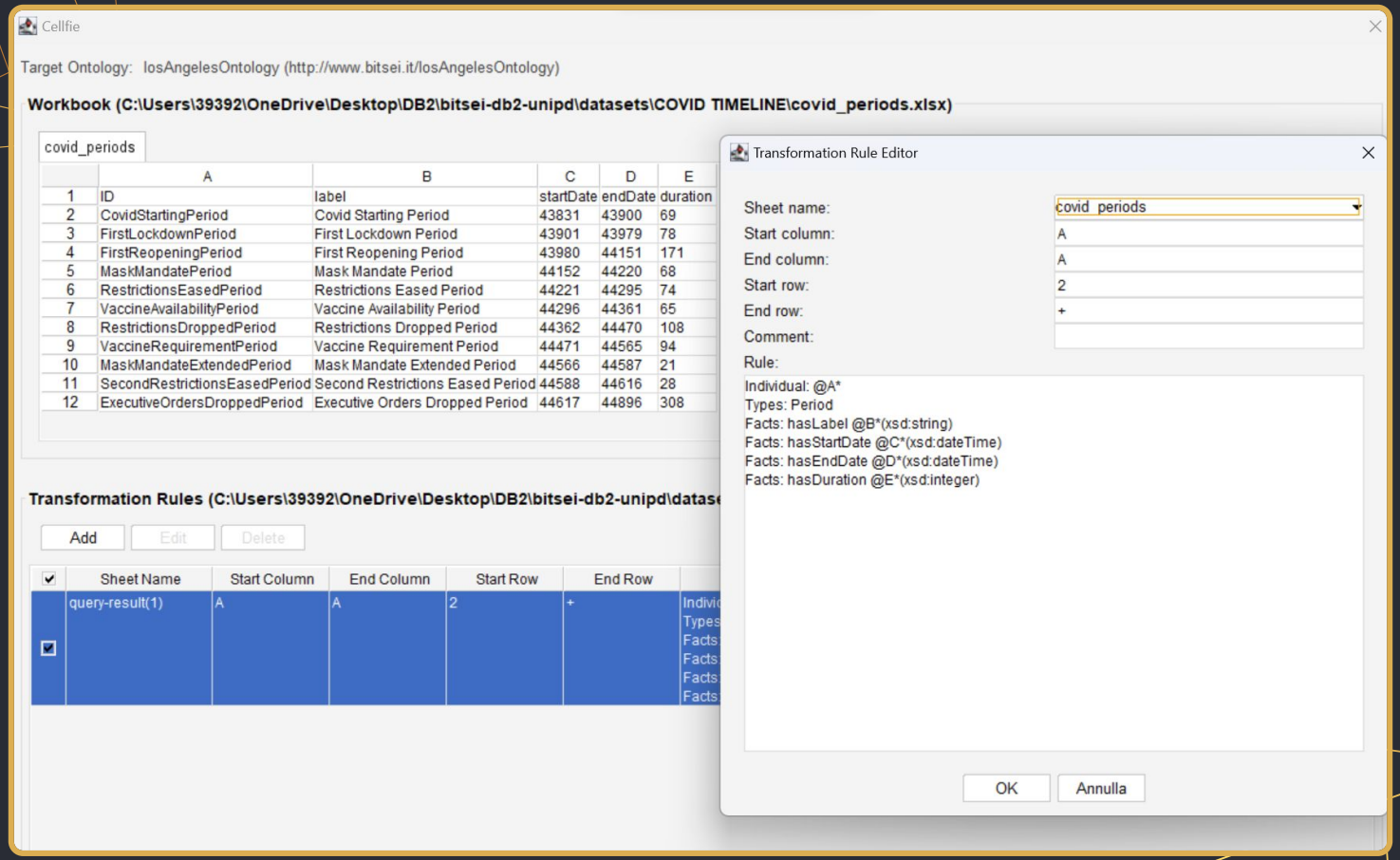
CELLFIE

Data associated to ***periods*** and ***crime typologies*** have been imported directly on the ontology using the *Cellfie* plugin

GRAPHDB

Triples then have been ingested in a platform-independent version of *GraphDB*, hosted on a virtual private server, so to have a shared environment among us.

3. CELLFIE USAGE



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DATA VALIDATION AND QUERYING

Ensuring data integrity and revealing valuable patterns and trends

4. DATA AND OBJECT PROPERTIES VALIDATION

After the data have been ingested, we conducted a complete validation process to ensure the integrity and reliability of the datasets within our ontology.

DATA PROPERTIES VALIDATION

Verified data cardinality and datatypes to ensure accuracy and consistency

OBJECT PROPERTIES VALIDATION

Checked object cardinality, domains, and ranges for integrity and adherence to ontology specifications.

Example of an **object property** validation

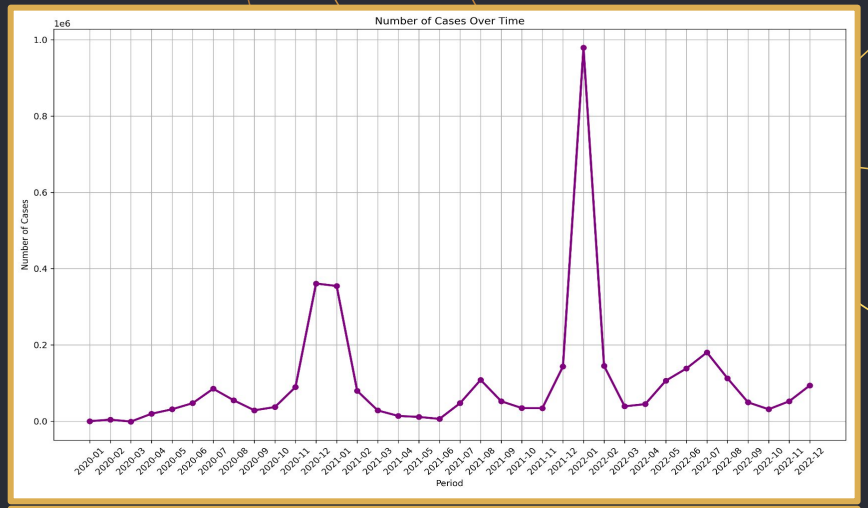
```
PREFIX lao: <http://www.bitsei.it/losAngelesOntology/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX val: <http://www.bitsei.it/validateLosAngelesOntology/>
PREFIX sh: <http://www.w3.org/ns/shacl#>
val:checkBusinessNodes
   a sh:NodeShape ;
   sh:targetClass lao:Business ;
   sh:property [
      sh:path lao:locatedInCity ;
      sh:Class lao:City ;
      sh:maxCount 1 ;
   ] ;
   sh:property [
      sh:path lao:hasNaics ;
      sh:Class lao:Naics ;
      sh:maxCount 1 ;
   ] ;
   sh:property [
      sh:path [sh:alternativePath (lao:openedOnDate
lao:closedOnDate)] ;
      sh:Class lao:Day ;
      sh:minCount 1 ;
   ] ;
   sh:property [
      sh:path lao:openedOnDate ;
      sh:Class lao:Day ;
      sh:maxCount 1 ;
   ] ;
   sh:property [
      sh:path lao:closedOnDate ;
      sh:Class lao:Day ;
      sh:maxCount 1 ;
   ] ;
.
```

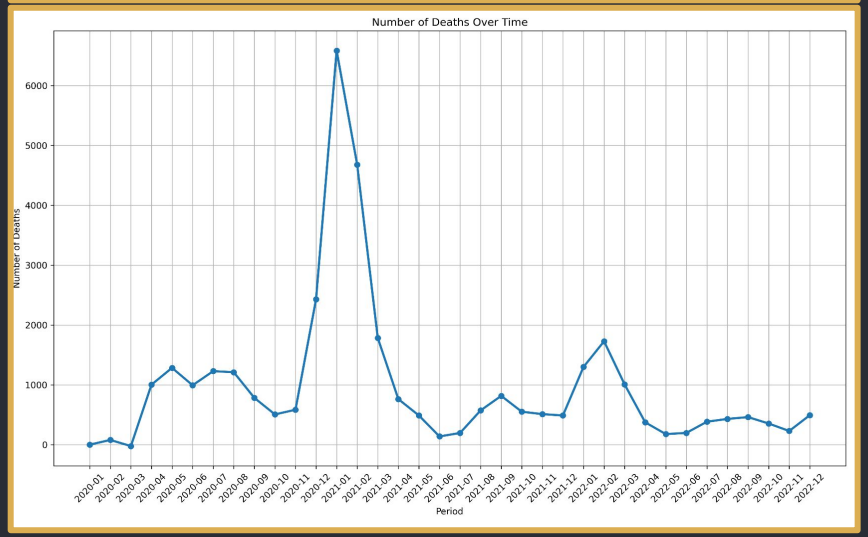
Example of a **data property** validation

```
PREFIX lao: <http://www.bitsei.it/losAngelesOntology/>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX val: <http://www.bitsei.it/validateLosAngelesOntology/>
PREFIX sh: <http://www.w3.org/ns/shacl#>

val:checkBusinessNodes
   a sh:NodeShape ;
   sh:targetClass lao:Business ;
   sh:property [
      sh:path lao:businessId ;
      sh:datatype xsd:string ;
      sh:minCount 1 ;
      sh:maxCount 1 ;
   ] ;
   sh:property [
      sh:path lao:businessName ;
      sh:datatype xsd:string ;
      sh:minCount 1 ;
      sh:maxCount 1 ;
   ] ;
   sh:property [
      sh:path lao:doingBusinessAsName ;
      sh:datatype xsd:string ;
      sh:maxCount 1 ;
   ] ;
.
```

Q1 A: number of COVID cases and COVID deaths grouped by month and year

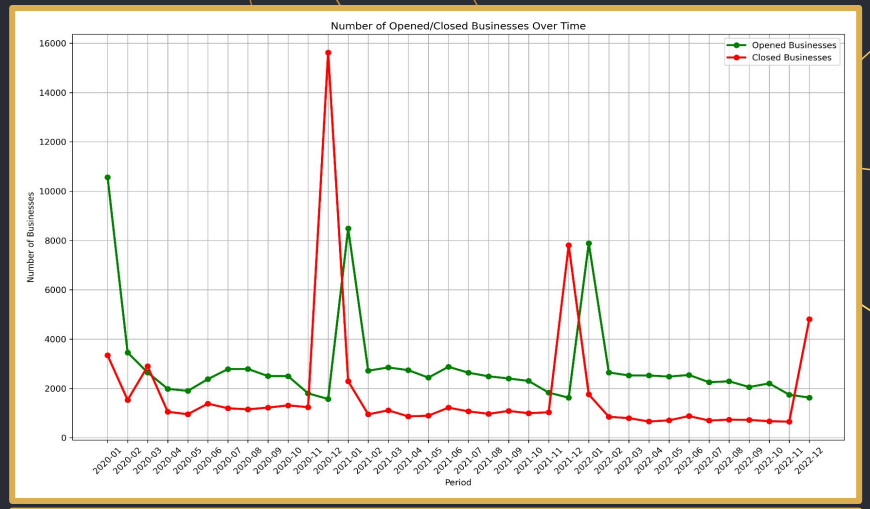
```
SELECT DISTINCT ?period (SUM(?newCases) AS ?numOfCovidCases) (ROUND((?numOfCovidCases*100 /
30))/100 AS ?casesRatio) (SUM(?newDeaths) AS ?numOfDeaths) (ROUND((?numOfDeaths*100 /
30))/100 AS ?deathsRatio)
WHERE {
   ?day lao:hasDate ?date ;
        lao:hasNewCases ?newCases ;
        lao:hasNewDeaths ?newDeaths .

   # convert to strings
   BIND(STR(YEAR(?date)) AS ?year)
   BIND(STR(MONTH(?date)) AS ?month)
   # pad with zeros
   BIND(CONCAT("00", ?year) AS ?paddedYear)
   BIND(CONCAT("0000", ?month) AS ?paddedMonth)
   # extract the right number of digits from the padded strings
   BIND(SUBSTR(?paddedYear, STRLEN(?paddedYear)-3) AS ?fourDigitYear)
   BIND(SUBSTR(?paddedMonth, STRLEN(?paddedMonth)-1) AS ?twoDigitMonth)
   # put it all back together
   BIND(CONCAT(?fourDigitYear, "-", ?twoDigitMonth) AS ?period)

   FILTER (xsd:date(?date) >= "2020-01-01"^^xsd:date && xsd:date(?date) <= "2022-12-31"^^xsd:date)
}
GROUP BY ?period
ORDER BY ASC(?period)
```

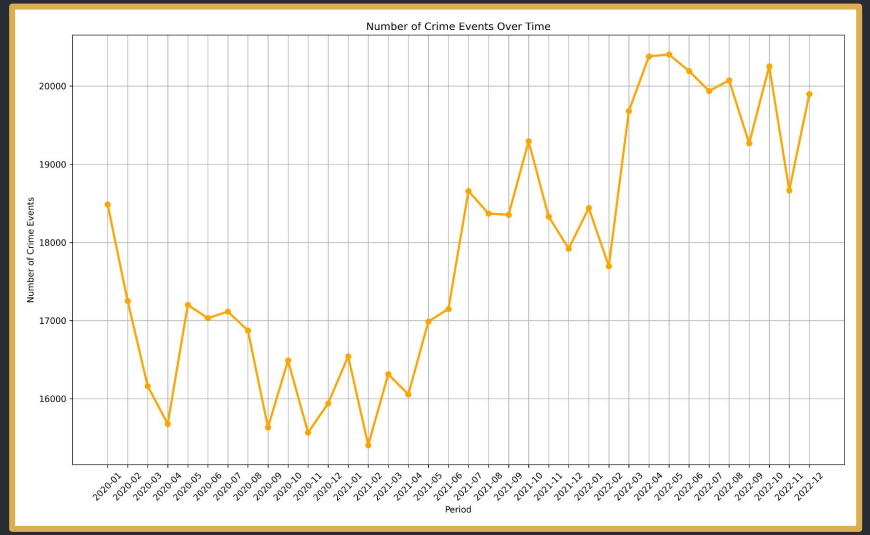




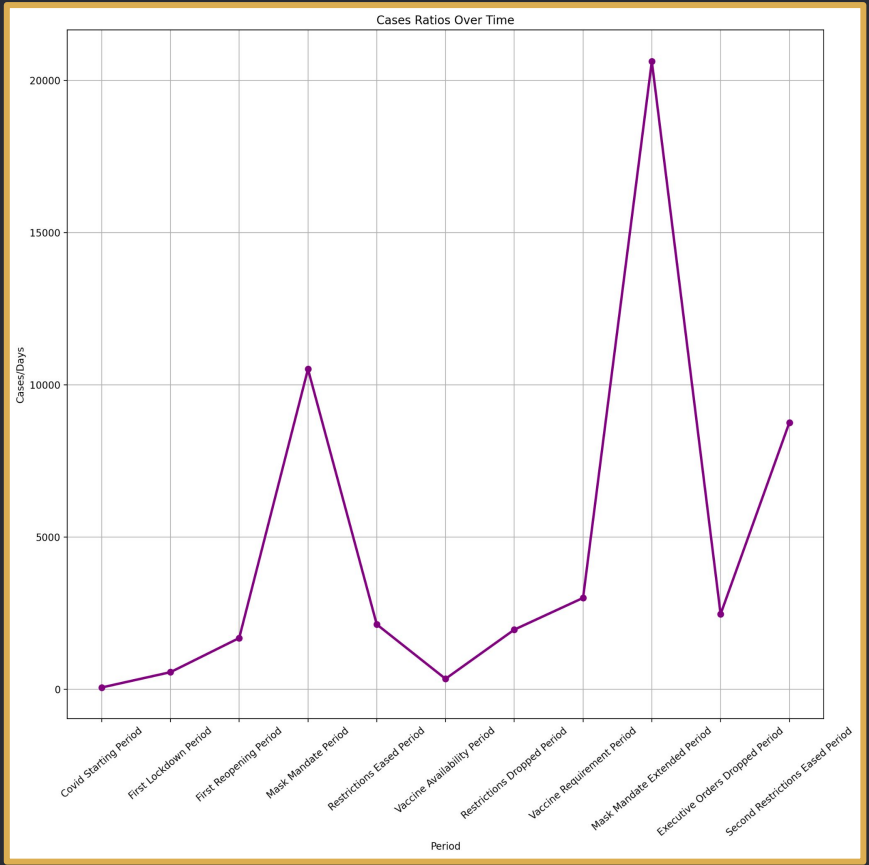
Q1 B, C & D: number of **businesses opened/closed** and **crime events** grouped by **month** and **year**

```
SELECT DISTINCT ?period (COUNT(?crimeEvent) AS ?crimeEvents) (ROUND(?crimeEvents*100 / 30)/100 AS ?ratio)
WHERE {
   ?crimeEvent lao:occurredOnDate ?day .
   ?day lao:hasDate ?date .

   # convert to strings
   BIND(STR(YEAR(?date)) AS ?year)
   BIND(STR(MONTH(?date)) AS ?month)
   # pad with zeros
   BIND(CONCAT("00", ?year) AS ?paddedYear)
   BIND(CONCAT("0000", ?month) AS ?paddedMonth)
   # extract the right number of digits from the padded strings
   BIND(SUBSTR(?paddedYear, STRLEN(?paddedYear)-3) AS ?fourDigitYear)
   BIND(SUBSTR(?paddedMonth, STRLEN(?paddedMonth)-1) AS ?twoDigitMonth)
   # put it all back together
   BIND(CONCAT(?fourDigitYear, "-", ?twoDigitMonth) AS ?period)

   FILTER (xsd:date(?date) >= "2020-01-01"^^xsd:date && xsd:date(?date) <= "2022-12-31"^^xsd:date)
}
GROUP BY ?period
ORDER BY ASC(?period)
```

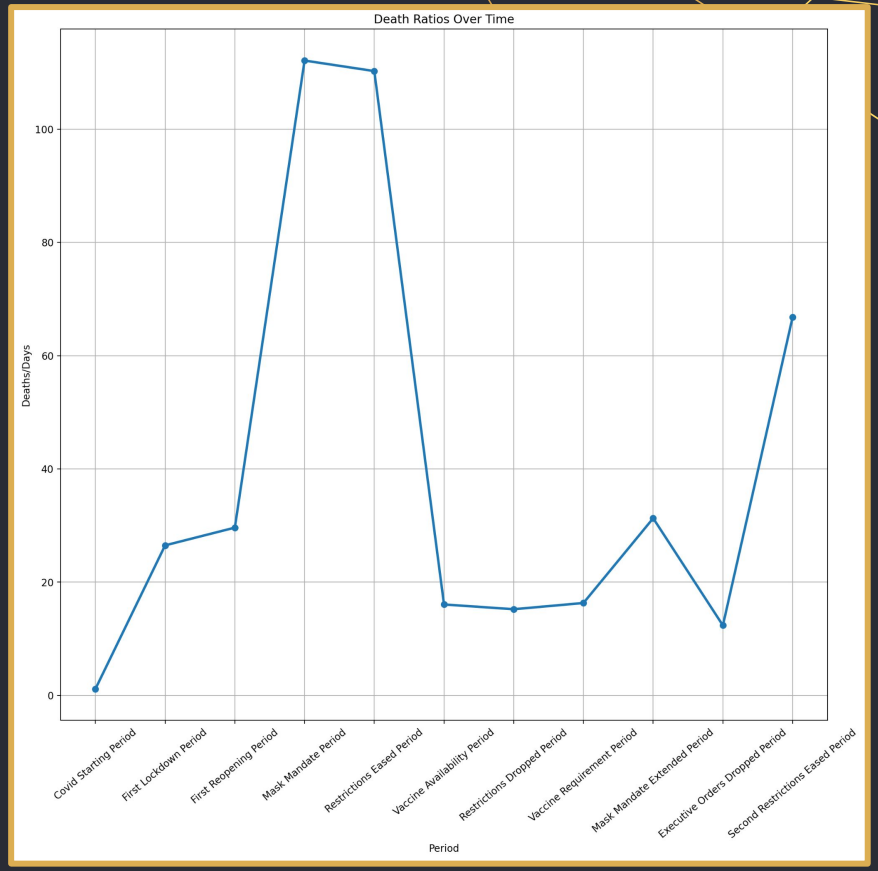




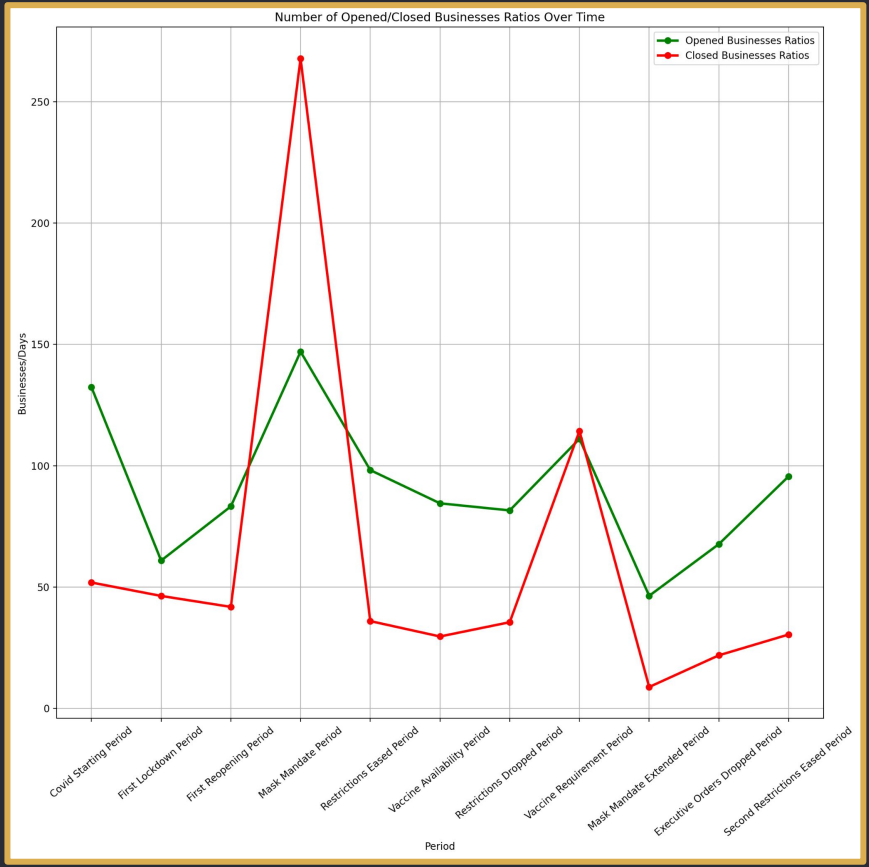
Q2 A: number of **COVID cases** grouped by **period**



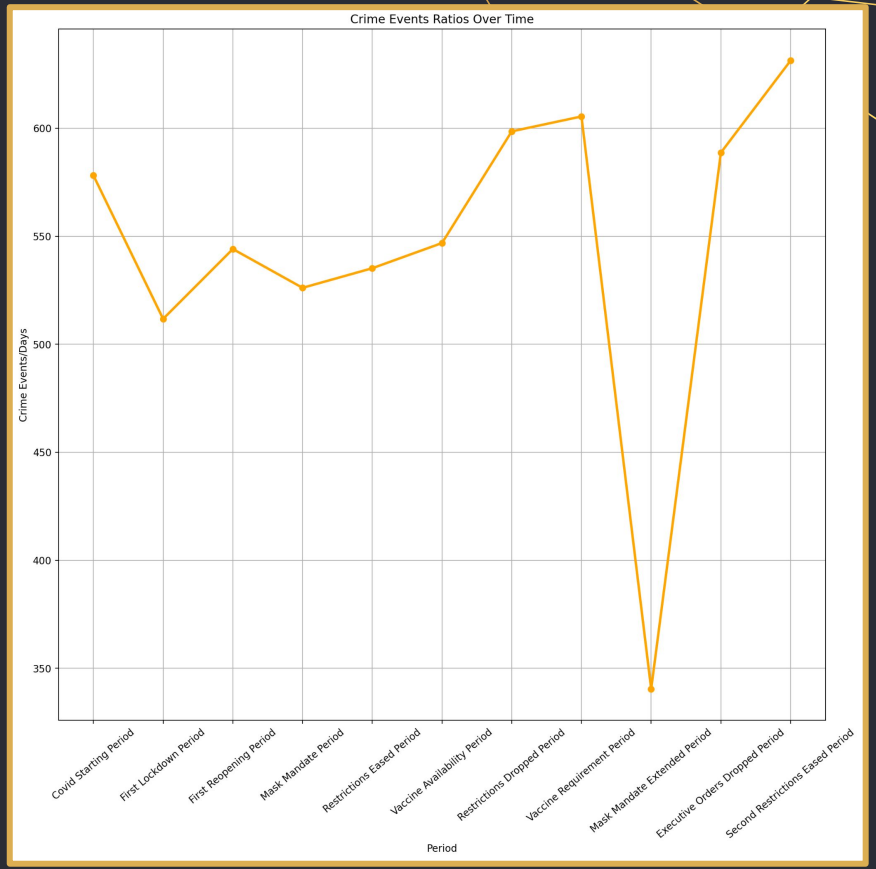
Q2 B: number of **COVID deaths** grouped by **period**



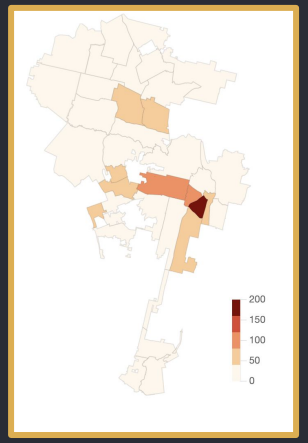
Q2 C: number of **opened/closed businesses** grouped by **period**



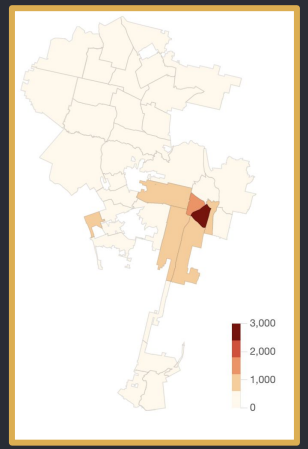
Q2 D: number of **crime events** grouped by **period**



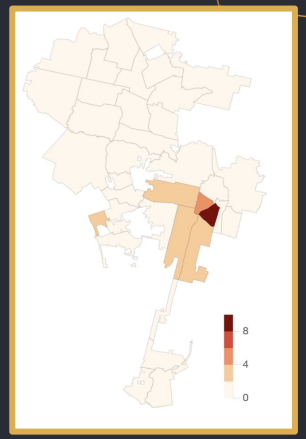
Q3: Different distributions over administrative subdivisions of LA



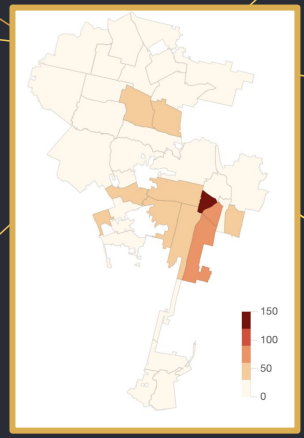
A. OPENED BUSINESSES



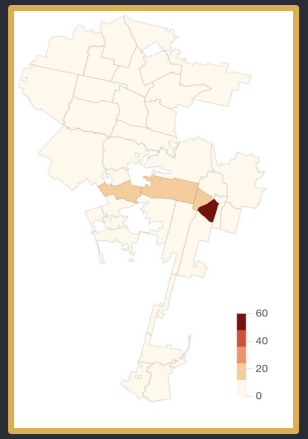
C. TOTAL CRIME EVENTS



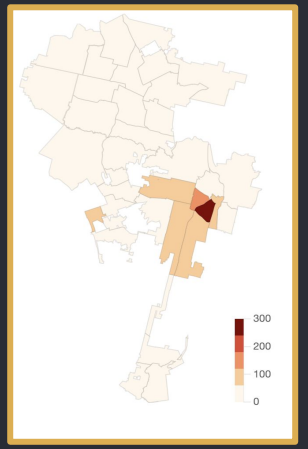
E. SEXUAL CRIME EVENTS



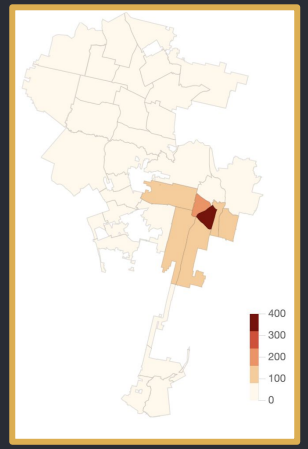
G. WHITE COLLAR CRIME EVENTS



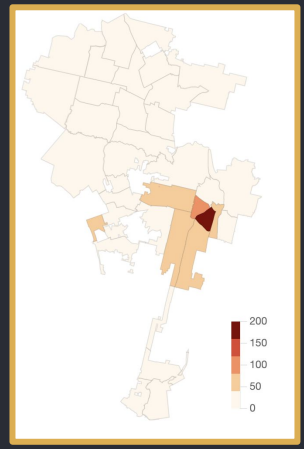
B. CLOSED BUSINESSES



D. VIOLENT CRIME EVENTS



F. PROPERTY CRIME EVENTS



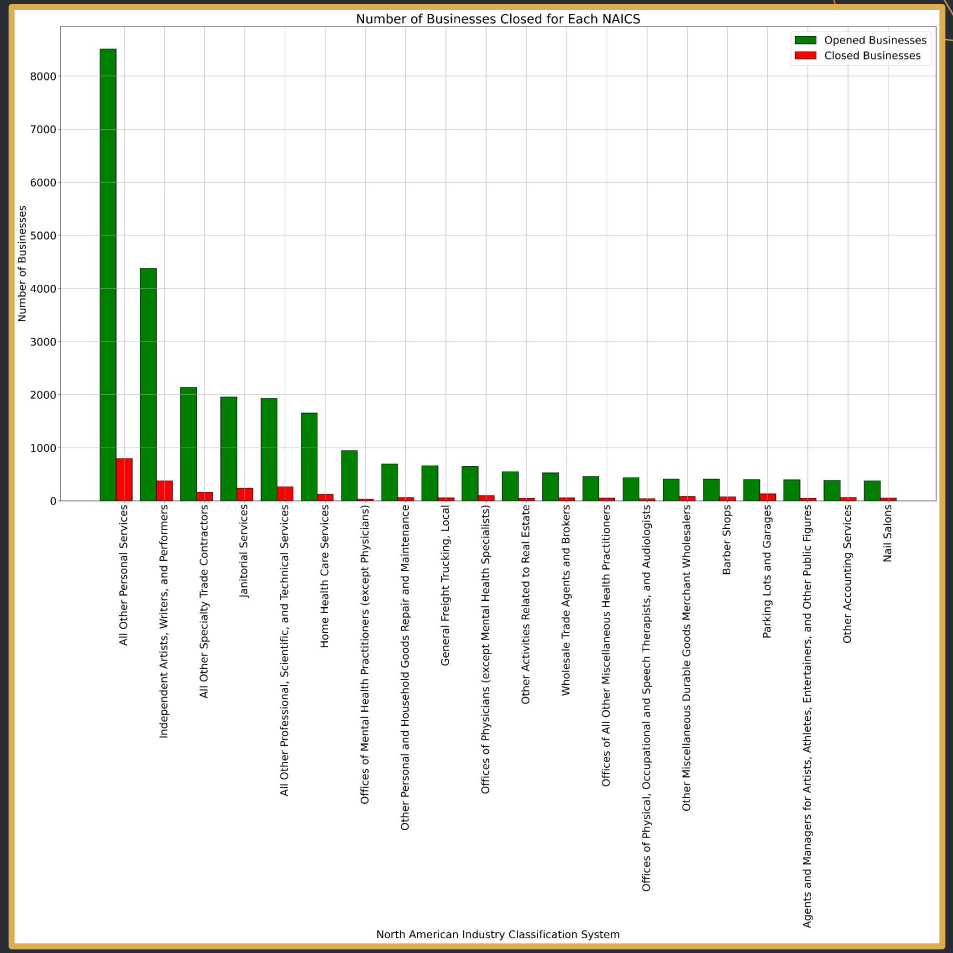
H. PUBLIC ORDER CRIME EVENTS

Q3 A: query & output sample

```
SELECT DISTINCT ?areaName ?areaAcronym (ROUND(?areaSurface*100)/100 AS
?areaSize) (COUNT(?openBusiness) AS ?openedBusinesses)
(((ROUND(?openedBusinesses * 1000 / ?areaSurface)) / 1000) AS ?ratio)
WHERE {
   ?openBusiness lao:openedOnDate ?day ;
            lao:locatedIn ?location .
   ?day lao:hasDate ?date .
   ?location lao:belongsToArea ?area .
   ?area lao:areaName ?areaName ;
       lao:areaAcronym ?areaAcronym ;
       lao:areaSurface ?areaSurface
   # convert to strings
   BIND(STR(YEAR(?date)) AS ?year)
   BIND(STR(MONTH(?date)) AS ?month)
   # pad with zeros
   BIND(CONCAT("00", ?year) AS ?paddedYear)
   BIND(CONCAT("0000", ?month) AS ?paddedMonth)
   # extract the right number of digits from the padded strings
   BIND(SUBSTR(?paddedYear, STRLEN(?paddedYear)-3) AS ?fourDigitYear)
   BIND(SUBSTR(?paddedMonth, STRLEN(?paddedMonth)-1) AS
?twoDigitMonth)
   # put it all back together
   BIND(CONCAT(?fourDigitYear, "-", ?twoDigitMonth) AS ?period)

   FILTER (xsd:date(?date) >= "2020-01-01"^^xsd:date && xsd:date(?date) <=
"2022-12-31"^^xsd:date)
}
GROUP BY ?areaName ?areaAcronym ?areaSurface
ORDER BY DESC(?ratio)
```

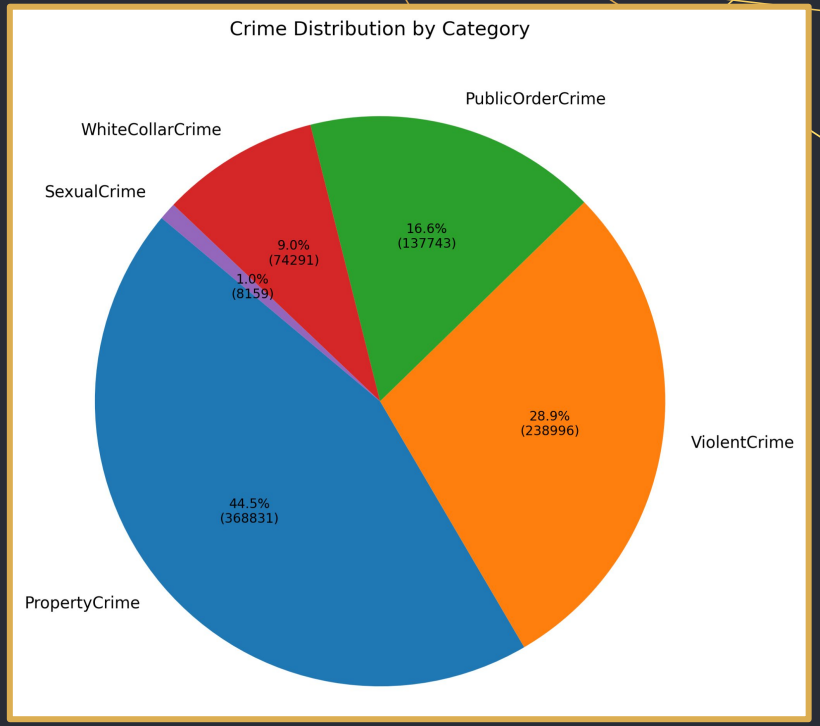
Area Name	Area Acronym	Area Size	Opened Bus.	Ratio
Central City	CCY	13,19	2552	193,482
Westlake	WLK	11,48	1195	104,051
Wilshire	WIL	52,98	4806	90,714
West Los Angeles	WLA	27,04	1837	67,941
Van Nuys	VNY	48,80	2688	55,079

Q4: number of **opened/closed businesses** grouped by **NAICS**

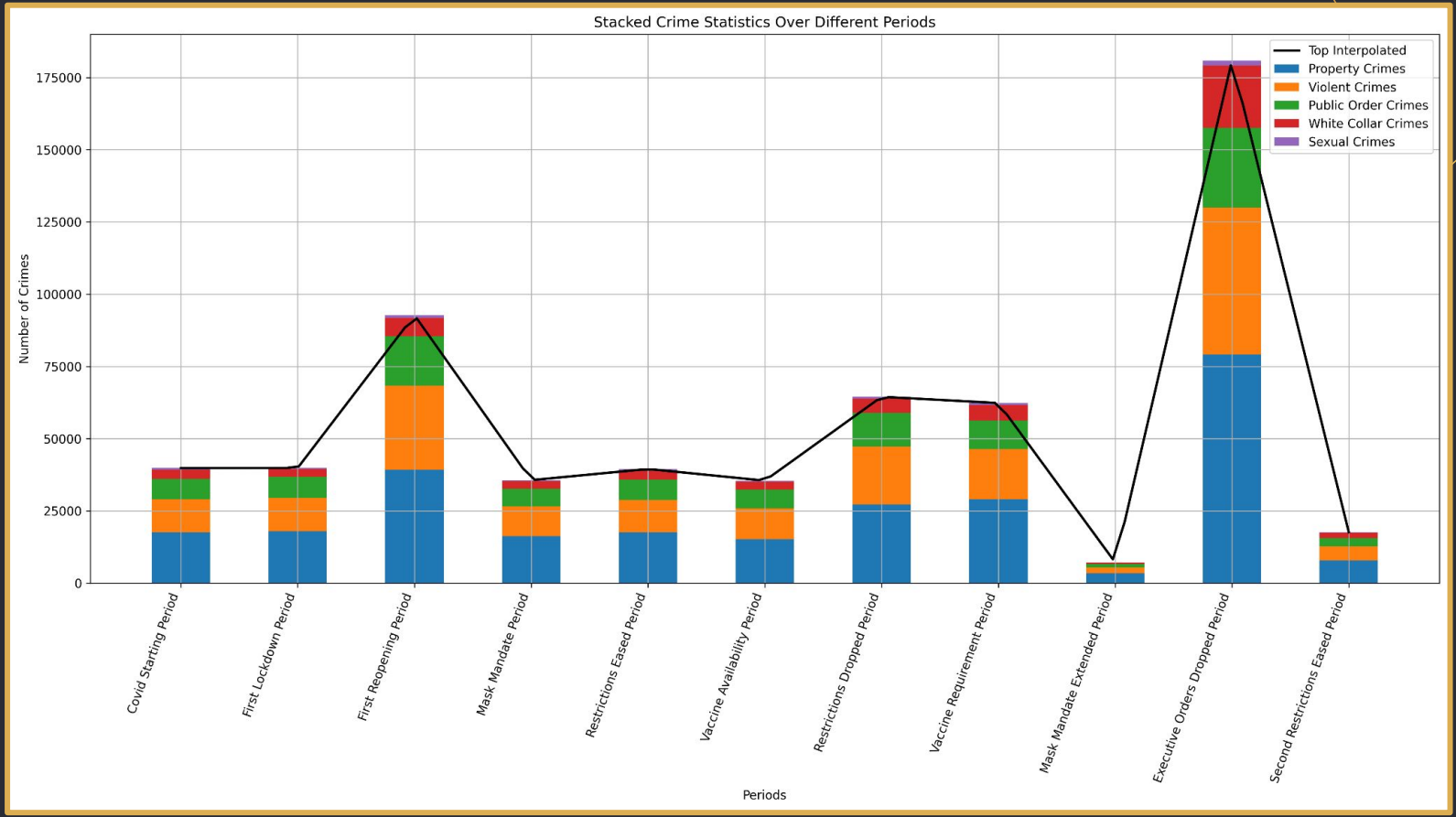


Q5 A: number of **crime events** grouped by **crime category**

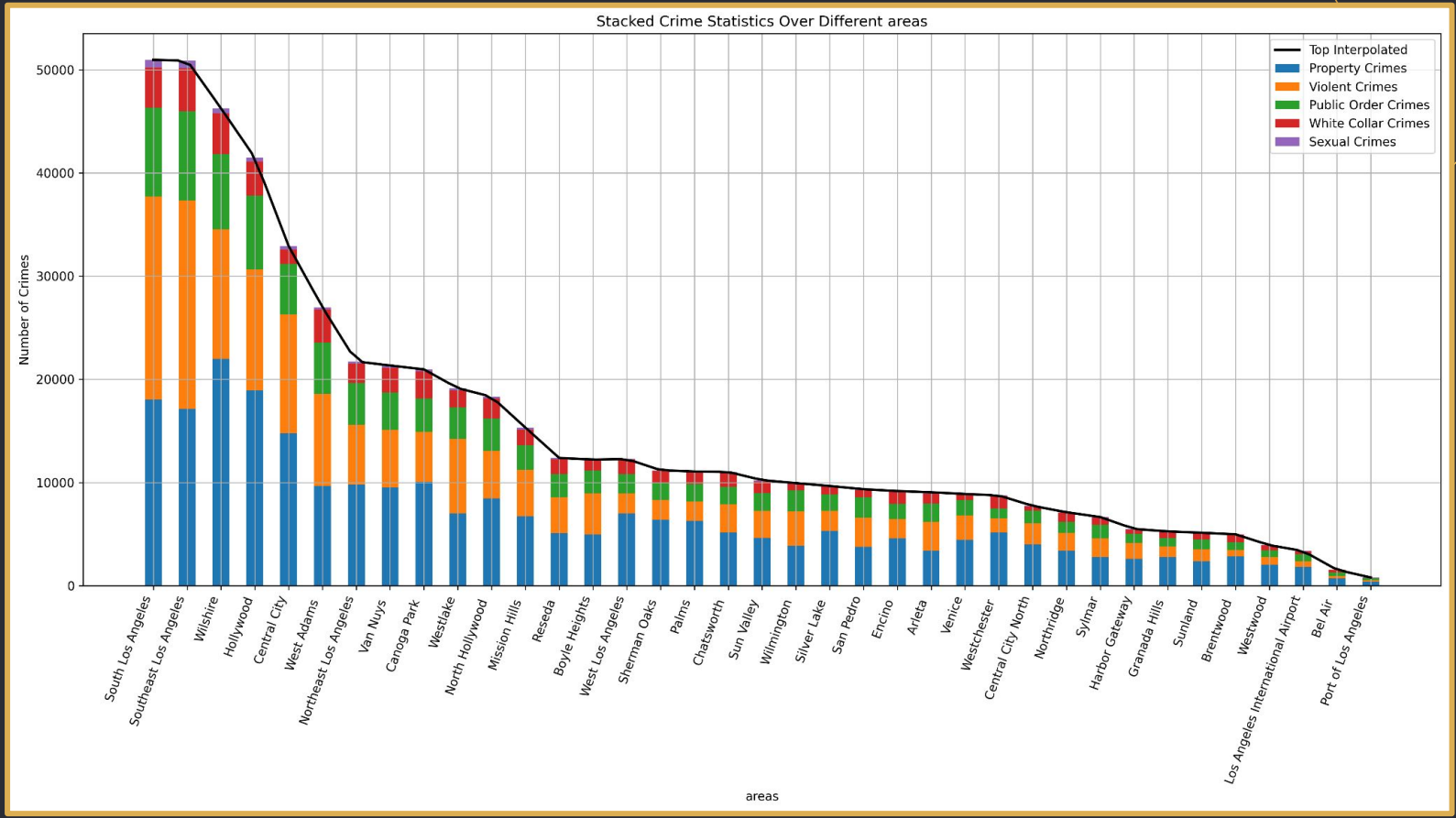
```
SELECT ?crimeCategory (COUNT(?crimeEvent) AS ?numOfCrimeEvents)
WHERE {
   ?crimeEvent lao:isOfType ?crime .
   ?crime a ?crimeCat .
   ?crimeCat rdfs:subClassOf lao:Crime .
   BIND(REPLACE(STR(?crimeCat), ".*/", "") AS ?crimeCategory)
}
GROUP BY(?crimeCategory)
ORDER BY DESC(?numOfCrimeEvents)
```



Q5 B: number of **crime events** grouped by **period** and **crime category**



Q5 B: number of **crime events** grouped by **area** and **crime category**



Q6: number of **crimes** (for each period), grouped by the **modus operandi** involved

MODUS OPERANDI	Covid Starting	First Lockdown	First Reopening	Mask Mandate	Restrictions Eased	Vaccine Availability	Restrictions Dropped	Vaccine Requirement	Mask Mandate Extended	Second Restrictions Eased	Executive Orders Dropped
Removes vict property	12951	11987	26171	10812	11667	10189	18578	18949	2270	5313	52895
Stranger	10354	10526	29605	11822	12995	11619	21854	21461	2442	6374	69189
Victim knew Suspect	5687	6449	16466	5945	6660	6307	11439	9745	1109	2709	28483
Hit-Hit w/ weapon	5465	5379	13078	4484	4872	4754	9231	7606	904	2152	22599
Vandalized	5262	5687	13792	5196	5571	5029	9179	8272	1008	2279	22709
Vehicle involved	3416	3941	9395	4013	4391	3846	6658	6236	785	1708	16537
Domestic violence	3250	3643	7980	2980	3271	3161	5571	4795	560	1300	13745
Force used	2912	2671	7154	2691	3215	2928	5746	5021	551	1419	14500
Evidence Booked (any crime)	2532	2983	6654	2475	2735	2496	4315	3439	419	1008	10315
Suspect is homeless/transient	2237	2557	5944	1919	2340	2275	4127	3273	403	904	9117
Smashed	1941	1490	3497	1374	1413	1227	2340	2735	363	846	8118
Susp is/was current/former boyfriend/girlfr	1929	2236	4935	1878	2018	1942	3466	3006	341	855	9025
Victim was aged (60 & over) or blind/physically disabled/unable to care for self	1866	1723	4388	1603	1701	1461	2885	2537	275	698	7361
Breaks window	1789	1336	2671	1124	1154	1068	2036	2185	282	645	6295
Pushed	1748	1699	3915	1408	1543	1357	2594	2314	302	676	6796
Susp uses vehicle	1641	1791	4835	1857	2138	1839	3206	2466	334	737	7405
Took merchandise	1596	1064	2612	993	1099	906	1606	1820	229	554	6745
Brandishes weapon	1377	1542	4303	1736	1781	1757	2965	2719	320	794	7713
Other MO (see rpt)	1185	1142	2631	1281	1466	1222	2263	2247	224	675	7285
Open/unlocked	1159	1253	2533	896	971	813	1362	1271	174	340	2981
Susp is/was current/former spouse/cohabitant	1107	1213	2595	931	933	933	1689	1467	173	383	4295
Multi-susps overwhelm	1074	1098	2665	965	1051	766	1466	1273	165	431	4211

Q6: number of **crimes** (for each period), grouped by the **modus operandi** involved

```
SELECT ?moDesc
    (SUM(?crimeCovidStartingPeriod) AS ?crimeCovidStartingPeriod)
    (SUM(?crimeFirstLockdownPeriod) AS ?crimeFirstLockdownPeriod)
    (SUM(?crimeFirstReopeningPeriod) AS ?crimeFirstReopeningPeriod)
    (SUM(?crimeMaskMandatePeriod) AS ?crimeMaskMandatePeriod)
    (SUM(?crimeRestrictionsEasedPeriod) AS ?crimeRestrictionsEasedPeriod)
    (SUM(?crimeVaccineAvailabilityPeriod) AS ?crimeVaccineAvailabilityPeriod)
    (SUM(?crimeRestrictionsDroppedPeriod) AS ?crimeRestrictionsDroppedPeriod)
    (SUM(?crimeVaccineRequirementPeriod) AS ?crimeVaccineRequirementPeriod)
    (SUM(?crimeMaskMandateExtendedPeriod) AS ?crimeMaskMandateExtendedPeriod)
    (SUM(?crimeSecondRestrictionsEasedPeriod) AS ?crimeSecondRestrictionsEasedPeriod)
    (SUM(?crimeExecutiveOrdersDroppedPeriod) AS ?crimeExecutiveOrdersDroppedPeriod)
WHERE {
 ?mo lao:moDesc ?moDesc .
 ?crimeEvent lao:hasModusOperandi ?mo ;
         lao:occurredOnDate ?day .
 ?day lao:belongsTo ?period .
 ?period lao:hasLabel ?label .

 BIND(IF(?label = "Covid Starting Period", 1, 0) AS ?crimeCovidStartingPeriod)
 BIND(IF(?label = "First Lockdown Period", 1, 0) AS ?crimeFirstLockdownPeriod)
 BIND(IF(?label = "First Reopening Period", 1, 0) AS ?crimeFirstReopeningPeriod)
 BIND(IF(?label = "Mask Mandate Period", 1, 0) AS ?crimeMaskMandatePeriod)
 BIND(IF(?label = "Restrictions Eased Period", 1, 0) AS ?crimeRestrictionsEasedPeriod)
 BIND(IF(?label = "Vaccine Availability Period", 1, 0) AS ?crimeVaccineAvailabilityPeriod)
 BIND(IF(?label = "Restrictions Dropped Period", 1, 0) AS ?crimeRestrictionsDroppedPeriod)
 BIND(IF(?label = "Vaccine Requirement Period", 1, 0) AS ?crimeVaccineRequirementPeriod)
 BIND(IF(?label = "Mask Mandate Extended Period", 1, 0) AS ?crimeMaskMandateExtendedPeriod)
 BIND(IF(?label = "Second Restrictions Eased Period", 1, 0) AS ?crimeSecondRestrictionsEasedPeriod)
 BIND(IF(?label = "Executive Orders Dropped Period", 1, 0) AS ?crimeExecutiveOrdersDroppedPeriod)
}
GROUP BY ?moDesc
ORDER BY DESC(?crimeCovidStartingPeriod)
```

Q7: number of **crimes** for each **period**, grouped by the **premise** in which they occurred

PREMISE	Covid Starting	First Lock-down	First Re-opening	Mask Man-date	Restrictions Eased	Vaccine Availability	Restrictions Dropped	Vaccine Re-quirement	Mask Mandate Extended	Second Restrictions Eased	Executive Orders Dropped
STREET	9457	10018	24171	9459	10120	8972	16655	16088	1857	4295	44370
SINGLE FAMILY DWELLING	6907	6910	15542	5954	6599	5894	10604	10098	1116	2998	31674
"MULTI-UNIT DWELLING (APART-MENT, DUPLEX, ETC)"	4545	4958	11371	4442	4956	4306	7712	7490	868	2101	22405
PARKING LOT	2967	2950	6597	2660	2899	2722	4703	4859	582	1259	12337
SIDEWALK	1942	1769	4495	1464	1710	1583	2965	2402	276	732	7925
OTHER BUSINESS	1820	1718	4402	1715	1825	1455	3068	2847	320	750	8323
"VEHICLE, PASSEN-GER/TRUCK"	1375	1306	3234	1145	1307	1208	2134	1786	197	485	4827
DRIVEWAY	747	910	1836	690	799	607	1058	1090	125	345	2555
GARAGE/CAI	607	962	1973	895	929	838	1376	1574	187	425	3187
RESTAURANT FOOD	599	489	1126	343	399	399	906	755	105	234	2410
DEPARTMEN STORE	514	178	609	222	268	266	409	544	57	154	2056
MARKET	431	368	642	266	292	250	384	398	59	108	1388
PARKING UNDER-GROUND/BUI	407	553	1195	372	437	279	557	676	57	205	1332
PARK/PLAYG	317	241	636	198	272	255	429	384	47	107	1146
ALLEY	277	321	789	309	318	294	488	474	46	131	1210
OTHER PREMISE	276	304	706	302	349	312	561	540	47	146	1518
YARD (RESIDEN-TIAL/BUSINE	250	282	626	241	268	242	477	382	28	108	1066
OTHER STORE	249	177	436	143	197	163	351	326	40	107	994
HIGH SCHOOL	222	69	143	40	50	52	173	248	17	66	684
GAS STA-TION	220	284	624	219	278	246	411	364	49	101	998
DRUG STORE	220	256	448	147	161	168	264	238	21	88	711
PUBLIC STORAGE	211	199	475	231	187	118	209	214	25	77	525
HOTEL	188	221	717	255	270	265	435	359	45	84	950

Q8: number of **crimes** for each **period**, grouped by the **weapon** used

WEAPON	Covid Starting	First Lock-down	First Re-opening	Mask Man-date	Restrictions Eased	Vaccine Availability	Restrictions Dropped	Vaccine Re-quirement	Mask Mandate Extended	Second Restrictions Eased	Executive Orders Dropped
STRONG-ARM	8252	7765	18427	6455	7141	6788	12809	11220	1323	3125	32719
UNKNOWN WEAPON/OT WEAPON	1442	1598	3821	1413	1484	1198	2293	1991	220	519	6228
VERBAL THREAT	1154	998	2448	845	989	928	1695	1496	158	436	4562
HAND GUN	631	640	1992	964	884	838	1570	1464	189	418	3790
KNIFE WITH BLADE 6INCHES OR LESS	251	297	796	251	288	296	463	504	51	113	1192
SEMI-AUTOMATIC PISTOL	235	296	806	334	297	242	572	561	77	134	1448
OTHER KNIFE	204	260	627	205	211	239	448	344	40	112	1172
UNKNOWN FIREARM	143	198	781	398	318	259	523	459	44	117	1254
MACE/PEPPE SPRAY	117	116	331	119	143	167	279	229	32	78	783
ROCK/THROV OBJECT	108	134	401	96	135	85	222	144	22	44	545
BOTTLE	105	95	321	94	97	109	209	136	13	39	449
VEHICLE	105	137	368	149	121	156	283	201	17	73	574
BLUNT IN-STRUMENT	90	63	182	47	59	57	111	81	9	28	251
FOLDING KNIFE	85	104	234	90	108	100	161	143	32	55	406
PIPE/METAL PIPE	83	128	301	116	104	99	197	161	14	40	463
STICK	82	97	293	77	89	98	194	147	17	32	454
CLUB/BAT	73	113	275	92	90	103	145	139	9	44	350
AIR PIS-TOL/REVOLV GUN	63	51	259	68	75	78	158	96	14	39	381
KITCHEN KNIFE	63	95	222	83	100	87	118	122	19	37	330
KNIFE WITH BLADE OVER 6 INCHES IN LENGTH	59	95	202	61	86	88	133	110	16	23	279
REVOLVER	58	82	183	48	49	58	72	90	13	22	184
SIMULATED GUN	55	52	123	47	68	31	59	93	6	22	258

Q9 and Q10: Property crimes (with position), grouped by the date and area acronym between 2021-12-31 and 2022-12-31

```
SELECT ?date ?acronym (COUNT(?crimeEvent) AS ?count) WHERE {
  ?crimeEvent rdf:type                  lao:CrimeEvent;
              lao:occurredInLocation    ?location;
              lao:occurredOnDate        ?day;
              lao:isOfType              ?crime.

  ?crime      rdf:type                  ?crimeCat.
  ?crimeCat   rdfs:subClassOf           lao:Crime.

  ?location   lao:hasLatitude           ?lat;
              lao:hasLongitude          ?lon;
              lao:belongsToArea         ?area.

  ?area       lao:areaAcronym           ?acronym.
  ?day        lao:hasDate               ?dt.

  FILTER(xsd:date(?dt) < "2022-12-30"^^xsd:date && xsd:date(?dt) >"2021-12-30"^^xsd:date)
  FILTER(?crimeCat = lao:PropertyCrime)
  BIND(SUBSTR(xsd:string(?dt), 1, 10) AS ?date)
}
GROUP BY ?date ?acronym
ORDER BY DESC(xsd:date(?date))
```

Near-repeat phenomenon

The near-repeat
refers to the ter
occurs at a part
location signific

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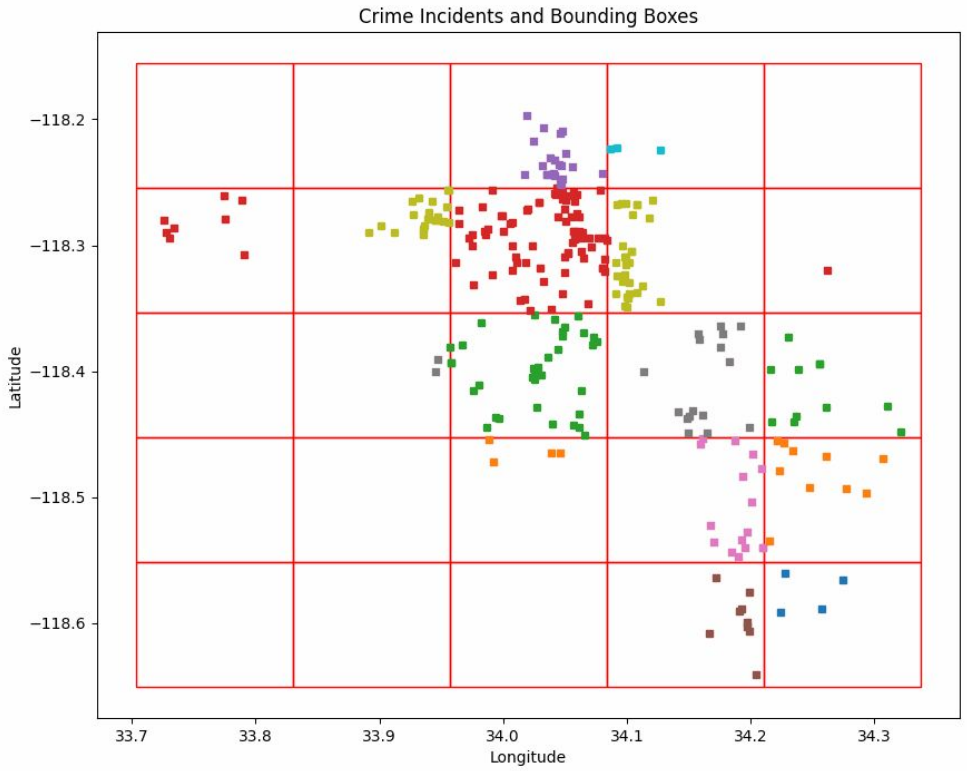
near that
ent.



From Statistical point of view for BOX-3:4

R-squared

Coefficient the relationship

Significanc efficient is equal to z s, the coefficient

1. **Intercept:** predictor variable is z

Considering these ip, and on the hand neigh

```
==============================================================================
Dep. Variable:                      y   R-squared:                       0.032
Model:                            OLS   Adj. R-squared:                  0.030
Method:                 Least Squares   F-statistic:                     12.08
Date:                Sat, 06 Jan 2024   Prob (F-statistic):           0.000572
Time:                        11:12:21   Log-Likelihood:                -1154.8
No. Observations:                 363   AIC:                             2314.
Df Residuals:                     361   BIC:                             2321.
Df Model:                           1
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const         13.5744      1.786      7.601      0.000      10.062      17.086
x1             0.0893      0.026      3.475      0.001       0.039       0.140
==============================================================================
Omnibus:                       72.693   Durbin-Watson:                   1.730
Prob(Omnibus):                  0.000   Jarque-Bera (JB):              148.908
Skew:                           1.051   Prob(JB):                     4.62e-33
Kurtosis:                       5.330   Cond. No.                         405.
==============================================================================
```

5

WEB APPLICATION

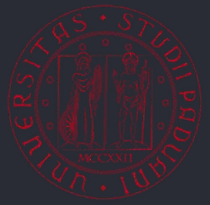
Presenting information to the general public through a platform.

DEMO

Server.IT
PREMIUM HOSTING

Our Web Application is hosted in
a private server.

You can find it at gd.bitsei.it



Università degli Studi di Padova

Dipartimento di Ingegneria dell'Informazione

THANKS!

DO YOU HAVE ANY QUESTION?

Nicola Boscolo Cegion
Mirco Cazzaro
Marco Martinelli
Farzad Shami