



IMPACT OF COVID - 19 PANDEMIC ON CRIME CASES IN LOS ANGELES

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Project Abstract

The COVID-19 pandemic of 2020 has had a global impact unlike any other. According to preliminary statistics, one of the outcomes is a substantial reduction in crime rates in many communities around the world. Los Angeles is one of the most populated cities in the United States, with a population of over four million people. For a city of this scale, it is worthwhile to investigate the city's crime rate. Although overall crime in Los Angeles declined during the COVID-19 pandemic, homicides, shootings, and car thefts spiked. However, robberies, rapes, and lesser property crimes dropped off. The crime patterns shifted completely after COVID-19 shutdown orders were issued. The swings were dramatic, too, with killings hitting a decade high after years of sustained reductions, and shootings increasing nearly 40%. Meanwhile, robberies declined by 17% and reported rapes fell 25%.

Since people commit crimes at random, crime is a difficult subject for analytics and prediction. Our model was developed in part based on that need, to help people analyze the data. This project gives all the insights about the crimes that are occurred during this pandemic which would make law enforcement agencies work more efficiently and enables them to take many preventive measures against crime, such as reviewing past criminal data and forecasting future crimes.

Project Description

As crimes happen every day it will even be harder to control in this pandemic and in cities like Los Angeles, there is no way to explain how difficult it will be. Keeping track of the crimes that are taking place in big cities is quite challenging and requires a lot of effort and time. Therefore, the main goal of this project is to gather detailed information on how and when crimes were committed in Los Angeles. It will also serve as a tracking system for crimes that occur in Los Angeles.

From the collected data we can identify information like the number of bikes stolen over a given period, the number of people affected by the crime, and so on. With this information, we can compare the crime rate from year to year. Further, by reviewing the past crimes this project helps in predicting future crimes as well. This helps law enforcement to take precautionary measures to decrease crime. As a result of utilizing this project, police can alert citizens in numerous ways that will enable them to take action and prevent crimes.

Database Initial Study

Objective:

The objective of this project is the authorized law enforcement official could add the data to the database. And This project should provide a tracking system to give the details about the criminal cases that are happened in Los Angeles. Keeping track of criminal cases may be more beneficial in this precarious situation and help to ensure people's protection.

The main objectives of this project include:

- Crimes that are committed most often.
- Identify which type of weapons are most commonly used.
- Locating the areas that are particularly vulnerable to criminal activity.
- Number of victims in Los Angeles
- Determining which age group of people is most likely to fall victim to the crime.

Analysis & Requirements:

In today's environment, crime prevention is critical, and residents must still be mindful of illegal activity in their neighborhood. This is one of the primary motivations for the development of the LAPD crime database. Crimes may be assessed based on factors such as the type of crime, the location, the weapon used, and so on.

Juvenile crime is another big concern in our culture today. It is tragic to see young people commit crimes, either knowingly or unknowingly, putting their futures in jeopardy. An examination of juvenile crimes will reveal information about our society's future. The number of juvenile crimes is calculated using variables such as crime type.

Crime and illegal activity can never be completely eradicated from our society, but they can be curtailed to a greater degree by law enforcement and citizen efforts. We, as people, have a role to play in maintaining a healthy living community, and one of the actions we should take is to report crime when we see it.

Our project needs the following requirements in order to provide detailed information about criminal cases.

- The data to be stored in the database should be true.
- The data should contain certain important information like a case number, the status of the crime, priority status of the crime, the crime happened location, victim sex the date crime occurred, and the date crime reported.

Problem Definition:

Since the Covid situation makes everyone's life harder, it does not spare law enforcement officials too. The existing system in real life does not help meet the requirements and makes it even harder.

Existing System:

The study of the existing system follows:

There are significant amounts of unrealized data in the existing system as the data volume is so enormous and the number of variables so large. It is therefore a challenge to achieve a relationship between them to derive the necessary information.

As the existing system evolves around criminal cases, there are many codes that are involved in the system. Their codes and the description of the codes are in the same place. Therefore, the existing system has more tendency to have data inconsistency and it will be a challenge to obtain data uniformity. These causes fail to achieve accurate information.

Proposed System:

This project helps to resolve all the problems found in the existing system. This project keeps track up to date to provide accurate and detailed information. This project doesn't have data inconsistency, also we ensure to obtain data uniformity. In this project, we used a well-defined database design that ensures data integrity.

From the existing system, we can't be able to find the cases which need more priority as we can't find the status of the cases. But using this project we can able to find the location of the crime that happened, victim information, case information details, the status of the case, its priority details and so on.

Constraints:

- The information provided by the law enforcement officials must be correct.
- If there is a lack of information in the data, the project will be difficult to maintain accuracy and validity.
- The law enforcement officials should have a little knowledge about the database.

Scope:

This project information is available only to authorized law enforcement officials. This project allows authorized users to access the historic data as well as current events. Also, these projects contain all the crime codes and necessary codes that are related to criminal cases.

Boundaries:

This project will be assessed with data provided by law enforcement officials. So the accuracy is fully dependent on the provided data. As humans make mistakes, we can't calculate the accuracy provided by this project.

End User:

As this project includes the personal and confidential information of particular individuals. Only Law enforcement authorities are authorized to access this project. Furthermore, not all members of Law Enforcement are permitted to edit the data. Only the Law Enforcement officials specifically appointed to access this project are allowed access. Other Law enforcement officials can only read the information from this project.

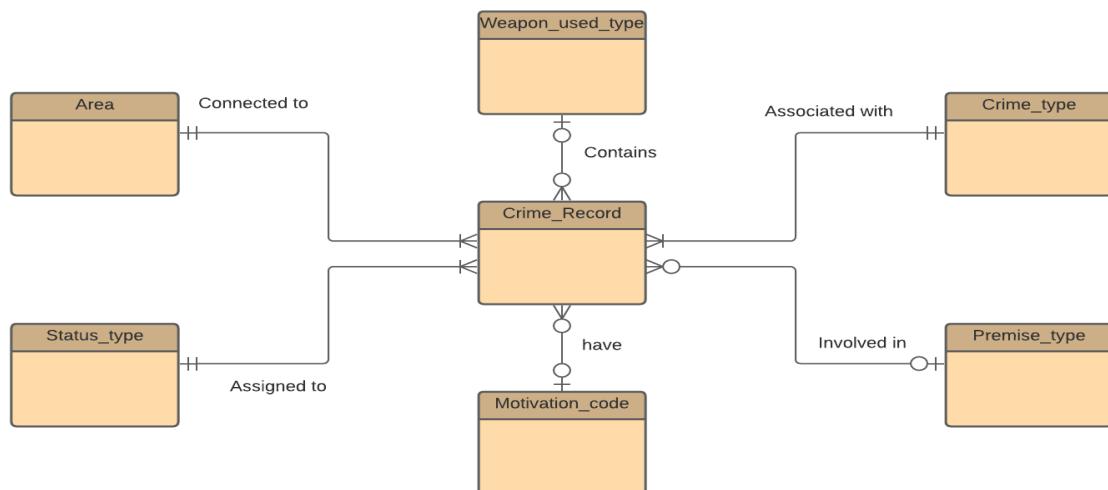
Database Design – Concept Design

In this data model, real-world objects are represented by an abstract database structure. In this point, the entities and their relationships are established, and a conceptual ERD is created.

Conceptual Data Model

At this point, a high-level ERD is developed, which represents a functional model of the established entities and their relationships. Figure illustrates the conceptual ERD.

Conceptual ER-Diagram



Business Rules

- Each crime record will be associated with one type of crime.
- Each type of crime can have more than one crime record.

- Each type of premise may or may not involve many crime records.
- Each crime record may or may not have a type of premise.
- Each crime record is connected to the area.
- Each area will have a crime record.
- Each crime record may or may not contain a type of weapon used in the crime scene.
- Each Weapon used in the crime may or may not contain many records.
- Each crime record may or may not have a motivation behind the crime.
- Each motivation may or may not have a many crime records.
- Each crime record will have a status update of the crime.
- Each status will have one or many crime records.

Entities

Entities that were identified for the mentioned business rules are as follows.

- Crime_Record
- Crime_type
- Premise_type
- Weapon_used_type
- Motivation_code
- Area
- Status_type
- Crime_address
- Priority
- Victim_descent

Relationship between the entities

Entity	Relationship	Entity
--------	--------------	--------

Crime_type	1:M	Crime_Record
Premise_type	1:M	Crime_Record
Weapon_used_type	1:M	Crime_Record
Motivation_code	M:N	Crime_Record
Area	1:M	Crime_Record
Status_type	1:M	Crime_Record
Crime_address	1:M	Crime_Record
Priority	1:M	Crime_Record
Victim_descent	1:M	Crime_Record

Description of Entities :

For this project we have used the crime data from 2019 to 2021 march provided by LAPD open data source. The datasets were huge with around 300k records, from that we have selected data using simple random sampling such that each record has equal chance of getting selected to be the part of the sample. The original data has been pre-processed in Jupyter Notebook to remove the rows and columns which are having null values, and the data has been converted into required format.

Crime_record: The crime record will include all the details that are relevant to a particular crime.

The identified attributes are:

- **DR_No**- Division of Records Number: Official file number made up of a 2 digit year, area ID, and 5 digits.
- **Date_occurrence** - Date of crime occurrence (YYYY-MM-DD).
- **Date_reported** – Reporting date of the crime.
- **Area_ID** – Indicates where the crime took place.
- **Priority_code** – Indicated the priority of the crime.
- **Crime_Code** - Indicates the crime committed.
- **Mo_code** – Indicates the Motivation of the crime.
- **Victim_age** – Indicates the age of the victim.
- **Victim_Sex** - F: Female M: Male X: Unknown.
- **Victim_Descent** - Descent Code: **A** - Other Asian **B** - Black **C** - Chinese **D** - Cambodian **F** - Filipino **G** - Guamanian **H** - Hispanic/Latin/Mexican **I** - American Indian/Alaskan Native **J** - Japanese **K** - Korean **L** - Laotian **O** - Other **P** - Pacific Islander **S** - Samoan **U** - Hawaiian **V** - Vietnamese **W** - White **X** - Unknown **Z** - Asian Indian.
- **Premise_Code** – Indicates the type of structure, vehicle, or location where the crime took place.
- **Weapon_used_code** – Indicates the type of the weapon used in crime scene.
- **Status_code** – Indicates the status of the crime.

Crime_type: The crime type is about the description of the crime.

The identified attributes are:

- **Crime_code:** Each crime will have a crime code.
- **Crime_Description :** Describes the code.

Premise_type: The Premise type is about the description of the structure, vehicle or location where the crime took place.

The identified attributes are:

- **Premise_code:** Each crime may or may not have a Premise code.
- **Premise_Description :** Describes the Premise code.

Weapon_used_type: The weapon used type is used to describe the weapon used in the crime scene.

The identified attributes are:

- **Weapon_used_code:** Each crime may or may not have a Weapon_used code.
- **Weapon_used_Description :** Describes the Weapon_used_code.

Motivation_Code: The Motivation Code is used to describe the Motivation behind the crime.

The identified attributes are:

- **Mo_code:** Each crime may or may not have a Motivation for the crime.
- **Mo_Description :** Describes the Mo_code.

Area: The Area describes the location of the Crime scene took place.

The identified attributes are:

- **Area_id:** Each crime will have area_id.
- **Area_Name :** Describes the Area_id.
- **Rpt_Dist_No:** Code that represents a sub-area within a Geographic Area.

Status_type: The Status type is used to describe the Status of the crime.

The identified attributes are:

- **Status_code:** Each crime will have a status of the crime.
- **Status_Description :** Describes the Status_code (eg : case closed, case opened).

Crime_address: Crime address is used to describe the address of a crime incident.

The identified attributes are:

- **Crime_Address** – Indicates the crime scene address.
- **Cross_street** - Indicates the cross-street address.
- **Latitude** - Indicates the Latitude address.
- **Longitude** - Indicates the Longitude address.

Victim_descent: Victim descent is used to describe the ethnicity of victim.

The identified attributes are:

- **Victim_description_code** – Every victim will have a victim description code.
- **Victim_description** – Description of victim description code.

Priority: Code that indicates the priority of crime.

The identified attributes are:

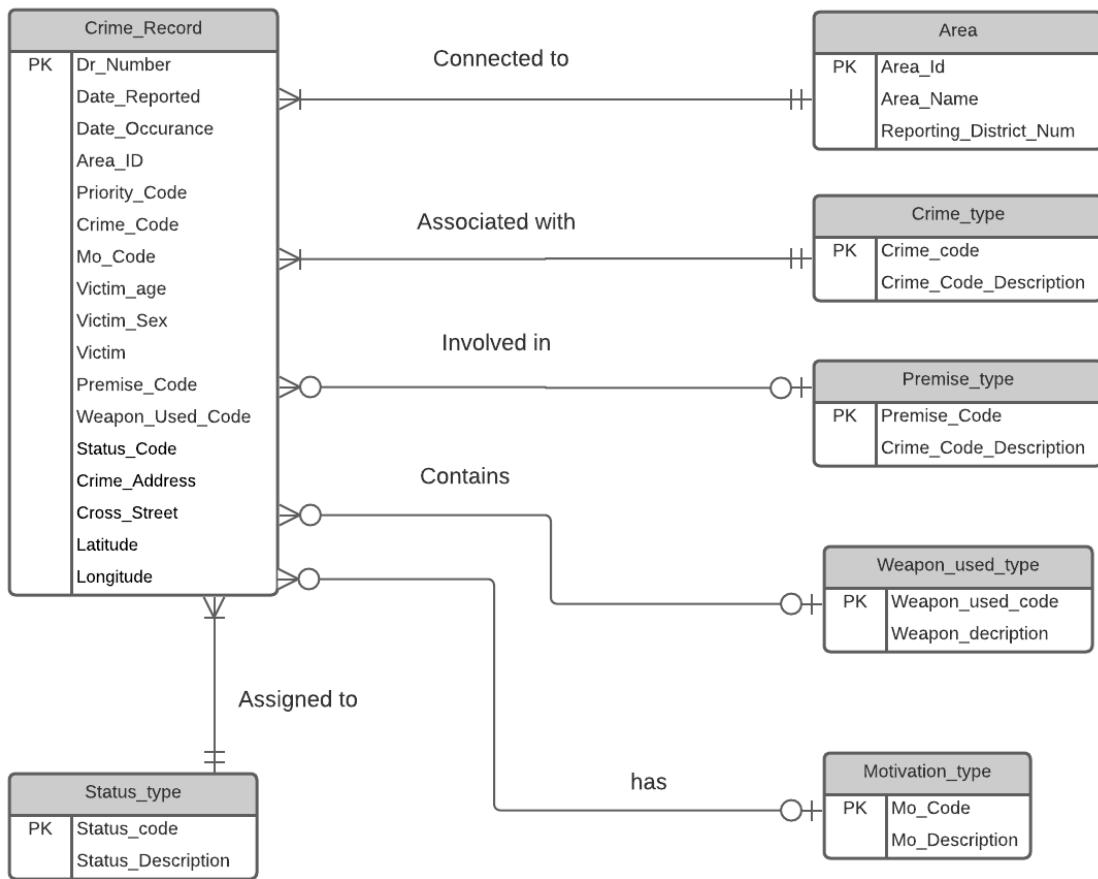
- **Priority_code** –There are two codes code 1 and code 2.
- **Description** – Code 1 crimes are the eight "serious offenses" for which the FBI gathers national data including Homicide, Rape, Robbery, Aggravated Assaults, Burglary, Larceny, Vehicle Theft and Arson. Code 2 Crimes are "less serious" offenses and include: Simple Assaults, Forgery/Counterfeiting, Embezzlement/Fraud, Receiving Stolen Property, Weapon Violations, Prostitution, Sex Crimes, Crimes Against Family/Child, Narcotic Drug Laws, Liquor Laws, Drunkenness, Disturbing the Peace, Disorderly Conduct, Gambling, DUI and Moving Traffic Violations.

Database Design – Logical Design

The conceptual design's devised entities and relationships are translated to logical and more practical forms here. The relationships are further outlined to provide a clear image of the entities' relationship. Each entity's attributes and constraints are specified. Until 3NF, all tables have been normalized.

Initial ER-Diagram:

The initial ER diagram is an initial step in determining requirements for an information systems project. This diagram further used in analyzing and designing a relational database that can be fit in the business process.

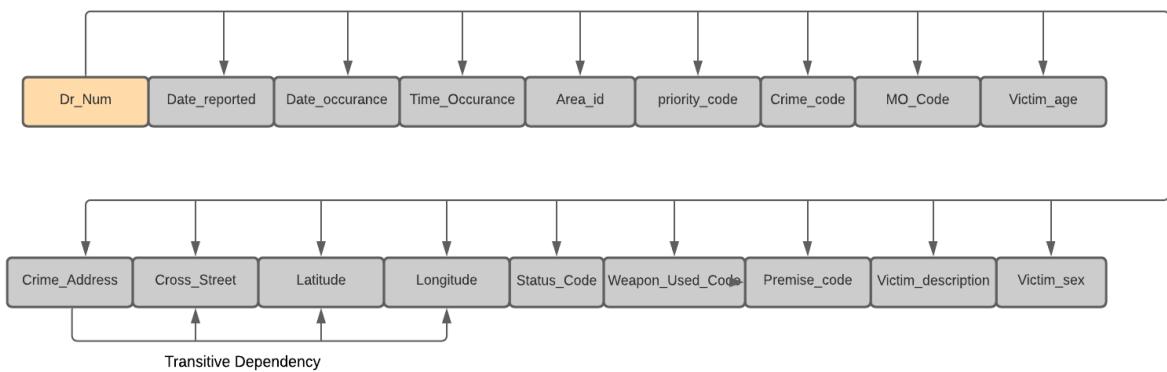


Normalization Process:

This project involves two stages of normalization: 2NF and 3NF. Our initial ER diagram was in 2NF as it does not contain partial dependency and repeated values.

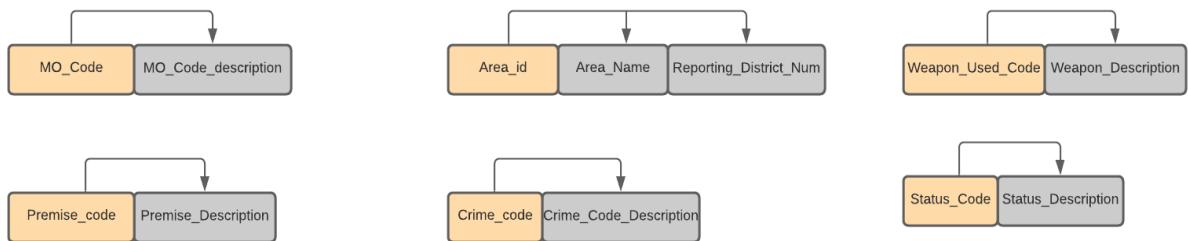
2NF:

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Relational Schema:

Crime_Record(**Dr_Num**, Date_reported, Date_occurrence, Time_Occurance, Area_id, priority_code, crime_code, MO_Code, Victim_age, Victim_sex, Victim_description, Premise_code, Weapon_Used_code, Status_code, Longitude, Latitude, Cross_street, Crime_Address)



Motivation_type(**MO_Code**, Mo_Code_description)

Weapon_used_type(**Weapon_Used_Code**, Weapon_Description)

Area(**Area_id**, Area_Name, Reporting_District_Num)

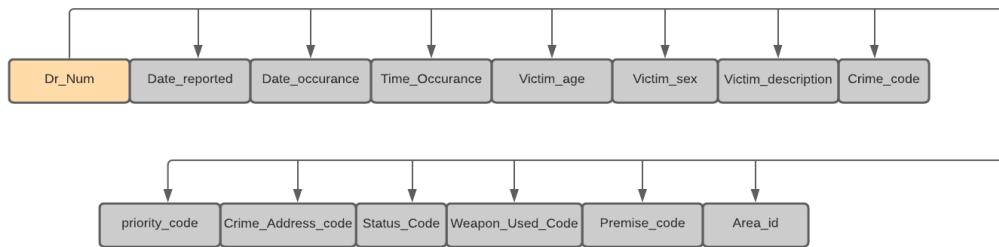
Premise_type(**Premise_code**, Premise_Description)

Crime_type(**Crime_code**, Crime_Code_Description)

Status_type(**Status_Code**, Status_Description)

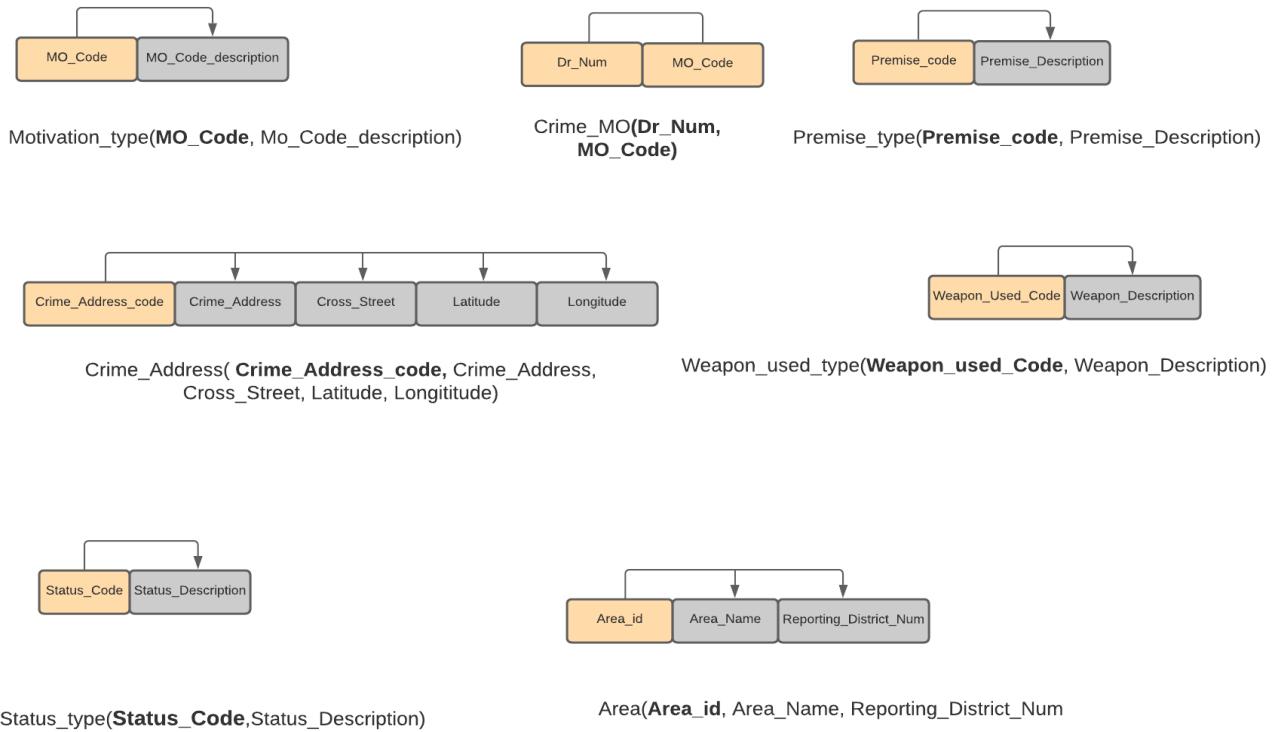
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3NF:



Relational Schema:

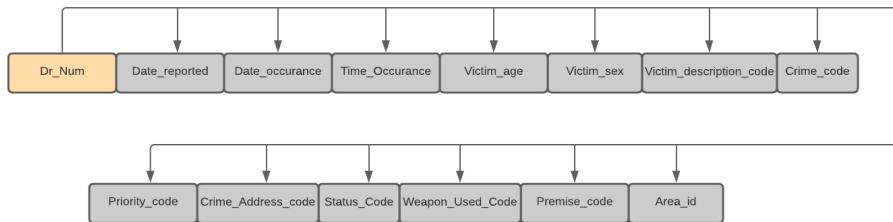
Crime_Record(Dr_Num, Date_reported, Date_occurrence, Time_Occurance, Victim_age, Victim_sex, Victim_description, Crime_code, priority_code, Crime_Address_code, Status_Code, Weapon_Used_code, Premise_code, Area_id)



Identifying New Attributes, Reevaluating PK and defining the attributes with granularity:

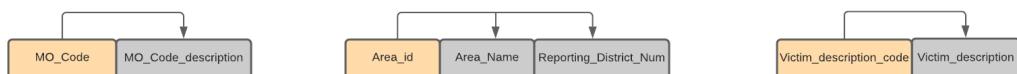
IMPACT OF COVID - 19 PANDEMIC ON CRIME CASES IN LOS ANGELES

Identifying New attributes, re evaluating PK and Defining the attributes with granularity:



Relational Schema:

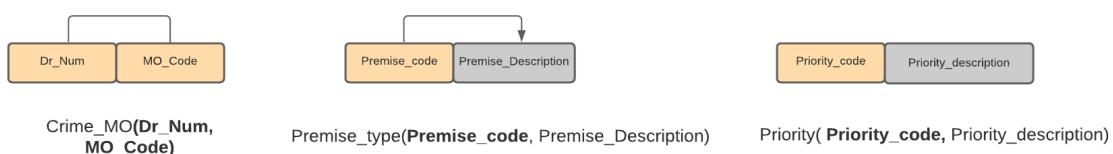
Crime_Record(Dr_Num, Date_reported, Date_occurrence, Time_Occurrence, Victim_age, Victim_sex, Victim_description_code, Crime_code, priority_code, Crime_Address_code, Weapon_Used_code, Status_code, Premise_code, Area_id)



Motivation_type(MO_Code, Mo_Code_description)

Area(Area_id, Area_Name, Reporting_District_Num)

Victim_Descent(Victim_description_code, Victim_description)



Crime_MO(Dr_Num, MO_Code)

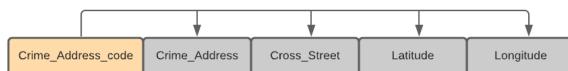
Premise_type(Premise_code, Premise_Description)

Priority(Priority_code, Priority_description)



Status_type(Status_Code, Status_Description)

Weapon_used_type(Weapon_used_Code, Weapon_Description)



Crime_Address(Crime_Address_code, Crime_Address, Cross_Street, Latitude, Longitude)

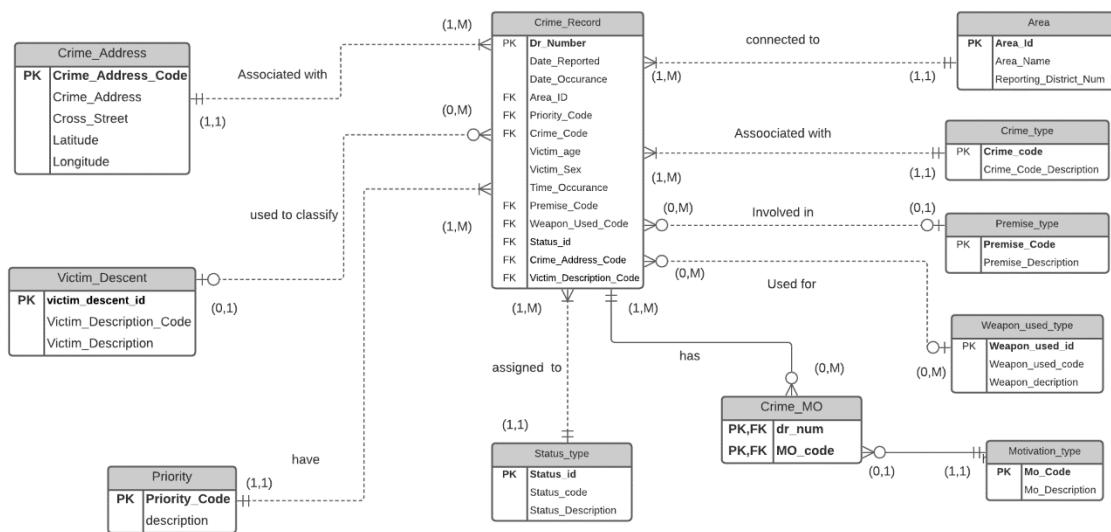
Logical ER-Diagram

The logical ER diagram is defined and designed based on the business needs. This design can be used to implement the schema design.

Logical Relationship:

- Each crime record will be associated with one type of crime.

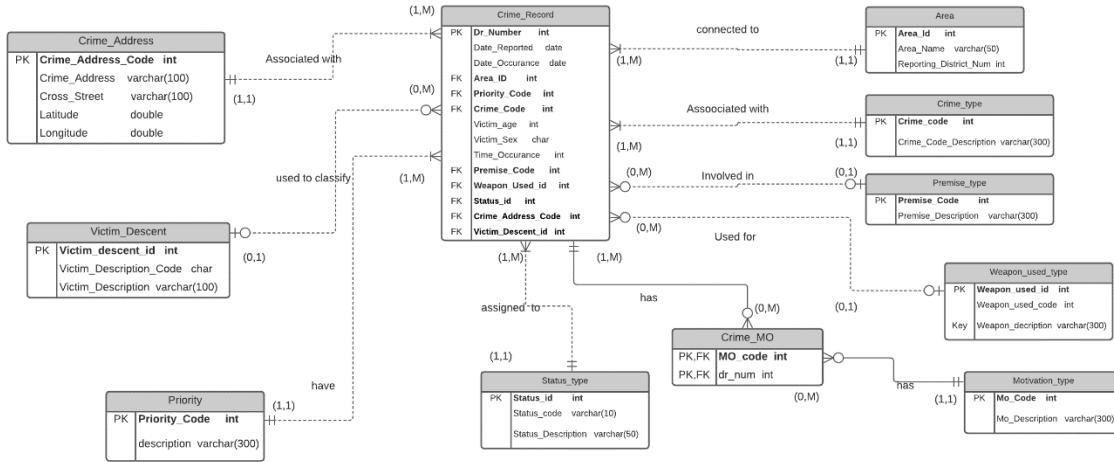
- Each type of crime can have more than one crime record.
- Each type of premise may or may not involve in many crime records.
- Each crime record may or may not have a type of premise.
- Each crime record is connected to the area.
- Each area will have a crime record.
- Each crime record may or may not contain a type of weapon used in the crime scene.
- Each Weapon used in the crime may or may not contain many records.
- Each crime record may or may not have a motivation behind the crime.
- Each motivation may or may not have a many crime record.
- Each crime record will have a status update of the crime.
- Each status will have one or many crime records.



Database Design – Physical Design

The storage capacity of the designed database is represented in the ERD below.

Physical ER-Diagram



Physical storage estimates:

The total population in Los Angeles is 3.967 million. According to statistics, 1 in 137 will be a victim of criminal activity. And 3.8% of population are impacted by crimes every single day.

As we are storing the entire details of the crime information and the storing size in the database can take about 30 to 40 bytes approximately. Therefore, to store the 10 years of data can take up to 1.5TB - 2TB.

Security & Access Control:

Security plays an important role in the database design. MySQL provides creation of multiple users and authenticates them with the credentials such as username and password. The MySQL privilege system guarantees that all the authenticated users may be allowed to perform only the operations permitted to them.

In this project, we have created two new users called '**viewer**' and '**admin**' in addition to the '**root**' user who is created by the system by default. '**viewer**' is assigned only **select** privilege on all the tables of the database. '**admin**' user has been assigned permissions to perform CRUD operations on all tables of the database. Whereas '**root**' user has all the privileges from higher level of permissions to granular level. Only a '**root**' user has the access to create other users. After we create the user, we need to assign the privileges to each user. These privileges can be assigned to

entire database objects or to the individual tables of the database or even to the column level. In this project, we have granted ‘viewer’ and ‘admin’ users access to the entire database objects.

Below is the way how to create and assign privileges to a user.

```
CREATE USER viewer@localhost
IDENTIFIED BY 'data225@proj';
```

Get list of all users of the database:

```
SELECT user FROM mysql.user;
```

user
mysql.infoschema
mysql.session
mysql.sys
root
viewer

List of privileges for ‘root’:

```
show grants for root@localhost;
```

Grants for root@localhost
GRANT SELECT, INSERT, UPDATE, DELETE, CREATE, DROP, RELOAD, SHUTDOWN, PROCESSES, SUPER ON *.* TO 'root'@'localhost'
GRANT APPLICATION_PASSWORD_ADMIN,AUDIT_ADMIN,BACKUP_ADMIN,BINLOG_ADMIN,...
GRANT PROXY ON "%" TO 'root'@'localhost' WITH GRANT OPTION

List of privileges for ‘viewer’:

```
show grants for viewer@localhost;
```

```
Grants for viewer@localhost
```

```
GRANT USAGE ON *.* TO `viewer`@`localhost`
```

The USAGE means that the viewer@localhost can log in the database but has no privileges assigned yet.

Adding select privilege to ‘viewer’ or all the tables of the database :

```
GRANT SELECT  
ON data225proj.*  
TO viewer@localhost;
```

List of privileges for ‘viewer’ after granting:

```
Grants for viewer@localhost
```

```
GRANT USAGE ON *.* TO `viewer`@`localhost`
```

```
GRANT SELECT ON `data225proj`.* TO `viewe...`
```

Creating **admin** user having permissions to perform CRUD operations on all tables of database:

```
CREATE USER admin@localhost  
IDENTIFIED BY 'data225@proj_admin';
```

user
admin
mysql.infoschema
mysql.session
mysql.sys
root
viewer

Grants for admin@localhost

```
GRANT USAGE ON *.* TO `admin`@`localhost`
```

Granting CRUD permissions to **admin** for all tables of the database.

```
GRANT SELECT, INSERT, UPDATE, DELETE  
ON data225proj.*  
TO admin@localhost;
```

Grants for admin@localhost

```
GRANT USAGE ON *.* TO `admin`@`localhost`  
GRANT SELECT, INSERT, UPDATE, DELETE ON `data225proj`.* TO `admin`@`localhost`
```

DBMS Selection

DBMS Analysis:

The requirement of this project follows:

This project needs to generate a report that gives information about the criminal cases that have occurred in Los Angeles.

- Data integrity and Data consistency is an important element for this project.
- Network access control is more concerned as it is dealing with real criminal cases.
- Authorized users are only able to access the database.

DBMS Selection:

Data integrity and data consistency are one of the main goals of this project. This can be achieved through the RDBMS. Also, RDBMS is capable of handling complex queries and reports. This project does not change its features constantly. Moreover, The RDBMS allows ensuring ACID compliance. Relation database allows defining the relationship between the attributes. So, we decided to use MySQL Bench to build the database design for this project.

Hardware & Software Requirements:

Minimum Hardware Requirements:

CPU - 64bit x86 CPU

RAM – 4GB

Display - 1024x768

Software Requirements:

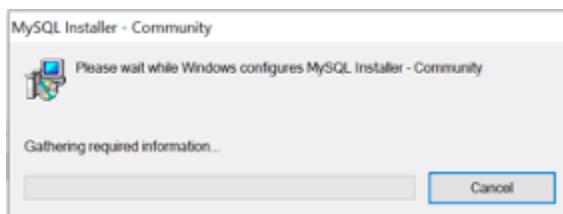
Operating system – Mac/Windows XP/7/8 or higher

Database – MYSQL Bench

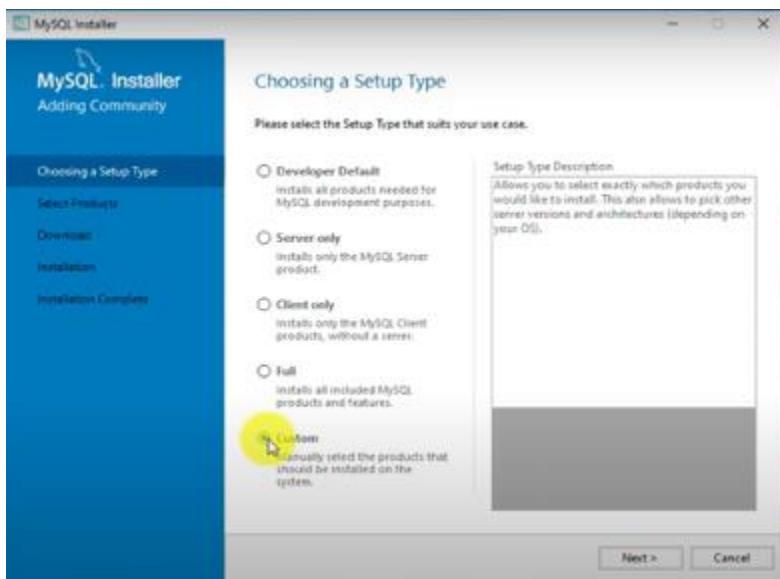
Implementation & Loading

DBMS Installation:

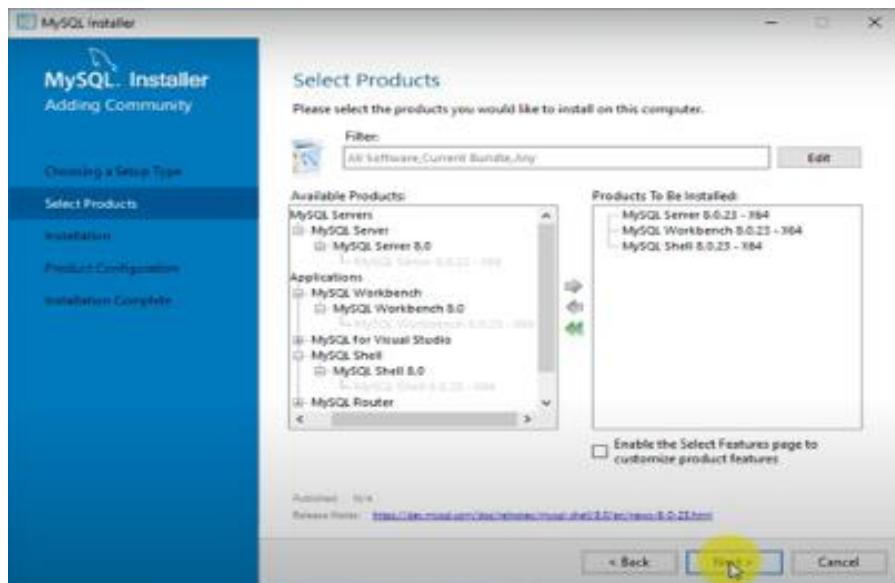
Double-click the MySQL installer file and follow the steps below to install MySQL using the MySQL installer:



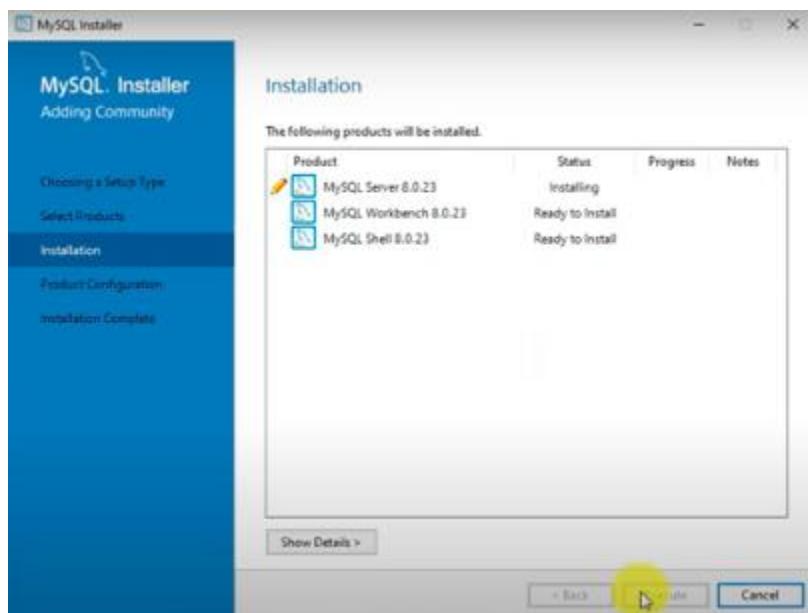
Choose the custom setup type and click on Next button.



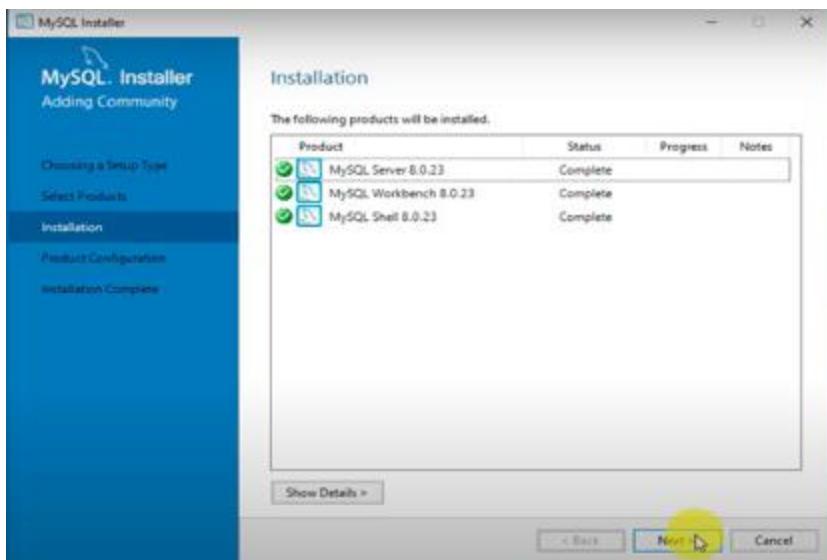
Add MySQL Server 8.0.23-X64, MySQL Workbench 8.0.23-X64 and MySQL Shell 8.0.23-X64 to the products to be installed and click on Next button.



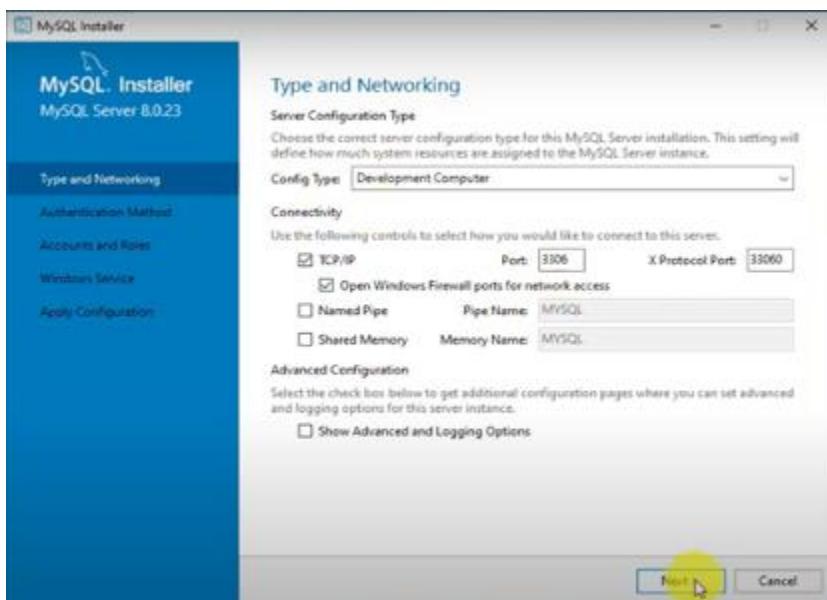
Execute the installation process.



Once the installation process is complete click on Next button.

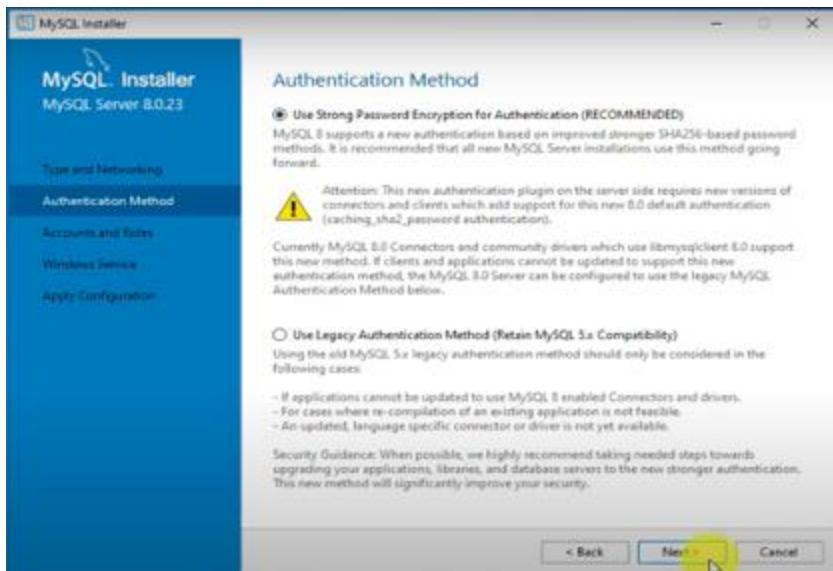


Product Configuration:

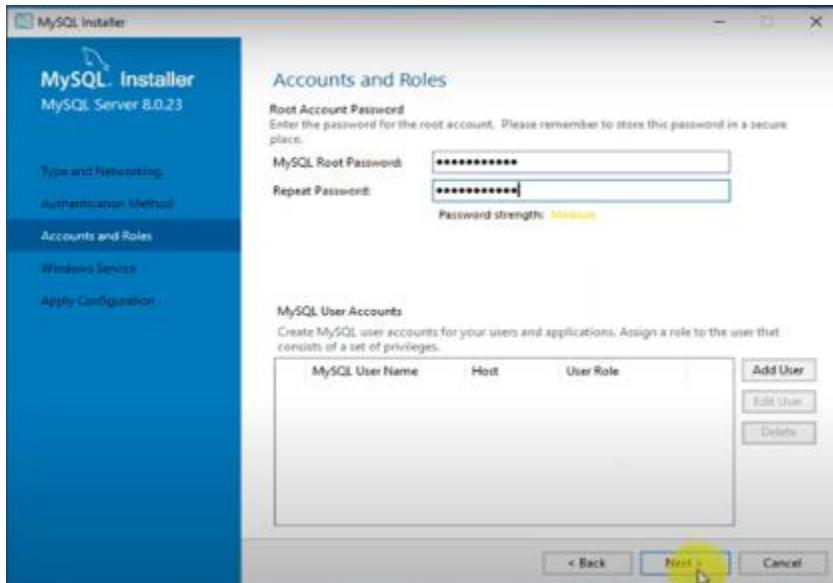


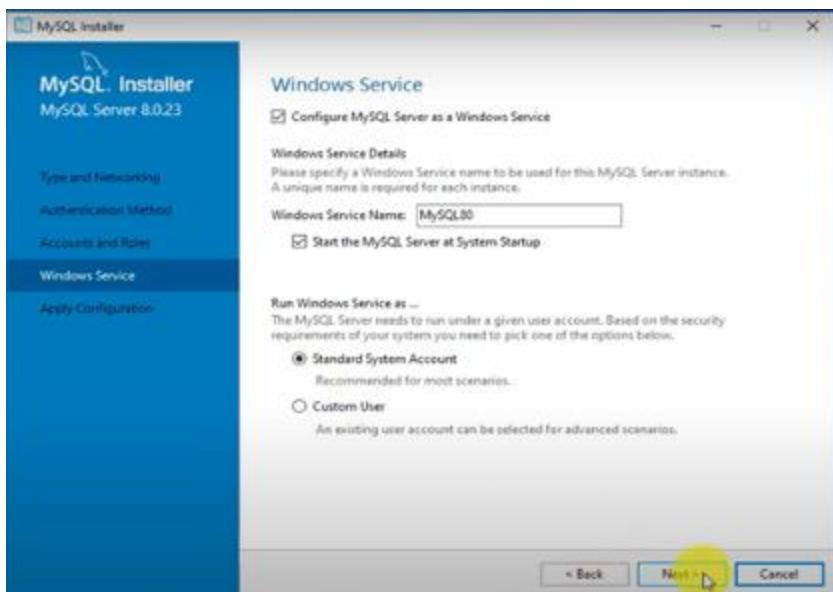
Choose the recommended authentication method and click on Next button.

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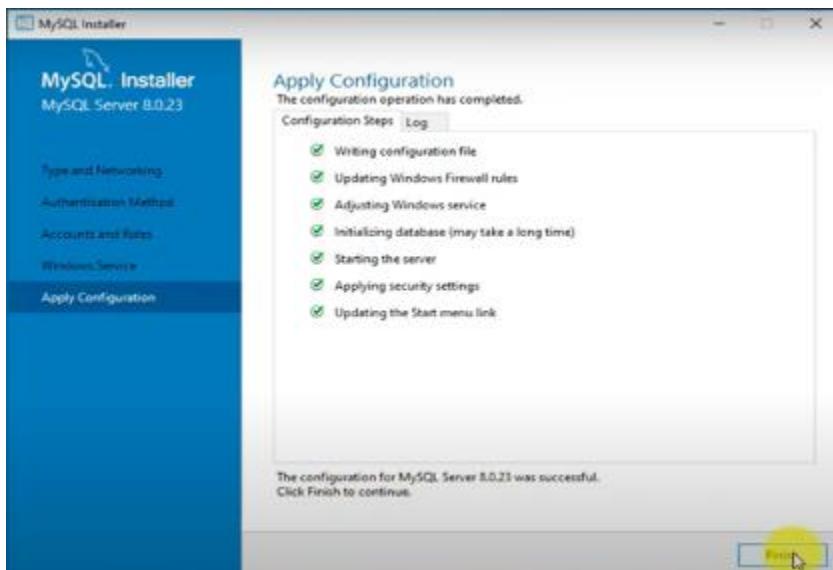


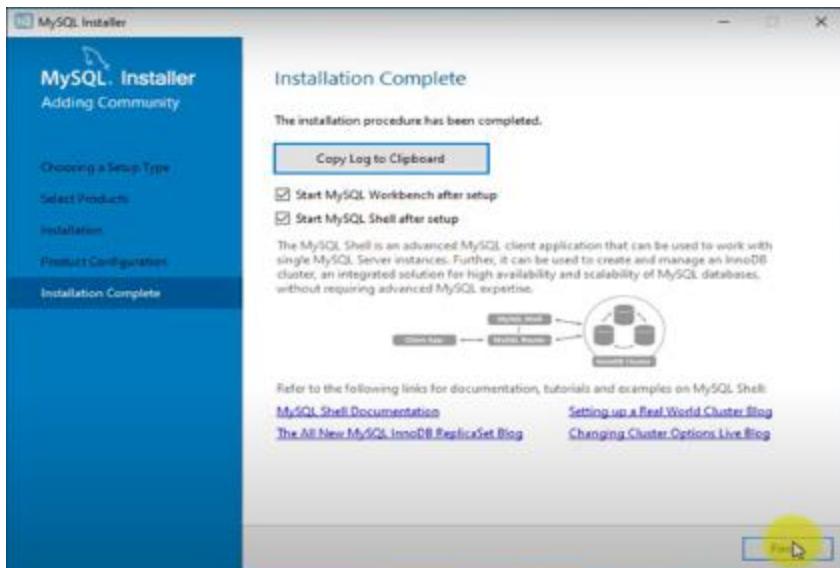
Setup your root account password and click on Next button.





Apply the configuration and click on the Finish button.





Schema Creation:

The following is the SQL code for generating the designed schema.

Creating database :

- create database data225proj;
- use data225proj;

Table: crime_address

```
create table crime_address(
    crime_address_code int not null auto_increment,
    crime_address varchar(100) not null,
    cross_street varchar(50),
    latitude float not null,
    longitude float not null,
    primary key(crime_address_code));
```

Table: victim_descent

```
create table victim_descent(
    victim_descent_id int not null AUTO_INCREMENT,
    victim_descent_code char not null,
    victim_descent_description varchar(100),
    primary key (victim_descent_id));
```

Table: status_type

```
create table status_type(
    status_id int not null AUTO_INCREMENT,
    status_code varchar(10) not null,
    status_description varchar(50),
    primary key(status_id));
```

Table: priority

```
create table priority(
    priority_code int not null,
    description varchar(300),
    primary key (priority_code));
```

Table: motivation_type

```
create table motivation_type(
    mo_code int not null,
    mo_description varchar(300),
    primary key (mo_code)
);
```

Table: weapon_used_type

```
create table weapon_used_type(
    weapon_used_id int not null AUTO_INCREMENT,
    weapon_used_code int,
    weapon_description varchar(300),
    primary key (weapon_used_id)
);
```

Table: premise_type

```
create table premise_type(
    premise_code int not null,
    premise_description varchar(300),
    primary key (premise_code)
```

);

Table: crime_type

```
create table crime_type(
    crime_code int not null,
    crime_code_description varchar(300),
    primary key (crime_code)
);
```

Table: area

```
create table area(
area_pk int not null AUTO_INCREMENT,
area_name varchar(50),
reporting_district_num int,
primary key (area_pk)
);
```

Table: crime_record

```
create table crime_record(
    dr_number int not null,
    date_reported date,
    date_occurrence date,
    victim_age int,
    victim_sex char not null,
    time_occurrence int,
    area_id int,
    priority_code int,
    crime_code int,
    premise_code int,
    weapon_used_id int,
    status_id int,
    victim_descent_id int,
    crime_address_code int,
    primary key (dr_number),
    foreign key (crime_address_code) references crime_address (crime_address_code) on
update cascade,
    foreign key (area_id) references area (area_pk) on update cascade,
    foreign key (priority_code) references priority (priority_code) on update cascade,
    foreign key (crime_code) references crime_type (crime_code) on update cascade,
    foreign key (premise_code) references premise_type (premise_code) on update
cascade,
```

```

foreign key (weapon_used_id) references weapon_used_type (weapon_used_id) on
update cascade,
foreign key (status_id) references status_type (status_id) on update cascade,
foreign key (victim_descent_id) references victim_descent (victim_descent_id) on
update cascade
);

```

Table: crime_mo

```

create table crime_mo(
    dr_number int not null,
    mo_code int not null,
    foreign key (dr_number) references crime_record (dr_number) on update cascade,
    foreign key (mo_code) references motivation_type (mo_code) on update cascade,
    primary key(dr_number,mo_code)
);

```

Data Loading & Conversion:

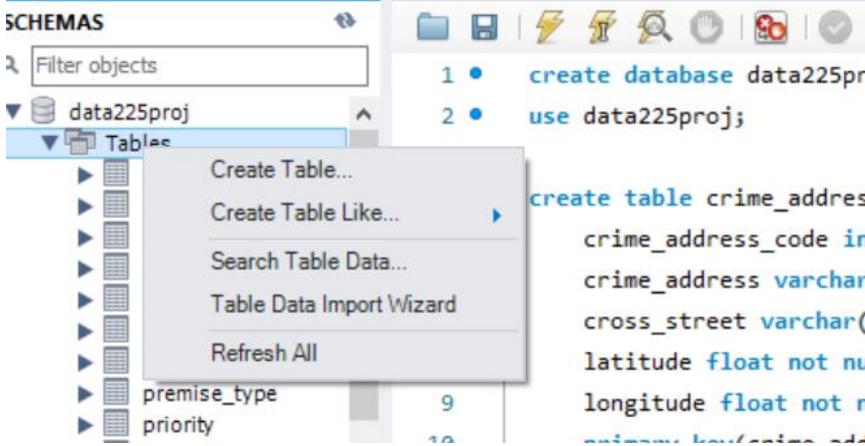
Two tables, crime_data_full and mo_codes, were developed by importing data from CSV files using the table data import wizard, which supports CSV and JSON file import and export operations, as well as several configuration options including separators, column selection, encoding selection, and more. The column, type, and table mapping can be imported using this wizard, which can be run on local or remote MySQL servers.

CSV file:

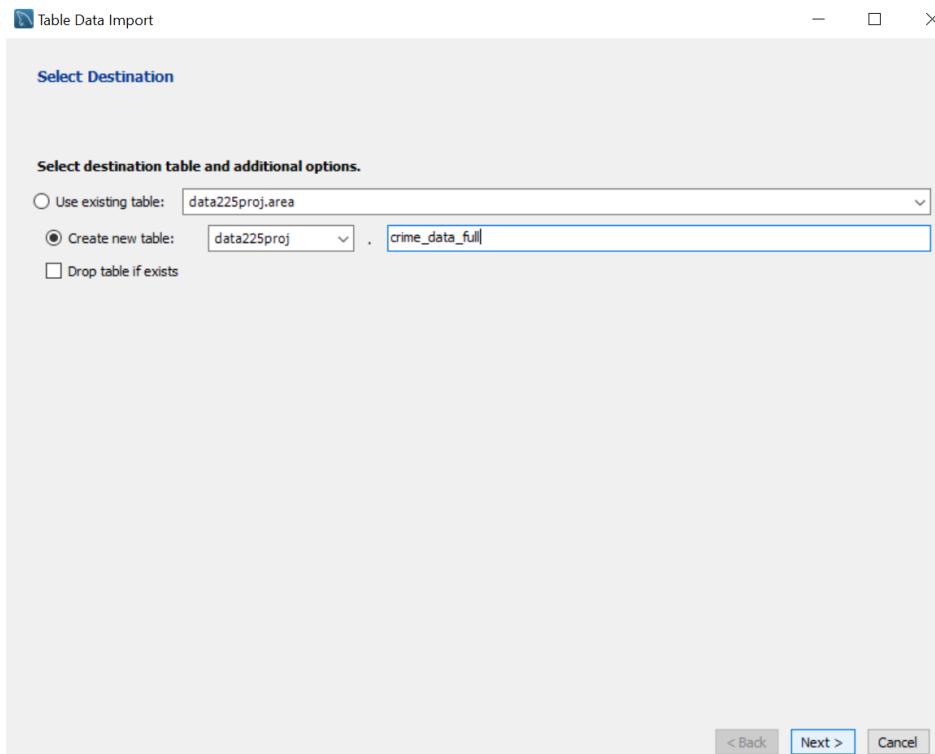
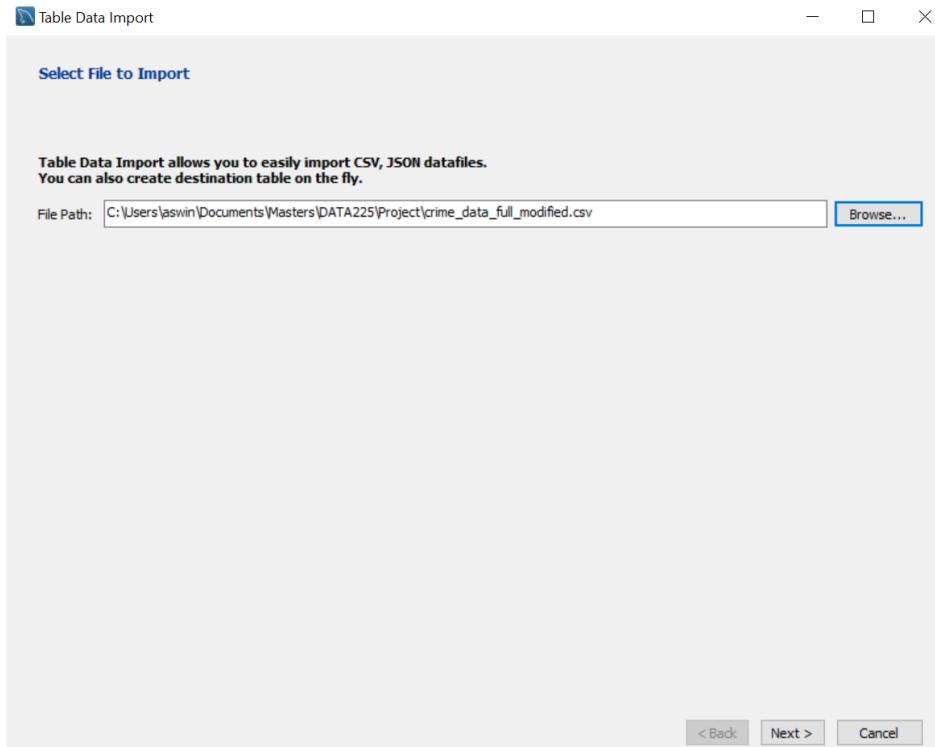
IMPACT OF COVID - 19 PANDEMIC ON CRIME CASES IN LOS ANGELES

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y
21120495	12/28/20	12/28/20	1350	12 77th Street	1249	2	354 THEFT F 0100 0382 0:	25 F	H	501 SINGLE FAM N/A	N/A	IC	Invest Cont	7000 S HOO N/A	33.9755	-118.2871								
20191889	10/20/20	8/5/20	2104	19 Mission	1972	2	740 VANDALISM 0329 1402	47 M	H	501 SINGLE FAM N/A	N/A	IC	Invest Cont	9000 N SEPLN/A	34.2338	-118.4675								
21070582	2/18/20	2/13/21	1000	7 Wilshire	713	2	354 THEFT F 0377 0344 0:	69 M	W	501 SINGLE FAM N/A	N/A	IC	Invest Cont	400 N OGDE N/A	34.0782	-118.3594								
21070513	12/24/20	12/12/20	1704	7 Wilshire	734	1	440 THEFT PLAIN 0344 0394	25 F	W	125 PAY PHONE N/A	N/A	IC	Invest Cont	300 S BURN N/A	34.0704	-118.3552								
20031890	10/12/20	8/21/20	1015	3 Southwest	396	2	624 BATTERY -5 1803 0444 0:	71 F	B	502 MULT-UNIT	400 STRONG-AR AA	IC	Adult Arrest	800 W 40TH N/A	34.01	-118.29								
20111904	7/28/20	7/27/20	2080	11 Northeast	1122	1	330 BURGLARY F 1307 0344	21 F	H	108 PARKING LO N/A	N/A	IC	Invest Cont	2000 LINCN/A	34.0678	-118.2024								
200412135	8/24/20	8/24/20	1045	4 Hollenbeck	424	2	624 BATTERY -5 0400 0416 0:	43 F	H	502 MULT-UNIT	400 STRONG-AR IC	IC	Invest Cont	7700 JAYS N/A	34.2655	-118.3004								
211605808	3/4/21	3/4/21	1455	16 Foothill	1637	2	901 VIOLATION C	209	M	501 SINGLE FAM N/A	N/A	IC	Invest Cont	900 N HUDS N/A	34.0871	-118.3321								
210605081	1/28/21	1/28/21	1555	6 Hollywood	656	2	740 VANDALISM 0358 0329 0:	29 M	H	501 SINGLE FAM	400 STRONG-AR IC	IC	Adult Arrest	1300 W 107 N/A	33.7352	-118.3056								
200509889	5/25/20	5/25/20	1355	5 Harbor	562	1	236 INTIMATE/P 0913 0408 21	22 F	W	501 SINGLE FAM	400 STRONG-AR AA	IC	Invest Cont	7500 OAKN/A	34.2064	-118.5669								
202113243	8/29/20	8/28/20	2200	21 Topanga	2139	2	928 THREATENIN 0554 2021 0:	55 M	A	501 SINGLE FAM	511 VERBAL THR IC	IC	Invest Cont	4000 SANT N/A	34.0093	-118.3437								
200320810	11/23/20	11/23/20	1700	3 Southwest	363	1	440 THEFT PLAIN 0913 0354 0:	27 F	B	502 MULT-UNIT N/A	N/A	IC	Invest Cont	5400 W ADV N/A	34.0334	-118.3639								
200306072	2/4/20	2/4/20	900	3 Southwest	391	2	940 EXORTION 1815 0337 0:	21 F	H	721 HIGH SCHOOL N/A	N/A	IC	Invest Cont	300 W 6TH N/A	34.0466	-118.252								
200319947	11/5/20	11/4/20	2110	3 Southwest	301	2	624 BATTERY -5 1309 0416 0:	21 M	H	101 STREET	400 STRONG-AR IC	IC	Invest Cont	4000 S SAN N/A	34.0109	-118.2682								
20012298	11/20/20	11/19/20	800	1 Central	153	1	330 BURGLARY F 1300 0377 11	23 F	B	101 STREET	N/A	IC	Invest Cont	1500 S GRA N/A	34.0436	-118.313								
20131578	8/16/20	8/12/20	2200	13 Newton	1354	1	251 SHOTS FIRE 1822 0906 1:	38 M	H	501 SINGLE FAM	102 HAND GUN IC	IC	Adult Other	8600 S BRO N/A	33.9601	-118.2782								
212004734	1/20/21	1/20/21	900	20 Olympic	2071	2	745 VANDALISM 0329 0319 0:	31 F	B	502 MULT-UNIT N/A	N/A	IC	Invest Cont	1700 ELLS N/A	34.0445	-118.3623								
201804666	1/13/20	1/13/20	1755	18 Southeast	1802	1	230 ASSAULT/WI 2004 0913 0:	25 M	B	102 SIDEWALK	312 PIPE/METAL AD	IC	Invest Cont	SATICOY FALLBROOK	34.2083	-118.6234								
200705459	1/11/20	1/31/20	1120	7 Wilshire	763	1	236 INTIMATE/P 0913 0448 21	23 M	H	502 MULT-UNIT	205 KITCHEN KNIC	IC	Invest Cont	11400 W BL N/A	34.0619	-118.4614								
202117568	12/29/20	12/29/20	2100	21 Topanga	2111	1	210 ROBBERY 0394 0416 1:	42 M	O	101 STREET	200 KNIFE WITH IC	IC	Invest Cont	3600 S BART N/A	34.0113	-118.4298								
200812827	8/10/20	8/9/20	1700	8 West LA	814	1	310 BURGLARY F 0344 0382 11	49 F	W	501 SINGLE FAM N/A	N/A	IC	Invest Cont	21900 VAN N/A	34.1938	-118.6037								
200215387	9/23/20	9/23/20	1640	2 Rampart	216	2	740 VANDALISM 0329 1322	47 M	B	101 STREET	N/A	IC	Invest Cont	14800 VAL N/A	34.149	-118.4537								
201405227	1/22/20	1/21/20	1440	14 Pacific	1435	2	626 INTIMATE/P 0416 2000 11	46 F	W	101 STREET	500 UNKNOWN N/A	IC	Invest Cont	9800 BUR N/A	34.0344	-118.3986								
202111624	7/15/20	7/15/20	1500	21 Topanga	2156	1	442 SHOPLIFTING 0378 0295	35 M	X	404 DEPARTMEN	N/A	IC	Invest Cont	CHESAPEAKE COUSEUM	34.0182	-118.3452								
210905711	2/13/21	2/12/21	1758	9 Van Nuys	984	1	310 BURGLARY 1609 0358 1:	38 M	B	501 SINGLE FAM N/A	N/A	IC	Invest Cont	600 S SAN P/N/A	34.0421	-118.2469								
200814561	9/7/20	9/1/20	1255	8 West LA	895	1	421 THEFT FRO 0344 0346	51 F	W	101 STREET	N/A	IC	Invest Cont	1100 W SLA N/A	33.9892	-118.2937								
200319918	5/3/20	5/2/20	2200	3 Southwest	362	1	330 BURGLARY F 1307 0329 0:	25 M	H	704 ELEMENTAR	N/A	IC	Adult Other	1300 WILC N/A	34.0944	-118.331								
200105604	1/24/20	1/24/20	630	1 Central	166	1	440 THEFT PLAIN 0377 1322 1:	32 M	B	517 MISSIONS	S/N/A	IC	Invest Cont	100 E AVEN N/A	34.0945	-118.2085								

This wizard is accessed from the table's context menu by right-clicking on a table and selecting Table Data Import Wizard, as shown below, and then selecting the route from which the csv file should be imported.



IMPACT OF COVID - 19 PANDEMIC ON CRIME CASES IN LOS ANGELES



Change the data types for # date_reported, date_occurred to date, crime_address to varchar(100) and latitude, longitude to float.

IMPACT OF COVID - 19 PANDEMIC ON CRIME CASES IN LOS ANGELES

Table Data Import

Configure Import Settings

Detected file format: csv 

Encoding: utf-8

Source Column	Field Type
DR_Number	int
Date_Reported	text
Date_Occurred	text
Time_Occurred	int
Area_ID	int
Area_Name	text

DR_Number	Date_Reported	Date_Occurred	Time_Occurred	Area_ID	Area_Name	Reporting...	Priority_Code	Crime_Code	Crime_C
191505856	2019-02-04	2019-02-04	1600	15	NHollywood	1595	1	440	THEFT
190309242	2019-03-21	2019-03-20	2000	3	Southwest	336	1	420	THEFT
190623011	2019-11-29	2019-11-29	916	6	Hollywood	659	1	230	ASSAUL
190711240	2019-05-27	2019-05-23	2000	7	Wilshire	785	2	354	THEFT

< Back  Cancel

Table Data Import

Import Data

The following tasks will now be performed. Please monitor the execution.

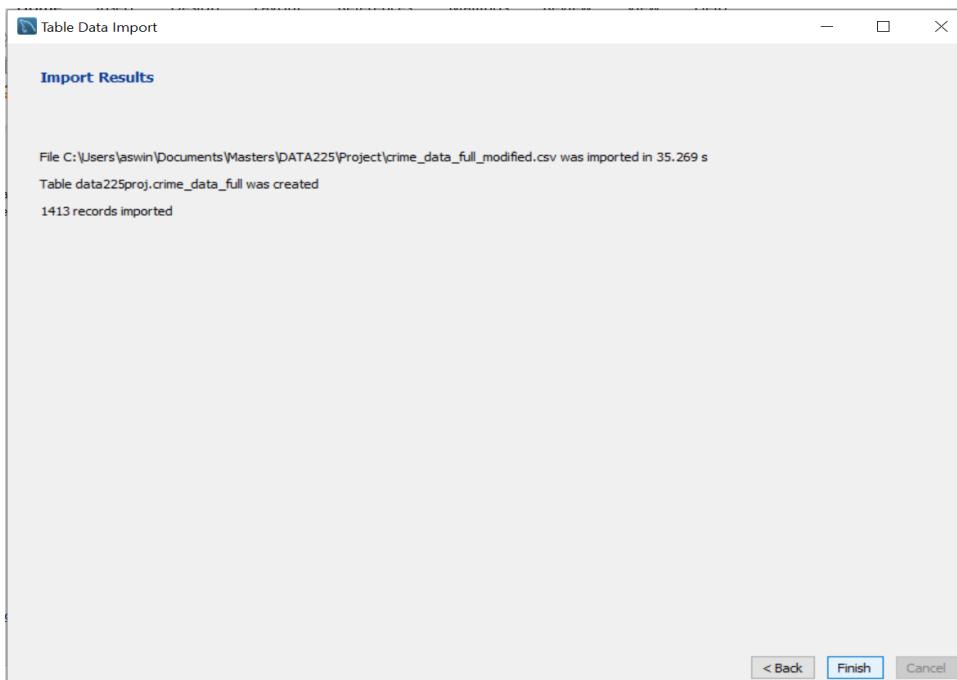
Prepare Import
 Import data file

Finished performing tasks. Click [Next >] to continue.

Show Logs  Cancel

And if the format suits the data type, the data from the csv file is successfully imported into the table.

IMPACT OF COVID - 19 PANDEMIC ON CRIME CASES IN LOS ANGELES



By using these two tables (crime_data_full and mo_codes) data is inserted into all other tables.

The following is the SQL code for loading data.

Table: area

```
insert into
data225proj.area(area_name,reporting_district_num)
select distinct Area_Name,Reporting_District_Num
from data225proj.crime_data_full
```

Table: crime_address

```
Insert into
data225proj.crime_address(crime_address,cross_street,latitude,longitude)
select distinct Crime_Address,Cross_Street,Latitude,Longitude
from data225proj.crime_data_full
```

Table: crime_type

```
insert into
data225proj.crime_type(crime_code,crime_code_description)
select distinct Crime_Code, Crime_Code_Description
from data225proj.crime_data_full
```

Table: premise_type

```
insert into
data225proj.premise_type(premise_code,premise_description)
select distinct Premise_Code, Premise_Description
from data225proj.crime_data_full
```

Table: weapon_used_type

```
insert into
data225proj.weapon_used_type(weapon_used_code,weapon_description)
select distinct Weapon_Used_Code, Weapon_Description
from data225proj.crime_data_full
where Weapon_Used_Code!=N/A';
```

Table: motivation_type

```
insert into
data225proj.motivation_type(mo_code,mo_description)
select MO_Code, Description
from data225proj.mo_codes
```

Table: status_type

```
insert into status_type(status_code,status_description) values('AA','Adult Arrest');
insert into status_type(status_code,status_description) values('AO','Adult Other');
insert into status_type(status_code,status_description) values('IC','Invest Cont');
insert into status_type(status_code,status_description) values('JA','Juv Arrest');
insert into status_type(status_code,status_description) values('JO','Juv Other');
```

Table: priority

```
insert into priority values(1,'high');
insert into priority values(2,'low');
```

Table: victim_descent

```
insert into victim_descent(victim_description_code,victim_description) values('A','Other
Asian');
insert      into      victim_descent(victim_description_code,victim_description)
values('B','Black');
```

```

insert      into      victim_descent(victim_description_code,victim_description)
values('C','Chinese');
insert      into      victim_descent(victim_description_code,victim_description)
values('D','Cambodian');
insert      into      victim_descent(victim_description_code,victim_description)
values('F','Filipino');
insert      into      victim_descent(victim_description_code,victim_description)
values('G','Guamanian');
insert      into      victim_descent(victim_description_code,victim_description)
values('H','Hispanic/Latin/Mexican');
insert      into      victim_descent(victim_description_code,victim_description)
values('I','American Indian/Alaskan Native');
insert      into      victim_descent(victim_description_code,victim_description)
values('J','Japanese');
insert      into      victim_descent(victim_description_code,victim_description)
values('K','Korean');
insert      into      victim_descent(victim_description_code,victim_description)
values('L','Laotian');
insert      into      victim_descent(victim_description_code,victim_description)
values('O','Other');
insert into victim_descent(victim_description_code,victim_description) values('P','Pacific
Islander');
insert      into      victim_descent(victim_description_code,victim_description)
values('S','Samoa');
insert      into      victim_descent(victim_description_code,victim_description)
values('U','Hawaiian');
insert      into      victim_descent(victim_description_code,victim_description)
values('V','Vietnamese');
insert      into      victim_descent(victim_description_code,victim_description)
values('W','White');
insert      into      victim_descent(victim_description_code,victim_description)
values('X','Unknown');
insert into victim_descent(victim_description_code,victim_description) values('Z','Asian
Indian');

```

Table: crime_record

```

insert into
crime_record(dr_number,date_reported,date_occurrence,victim_age,victim_sex,time_occurrence,
area_id,priority_code,crime_code,premise_code,
weapon_used_id,status_id,victim_descent_id,crime_address_code)

```

```

select
cdf.DR_Number,cdf.Date_Reported,cdf.Date_Occurred,cdf.Victim_Age,cdf.Victim_Sex,
cdf.Time_Occurred,a.area_pk,p.priority_code,ct.crime_code,pt.premise_code,
w.weapon_used_id,st.status_id,v.victim_descent_id,ca.crime_address_code
from crime_data_full cdf
left join crime_address ca on ca.latitude = cdf.latitude and ca.longitude = cdf.longitude and
ca.crime_address = cdf.Crime_Address
left join area a on a.reporting_district_num = cdf.Reporting_District_Num
left join priority p on p.priority_code = cdf.Priority_Code
left join crime_type ct on ct.crime_code = cdf.Crime_Code
left join premise_type pt on pt.premise_code = cdf.Premise_Code
left join weapon_used_type w on w.weapon_used_code = cdf.Weapon_Used_Code
left join status_type st on st.status_code = cdf.Status_Code
left join victim_descent v on v.victim_description_code = cdf.Victim_Descent;

```

Table: crime_mo

```

insert into crime_mo
SELECT cr.DR_Number,mo.MO_Code
FROM motivation_type mo
INNER JOIN crime_data_full cdf ON FIND_IN_SET(mo.mo_code, cdf.MO_Codes)
inner join crime_record cr on cr.dr_number = cdf.DR_Number;

```

Testing & Evaluation

Entity integrity

Testing if the created tables are having primary keys and the values in it are not null and unique.

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Schemas

Filter objects

- area
- crime_address
- crime_data_full
- crime_mo
- crime_record
- crime_type
 - Columns
 - crime_code
 - crime_code_description
- Indexes
- Foreign Keys
- Triggers

Administration Schemas

Information

Column: **crime_code**

Definition: **crime_code** int PK

```

67
68
69 •   select * from crime_type;
70
71
    
```

Result Grid | Filter Rows: Edit: Export/Import: Wrap Cell Content:

	crime_code	crime_code_description
110		CRIMINAL HOMICIDE
121		RAPE, FORCIBLE
210		ROBBERY
220		ATTEMPTED ROBBERY
230		ASSAULT WITH DEADLY WEAPON, AGGRAVE...
231		ASSAULT WITH DEADLY WEAPON ON POLICE O...
235		CHILD ABUSE (PHYSICAL) - AGGRAVATED ASSA...
236		INTIMATE PARTNER - AGGRAVATED ASSAULT
237		CHILD NEGLECT (SEE 300 W.I.C.)
250		SHOTS FIRED AT MOVING VEHICLE, TRAIN OR ...
251		SHOTS FIRED AT INHABITED DWELLING

Schemas

Filter objects

- area
- crime_address
- crime_data_full
- crime_mo
- crime_record
 - Columns
 - dr_number
 - date_reported
 - date_occurrence
 - victim_age
 - victim_sex
 - time_occurrence

Administration Schemas

Information

Column: **dr_number**

Definition: **dr_number** int PK

```

103
104     foreign key (status_id) references status_type (status_id) on update cascade,
105     foreign key (victim_descent_id) references victim_descent (victim_descent_id) on update
106
107 •   select * from crime_record;
    
```

Result Grid | Filter Rows: Edit: Export/Import: Wrap Cell Content: Fetch rows

	dr_number	date_reported	date_occurrence	victim_age	victim_sex	time_occurrence	area_id	priority_code	crime_code
190104296	2019-01-04	2019-01-04	43	F	1910	310	2	624	
190104302	2019-01-05	2019-01-05	31	M	230	171	1	330	
190104640	2019-01-10	2019-01-10	34	F	805	160	2	624	
190104896	2019-01-14	2019-01-14	57	F	1220	263	1	761	
190105240	2019-01-20	2019-01-20	46	M	355	265	2	624	
190106092	2019-01-30	2019-01-29	26	F	709	281	1	440	
190106757	2019-02-10	2019-02-09	30	M	1600	116	1	230	
190106901	2019-02-12	2019-02-12	28	M	1437	384	2	740	
190108596	2019-03-07	2019-03-07	20	M	2115	243	2	930	
190109673	2019-03-22	2019-02-09	25	F	1200	215	2	956	

The screenshot shows the MySQL Workbench interface. On the left, the 'SCHEMAS' tree view shows the 'motivation_type' schema selected. In the center, the SQL editor pane displays the creation of the 'motivation_type' table:

```

37
38 •    select * from priority;
39
40 •    create table motivation_type(
41          mo_code int not null,

```

On the right, the 'Result Grid' pane shows the data for the 'motivation_type' table:

priority_code	description
1	high
2	low
*	NULL

Below the grid, the definition of the 'priority_code' column is shown:

Column: priority_code

Definition:
`priority_code int PK`

The screenshot shows the MySQL Workbench interface. On the left, the 'SCHEMAS' tree view shows the 'motivation_type' schema selected. In the center, the SQL editor pane displays the creation of the 'motivation_type' table:

```

42          mo_description varchar(300),
43          primary key (mo_code)
44      );
45
46 •    select * from motivation_type;

```

On the right, the 'Result Grid' pane shows the data for the 'motivation_type' table:

mo_code	mo_description
100	Suspect Impersonate
101	Aid victim
102	Blind
103	Crippled
104	Customer
105	Delivery
106	Doctor
107	God
108	Infirm
109	Inspector
110	Involved in traffic/a...

Below the grid, the definition of the 'mo_code' column is shown:

Column: mo_code

Definition:
`mo_code int PK`

Referential integrity

There are two codes in the priority table and the primary key of the priority table(priority_code) is used in the crime_record table as foreign key. Trying to insert a new record in the crime_record table with different priority code which was not present in the priority table.

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Table: crime_record

Columns:

dr_number	int PK
date_reported	date
date_occurrence	date
victim_age	int
victim_sex	char(1)
time_occurrence	int
area_id	int
priority_code	int
crime_code	int
premise_code	int
weapon_used_id	int

Error Code: 1452. Cannot add or update a child row: a foreign key constraint fails ('data223proj','crime_record', CONSTRAINT 'crime_record_ibfk_3' FOREIGN KEY ('priority_code') REFERENCES 'priority' ('priority_code') ON UPDATE CASCADE)

CRUD Operations:

S.No	Action	Name	Expected Working	Test Results	Screenshot
1	Create Tables	crime_address, victim_descent, status_type, motivation_type, premise_type, crime_type, area, crime_record, crime_mo, priority, weapon_used_type.	Tables should be created with required constraints	Tables created successfully	Attached
2	Create View	priority_report	Priority report view should be created with area name, priority description and count of number	View is successfully created with the given requirements	Attached

IMPACT OF COVID - 19 PANDEMIC ON CRIME CASES IN LOS ANGELES

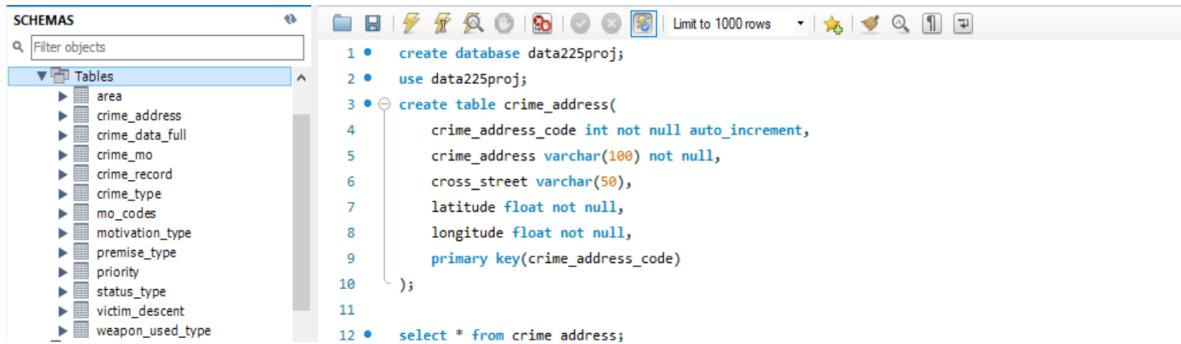
			of cases in particular area.		
3	Create View	daily_cases	Daily case's view should be created with area name, count of cases and victim sex	View is successfully created with the given requirements	Attached
4	Create View	status_report	Status report view should be created with area name, status of the crime investigation, number of crime cases for that area	View is successfully created with the given requirements	Attached
5	Read Tables	crime_address, victim_descent, status_type, motivation_type, premise_type, crime_type, area, crime_record, crime_mo, priority, weapon_used_type.	When user searches for the records based on any condition the output should be as expected	Performed dml operations and the results were as expected.	Attached
6	Read View	priority_report	User should be able to see a view with area name, priority description and number of cases in particular area	Working as expected	Attached
7	Read View	daily_cases	User should be able to see a view with area name, count of cases and victim sex	Working as expected	Attached

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8	Read View	status_report	User should be able to view area name, status of the crime investigation, number of crime cases for that area	Working as expected	Attached
9	Update records in tables	crime_address, victim_descent, status_type, motivation_type, premise_type, crime_type, area, crime_record, crime_mo, priority, weapon_used_type.	Records should be updated as per the requirements only after satisfying conditions like referential integrity etc..	Working as expected	Attached
10	Update Views	priority_report, daily_cases, status_report.	Views should be updated when the base tables used to create views gets updated	Working as expected	Attached
11	Delete records from the tables	crime_address, victim_descent, status_type, motivation_type, premise_type, crime_type, area, crime_record, crime_mo, priority, weapon_used_type.	Delete operation should be performed to remove any records from the tables	Working as expected	Attached

Screenshots:

Create Tables



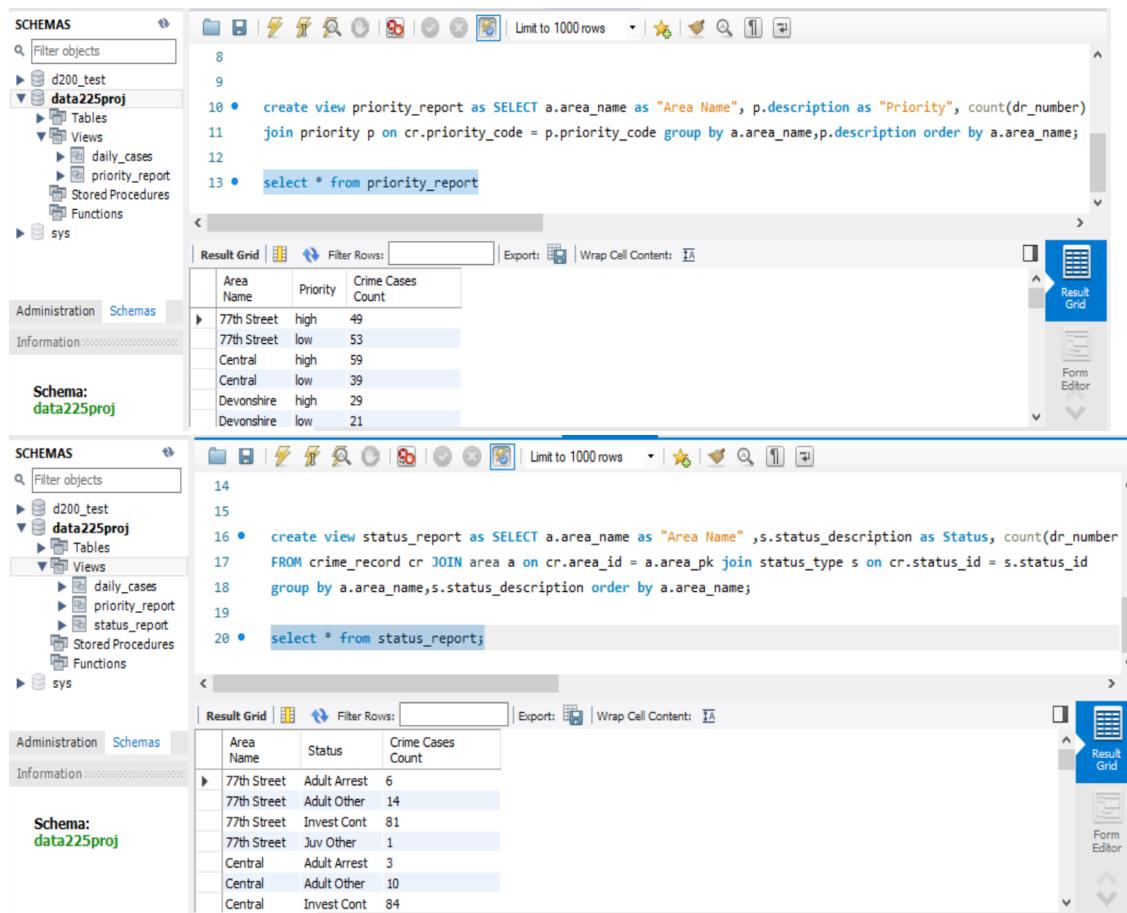
The screenshot shows the MySQL Workbench interface. On the left, the 'SCHEMAS' tree shows the 'data225proj' schema containing various tables like 'area', 'crime_address', etc. The main panel displays the SQL code for creating the 'crime_address' table:

```

1 •  create database data225proj;
2 •  use data225proj;
3 •  create table crime_address(
4      crime_address_code int not null auto_increment,
5      crime_address varchar(100) not null,
6      cross_street varchar(50),
7      latitude float not null,
8      longitude float not null,
9      primary key(crime_address_code)
10 );
11
12 •  select * from crime address;

```

Create and read views



The screenshot shows the MySQL Workbench interface with two separate panes. The top pane shows the creation of the 'priority_report' view:

```

8
9
10 •  create view priority_report as SELECT a.area_name as "Area Name", p.description as "Priority", count(dr_number)
11   join priority p on cr.priority_code = p.priority_code group by a.area_name,p.description order by a.area_name;
12
13 •  select * from priority_report

```

The bottom pane shows the creation of the 'status_report' view:

```

14
15
16 •  create view status_report as SELECT a.area_name as "Area Name" ,s.status_description as Status, count(dr_number)
17   FROM crime_record cr JOIN area a on cr.area_id = a.area_pk join status_type s on cr.status_id = s.status_id
18   group by a.area_name,s.status_description order by a.area_name;
19
20 •  select * from status_report;

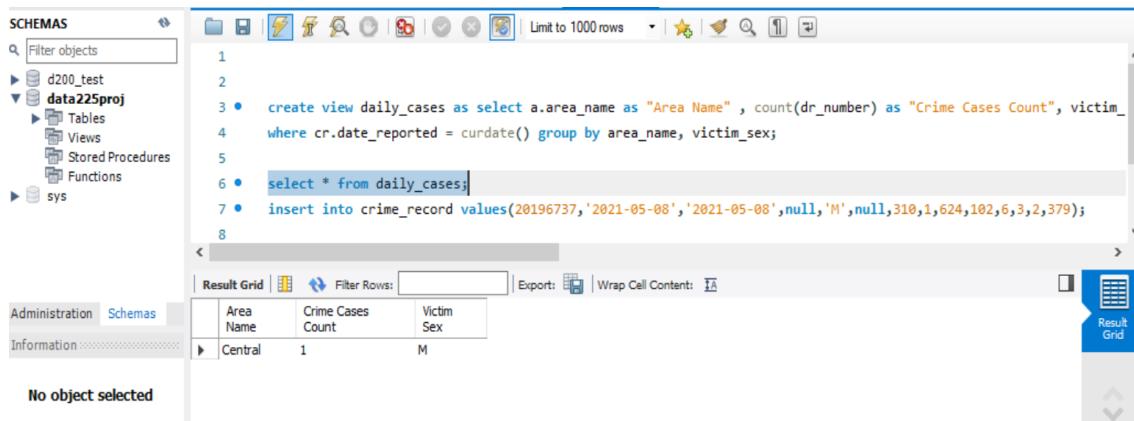
```

Both panes include a 'Result Grid' tab where the query results are displayed as tables.

Area Name	Priority	Crime Cases Count
77th Street	high	49
77th Street	low	53
Central	high	59
Central	low	39
Devonshire	high	29
Devonshire	low	21

Area Name	Status	Crime Cases Count
77th Street	Adult Arrest	6
77th Street	Adult Other	14
77th Street	Invest Cont	81
77th Street	Juv Other	1
Central	Adult Arrest	3
Central	Adult Other	10
Central	Invest Cont	84

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The screenshot shows the MySQL Workbench interface. On the left, the 'SCHEMAS' tree shows 'd200_test' and 'data225proj'. The 'data225proj' schema is selected, displaying 'Tables', 'Views', 'Stored Procedures', and 'Functions'. The 'Information' tab is also visible.

```

1
2
3 •  create view daily_cases as select a.area_name as "Area Name", count(dr_number) as "Crime Cases Count", victim_
4 where cr.date_reported = curdate() group by area_name, victim_sex;
5
6 •  select * from daily_cases;
7 •  insert into crime_record values(20196737, '2021-05-08', '2021-05-08', null, 'M', null, 310, 1, 624, 102, 6, 3, 2, 379);
8

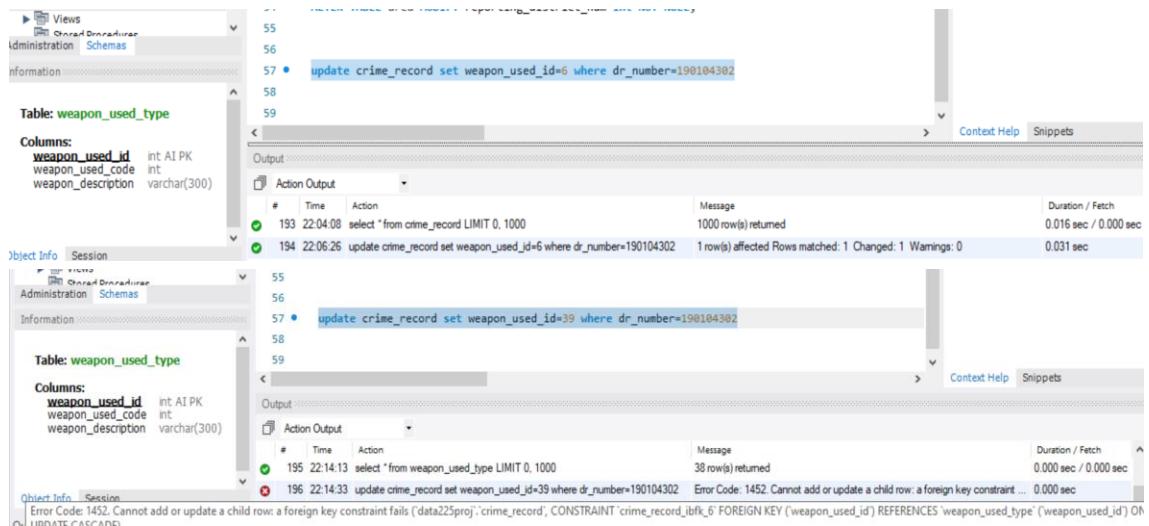
```

The 'Result Grid' shows the output of the 'select * from daily_cases;' query:

Area Name	Crime Cases Count	Victim Sex
Central	1	M

No object selected

Update records in tables



The screenshot shows the MySQL Workbench interface with two sessions. Both sessions are connected to the 'data225proj' schema.

Session 1 (Top):

- Table: **weapon_used_type**
- Columns:
 - weapon_used_id** int AI PK
 - weapon_used_code int
 - weapon_description varchar(300)

Session 2 (Bottom):

- Table: **weapon_used_type**
- Columns:
 - weapon_used_id** int AI PK
 - weapon_used_code int
 - weapon_description varchar(300)

The 'Output' panes show the results of the following update queries:

- Session 1: `update crime_record set weapon_used_id=6 where dr_number=190104302` (1 row(s) affected, Rows matched: 1 Changed: 1 Warnings: 0)
- Session 1: `update crime_record set weapon_used_id=39 where dr_number=190104302` (38 row(s) returned)
- Session 2: `update crime_record set weapon_used_id=39 where dr_number=190104302` (Error Code: 1452. Cannot add or update a child row: a foreign key constraint fails ('data225proj').'crime_record', CONSTRAINT 'crime_record_ibfk_6' FOREIGN KEY ('weapon_used_id') REFERENCES 'weapon_used_type' ('weapon_used_id'))

Update Views

```

62
63 • insert into crime_record values(192067399,'2021-05-10','2021-05-10',23,'M',null,'313',1,624,102,6
64
65 • select * from daily_cases
  
```

The screenshot shows the MySQL Workbench interface. A query window displays the creation of a view named 'daily_cases'. Below the window, a result grid shows one row of data: Area Name (77th Street), Crime Cases Count (1), and Victim Sex (M). The output pane shows two actions: an insertion into the crime_record table and a selection from the daily_cases view.

Area Name	Crime Cases Count	Victim Sex
77th Street	1	M

Output:

#	Time	Action	Message	Duration / Fetch
199	22:18:37	insert into crime_record values(192067399,'2021-05-10','2021-05-10',23,'M',n... 1 row(s) affected	1 row(s) affected	0.032 sec
200	22:18:43	select * from daily_cases LIMIT 0, 1000	1 row(s) returned	0.015 sec / 0.000 sec

Delete records from the tables

```

63 • insert into crime_record values(192067399,'2021-05-10','2021-05-10',23,'M',null,'313',1,624,102,6
64
65 • delete from crime_record where dr_number= 192067399
66
67
68
69
  
```

The screenshot shows the MySQL Workbench interface. A query window displays the deletion of a record from the crime_record table where dr_number is 192067399. The output pane shows the selection of all rows from the daily_cases view followed by the deletion command.

#	Time	Action	Message	Duration / Fetch
200	22:18:43	select * from daily_cases LIMIT 0, 1000	1 row(s) returned	0.015 sec / 0.000 sec
201	22:25:02	delete from crime_record where dr_number= 192067399	1 row(s) affected	0.015 sec

Check constraints:

CHK_VictimSex(Victim_sex should accept only 'F','M','X' characters) constraint has been added to victim_sex attribute in crime_record table.

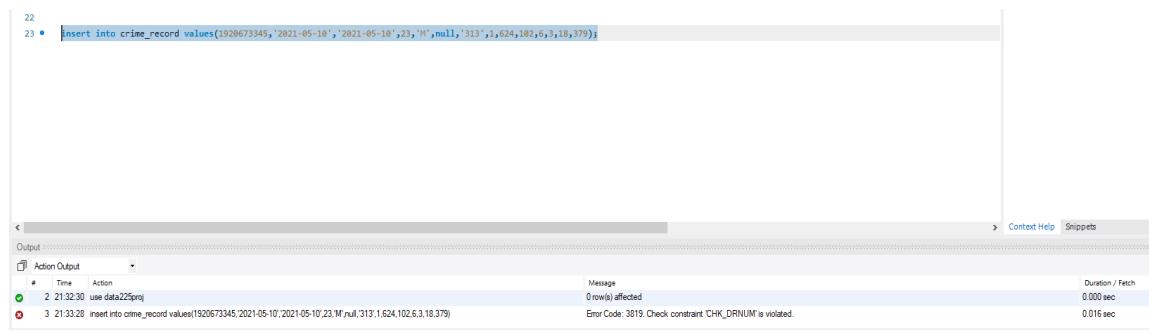
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The screenshot shows the Oracle SQL Developer interface. In the code editor, lines 62 through 69 are visible, ending with an insertion into the `crime_record` table. In the output window, two actions are listed:

#	Time	Action	Message	Duration / Fetch
201	22:25:02	delete from crime_record where dr_number= 192067399	1 row(s) affected	0.015 sec
202	23:05:03	insert into crime_record values(192067399,'2021-05-10','2021-05-10',23,'A',null,'313',1,624,102,6)	Error Code: 3819. Check constraint 'CHK_VictimSex' is violated.	0.000 sec

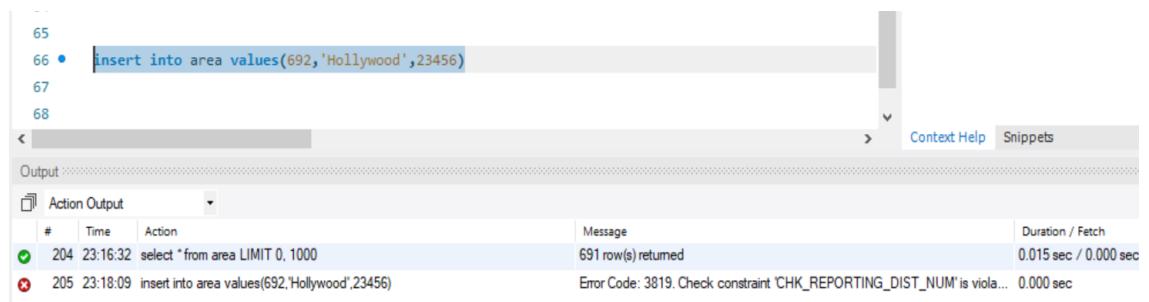
`CHK_DRNUM`(length of `dr_number` should equal to nine digits) constraint has been added to `dr_number` attribute in `crime_record` table.



The screenshot shows the Oracle SQL Developer interface. In the code editor, lines 22 through 25 are visible, ending with an insertion into the `crime_record` table. In the output window, three actions are listed:

#	Time	Action	Message	Duration / Fetch
2	21:32:30	use data225proj	0 row(s) affected	0.000 sec
3	21:33:28	insert into crime_record values(1920673345,'2021-05-10','2021-05-10',23,'M',null,'313',1,624,102,6,3,18,379)	Error Code: 3819. Check constraint 'CHK_DRNUM' is violated.	0.016 sec

`CHK_REPORTING_DIST_NUM`(length of `reporting_district_num` should be less than or equal to four) constraint has been added to `reporting_district_num` attribute in `area` table.



The screenshot shows the Oracle SQL Developer interface. In the code editor, lines 65 through 68 are visible, ending with an insertion into the `area` table. In the output window, three actions are listed:

#	Time	Action	Message	Duration / Fetch
204	23:16:32	select * from area LIMIT 0, 1000	691 row(s) returned	0.015 sec / 0.000 sec
205	23:18:09	insert into area values(692,'Hollywood',23456)	Error Code: 3819. Check constraint 'CHK_REPORTING_DIST_NUM' is violated.	0.000 sec

Query Descriptions

Following queries are performed on the created tables.

- 1) Total number of crime cases per status: This query gives the count of crime cases for each status type.

```
SELECT S.status_description,COUNT(dr_number) as count_of_cases
FROM data225proj.crime_record as Cr
JOIN data225proj.status_type as S ON Cr.status_id = S.status_id
group by S.status_description
order by COUNT(dr_number) desc;
```

status_descripti...	count_of_cases
Invest Cont	1106
Adult Other	191
Adult Arrest	104
Juv Arrest	7
Juv Other	5

- 2) Top 5 total number of cases per motivation: This query gives the top 5 results of total crime cases for each motivation code type.

```
select M.mo_description as Motivation, count(Dr_number) as Count_of_cases
from data225proj.crime_mo as Mo
join data225proj.motivation_type as M on Mo.mo_code = M.mo_code
group by M.mo_description
order by count(dr_number) desc
limit 5;
```

Motivation	Count_of_cases
Stranger	375
Domestic violence	146
Vehicle involved	134
Susp is/was current/former boyfriend/girlfriend	107
Aged (60 & over) or blind/crippled/unable to car...	95

- 3) Top 10 total number of crime cases per crime code: This query gives the top 10 results of total crime cases for each crime code.

```
SELECT ct.crime_code_description, count(cr.dr_number) as count_of_cases
FROM data225proj.crime_record cr
inner join data225proj.crime_type ct on ct.crime_code = cr.crime_code
group by ct.crime_code_description
order by count(cr.crime_code) desc
limit 10;
```

crime_code_description	count_of_cases
BATTERY - SIMPLE ASSAULT	156
BURGLARY FROM VEHICLE	117
ASSAULT WITH DEADLY WEAPON, AGGRAV...	108
THEFT PLAIN - PETTY (\$950 & UNDER)	96
INTIMATE PARTNER - SIMPLE ASSAULT	95
VANDALISM - FELONY (\$400 & OVER, ALL C...	82
THEFT OF IDENTITY	72
BURGLARY	67
VANDALISM - MISDEAMEANOR (\$399 OR UN...	58
THEFT-GRAND (\$950.01 & OVER)EXCPT, GU...	54

- 4) Top 10 total number of crime cases per area: This query gives the top 10 results of total crime cases for each area.

```
SELECT area_name, COUNT(dr_number) as count_of_crimes
```

```
FROM data225proj.crime_record AS cr
JOIN data225proj.area as a ON cr.area_id = a.area_pk
group by a.area_name
order by count(dr_number) desc
limit 10;
```

	area_name	count_of_crimes
▶	Southwest	103
	77th Street	102
	Central	93
	Wilshire	89
	Southeast	89
	N Hollywood	83
	Topanga	71
	Pacific	71
	Rampart	67
	West LA	63

- 5) Top 10 total number of crime cases per victim age: This query gives the top 10 results of total crime cases according to the victim age.

```
select cr.victim_age,count(cr.dr_number) as crime_count_per_age
from data225proj.crime_record cr
group by cr.victim_age
order by count(cr.dr_number) desc
limit 10;
```

victim_age	crime_count_per_age
31	48
36	47
26	45
25	43
28	41
27	39
30	37
32	37
29	36
34	35

- 6) Top 10 total number of crime cases per victim descent: This query gives the top 10 results of total crime cases according to the victim descent type.

```
select v.victim_description, count(cr.dr_number) as count_of_crime_cases
from data225proj.crime_record as cr
Join data225proj.victim_descent as v on cr.victim_descent_id = v.victim_descent_id
group by v.victim_description
order by count(cr.dr_number) desc
limit 10;
```

victim_description	count_of_crime_cases
Hispanic/Latin/Mexican	553
White	366
Black	288
Other	131
Other Asian	38
Unknown	22
Korean	6
Chinese	4
Filipino	2
American Indian/Alaskan Native	2

- 7) Top 10 total number of crime cases per premise: This query gives the top 10 results of total crime cases for each premise.

```
select p.premise_description,count(cr.dr_number) as count_of_crime_cases
from data225proj.crime_record as cr
join data225proj.premise_type as p on cr.premise_code = p.premise_code
group by p.premise_description
order by count(cr.dr_number) desc
limit 10;
```

premise_description	count_of_crime_cases
SINGLE FAMILY DWELLING	289
STREET	252
MULTI-UNIT DWELLING (APARTMENT, DUPL...	214
PARKING LOT	99
SIDEWALK	91
VEHICLE, PASSENGER/TRUCK	62
OTHER BUSINESS	36
GARAGE/CARPORT	32
DRIVEWAY	29
PARK/PLAYGROUND	17

- 8) Total Num of crimedata cases group by victim age per victim sex: This query gives the total number of crime cases according to the victim gender and age.

```
select victim_age ,victim_sex, count(dr_number) as count_of_crime_cases
from data225proj.crime_record
group by victim_age, victim_sex
order by count(dr_number) desc
limit 10;
```

victim_age	victim_sex	count_of_crime_cases
36	M	26
31	M	24
31	F	24
28	M	24
50	M	24
25	F	24
26	F	23
26	M	22
30	M	22
41	M	21

- 9) Total Number of crimecases per victim sex: This query gives the total number of crime cases according to the victim gender.

```
select victim_sex, count(dr_number) as count_of_crime_cases
from data225proj.crime_record
group by victim_sex
Order by count(dr_number) desc;
```

victim_sex	count_of_crime_cases
M	743
F	661
X	9

- 10.)Total number of crime cases per priority: This query gives the total number of crime cases for each priority.

```
SELECT p.description, COUNT(dr_number) AS count_of_crime_cases
FROM data225proj.crime_record as cr
join data225proj.priority as p on cr.priority_code = p.priority_code
GROUP BY p.description
ORDER BY COUNT(dr_number) DESC;
```

description	count_of_crime_cases
high	744
low	669

- 11.)Top 10 most commonly used weapons: This query gives the top 10 results of most commonly used weapons.

```
SELECT w.weapon_description, count(cr.weapon_used_id) as weapon_used_count
FROM data225proj.crime_record cr
inner join data225proj.weapon_used_type w on w.weapon_used_id = cr.weapon_used_id
```

```
group by w.weapon_description
order by count(cr.weapon_used_id) desc
limit 10;
```

weapon_description	weapon_used_count
STRONG-ARM (HANDS, FIST, FEET OR BODY)	344
UNKNOWN WEAPON/OTHER WEAPON	56
HAND GUN	34
VERBAL THREAT	33
SEMI-AUTOMATIC PISTOL	13
KNIFE WITH BLADE 6INCHES OR LESS	11
OTHER KNIFE	9
MACE/PEPPER SPRAY	9
VEHICLE	8
KNIFE WITH BLADE OVER 6 INCHES IN LENGTH	7

- 12.) Total number of crime cases per area: This query gives the total number of crime cases for each area.

```
SELECT a.area_name, count(dr_number) as count_of_cases, count(victim_age) as count_of_victim
FROM data225proj.crime_record cr
join data225proj.area a on cr.area_id = a.area_pk
group by a.area_name;
```

area_name	count_of_cases	count_of_victim
Wilshire	89	89
Northeast	58	58
Harbor	51	51
77th Street	102	102
Van Nuys	55	55
West LA	63	63
Pacific	71	71
Hollenbeck	43	43
West Valley	56	56
Southwest	103	103
Southeast	89	89
Newton	49	49
Rampart	67	67
Hollywood	61	61
N Hollywood	83	83
Central	93	93
Foothill	39	39
Topanga	71	71
Olympic	60	60
Devonshire	50	50
Mission	60	60

Views:

A view is an efficient way to reduce the amount of reusable code and can also act as a logical table. Due to the fact that this project will serve as a tracking system, it will be difficult to query and extract the data every time. In that case, we created three views to be used for three different purposes. The three views can serve as a general report so that law enforcement officials do not have to query the code every time. They can be easily viewable in views. By doing so, time can be saved, and efficiency increased.

View_1 # daily_cases:

Below is a daily crime report for Los Angeles. It lists all criminal cases reported every day in each area.

```
create view daily_cases as
select a.area_name as "Area Name" , count(dr_number) as "Crime Cases Count",
victim_sex as "Victim Sex"
from crime_record cr
join area a on cr.area_id = a.area_pk
where cr.date_reported = curdate()
group by area_name, victim_sex;
```

The screenshot shows the MySQL Workbench interface. On the left, the 'SCHEMAS' sidebar is open, showing the 'data225proj' schema selected. In the main pane, SQL code is being entered into the query editor:

```
1
2
3 •  create view daily_cases as select a.area_name as "Area Name" , count(dr_number) as "Crime Cases Count", victim_
4   where cr.date_reported = curdate() group by area_name, victim_sex;
5
6 •  select * from daily_cases;
7 •  insert into crime_record values(20196737,'2021-05-08','2021-05-08',null,'M',null,310,1,624,102,6,3,2,379);
8
```

Below the code, the results are displayed in a 'Result Grid' table:

Area Name	Crime Cases Count	Victim Sex
Central	1	M

View_2 # priority_report:

This view shows the number of criminal cases based on their priority in each area.

```
create view priority_report as
SELECT a.area_name as "Area Name", p.description as "Priority", count(dr_number)
as "Crime Cases Count"
FROM crime_record cr
JOIN area a on cr.area_id = a.area_pk
join priority p on cr.priority_code = p.priority_code
group by a.area_name,p.description
```

order by a.area_name;

```

SCHEMAS
  d200_test
  data225proj
    Tables
    Views
      daily_cases
      priority_report
    Stored Procedures
    Functions
  sys

Administration Schemas
Information: data225proj

Schema: data225proj

8
9
10 •  create view priority_report as SELECT a.area_name as "Area Name", p.description as "Priority", count(dr_number)
11   join priority p on cr.priority_code = p.priority_code group by a.area_name,p.description order by a.area_name;
12
13 •  select * from priority_report

```

Area Name	Priority	Crime Cases Count
77th Street	high	49
77th Street	low	53
Central	high	59
Central	low	39
Devonshire	high	29
Devonshire	low	21

View_3 # status_report:

Using this view, we can see the number of criminal cases by Status in each area.

```

create view status_report as
SELECT a.area_name as "Area Name", s.status_description as Status,
count(dr_number) as "Crime Cases Count"
FROM crime_record cr
JOIN area a on cr.area_id = a.area_pk
join status_type s on cr.status_id = s.status_id
group by a.area_name,s.status_description
order by a.area_name;

```

```

14
15
16 •  create view status_report as SELECT a.area_name as "Area Name", s.status_description as Status, count(dr_number)
17   FROM crime_record cr JOIN area a on cr.area_id = a.area_pk join status_type s on cr.status_id = s.status_id
18   group by a.area_name,s.status_description order by a.area_name;
19
20 •  select * from status_report;

```

Area Name	Status	Crime Cases Count
77th Street	Adult Arrest	6
77th Street	Adult Other	14
77th Street	Invest Cont	81
77th Street	Juv Other	1
Central	Adult Arrest	3
Central	Adult Other	10
Central	Invest Cont	84

Constraints:

Constraints are the rules to allow or restrict what values can be stored in columns. The purpose of inducing constraints is to enforce the integrity of a database.

- 1) Check constraints are added for a few of the columns of crime_record table and area table.

```

ALTER TABLE crime_record
ADD CONSTRAINT CHK_VictimSex CHECK (victim_sex in ('F','M','X'));

```

```

ALTER TABLE crime_record
ADD CONSTRAINT CHK_DRNUM CHECK (LENGTH(dr_number) = 9);

```

```

ALTER TABLE area
ADD CONSTRAINT CHK_REPORTING_DIST_NUM CHECK
(LENGTH(reporting_district_num) <= 4);

```

- 2) Unique constraints are added for the columns which represents codes of status_type, motivation_type, priority, premise, crime_type, victim_descent and weapon_used_type tables.

```

ALTER TABLE status_type
ADD CONSTRAINT UNQ_STATUS_CODE UNIQUE(status_code);

```

```

ALTER TABLE motivation_type

```

ADD CONSTRAINT UNQ_MOTIVATION_CODE UNIQUE(mo_code);

ALTER TABLE priority

ADD CONSTRAINT UNQ_PRIORITY_CODE UNIQUE(priority_code);

ALTER TABLE premise_type

ADD CONSTRAINT UNQ_PREMISE_CODE UNIQUE(premise_code);

ALTER TABLE crime_type

ADD CONSTRAINT UNQ_CRIME_CODE UNIQUE(crime_code);

ALTER TABLE victim_descent

ADD CONSTRAINT UNQ_VICTIM_CODE UNIQUE(victim_description_code);

ALTER TABLE weapon_used_type

ADD CONSTRAINT UNQ_WEAPON_CODE UNIQUE(weapon_used_code);

- 3) Null constraints are added for a few columns in crime_record, weapon_used_type and area tables.

ALTER TABLE crime_record MODIFY victim_sex char(1) NOT NULL;

ALTER TABLE crime_record MODIFY date_reported date NOT NULL;

ALTER TABLE weapon_used_type MODIFY weapon_used_code int NOT NULL;

ALTER TABLE area MODIFY area_name varchar(50) NOT NULL;

ALTER TABLE area MODIFY reporting_district_num int NOT NULL;

Visualization:

An important part of the process is data visualization, which provides an in-depth look at the data. A visual representation of the above-inserted data was created using Tableau. In addition to helping to understand the data better, this could also increase the effectiveness of the database design.

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Chart 1:

The following chart summarizes criminal cases that occurred during these years.

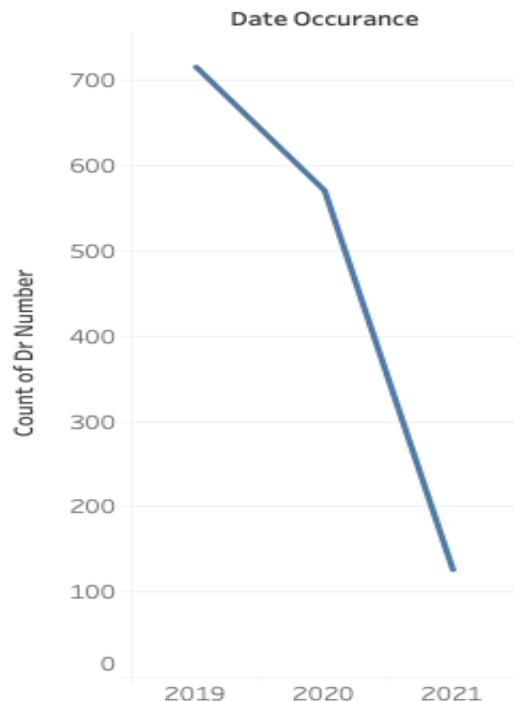


Chart 2:

According to their gender, here is a chart that shows how many victims had been affected.

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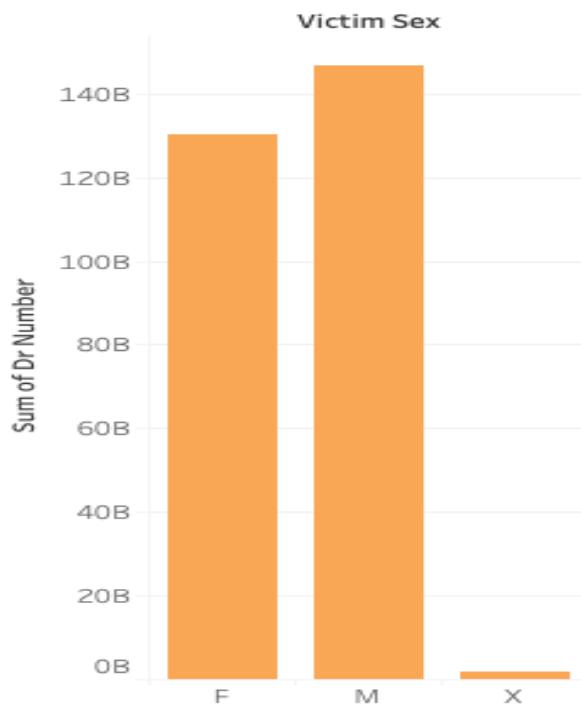
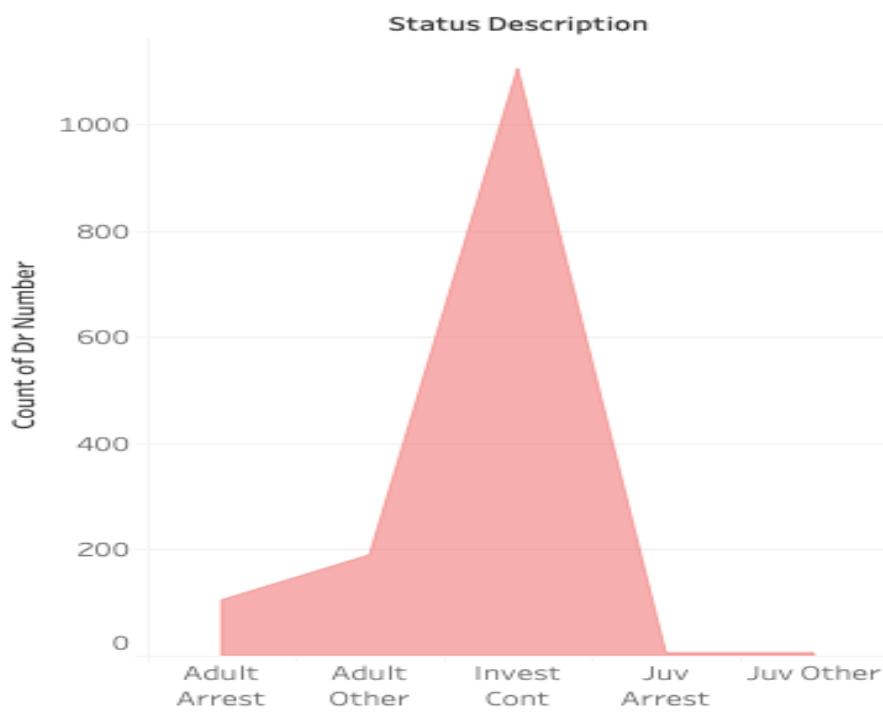


Chart 3:

A chart highlighting criminal case counts based on their status is shown below.



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Chart 4:

The chart shows the number of criminal cases based on the victim's decedent.

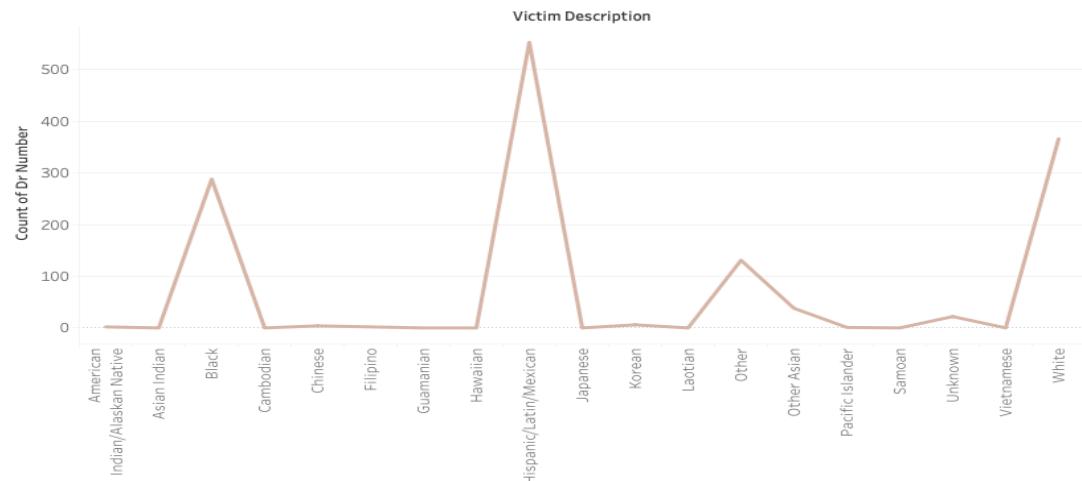


Chart 5:

These are the Top 10 crimes that have been reported in Los Angeles.

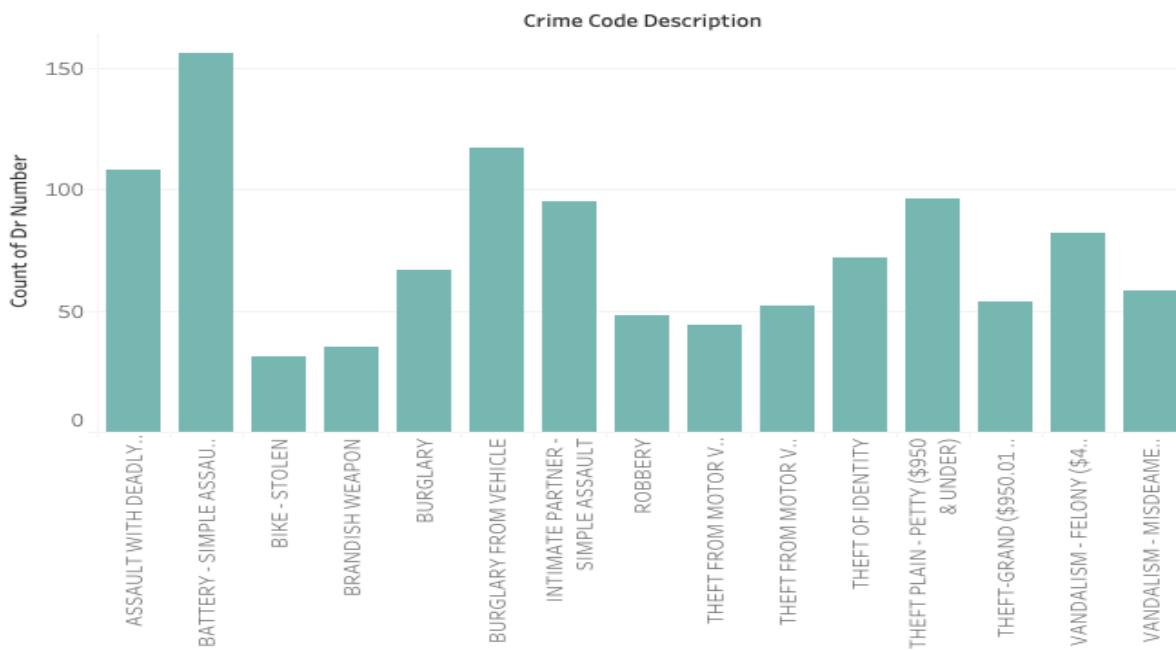


Chart 6:

We can learn how many criminal cases occurred in each area from this diagram.

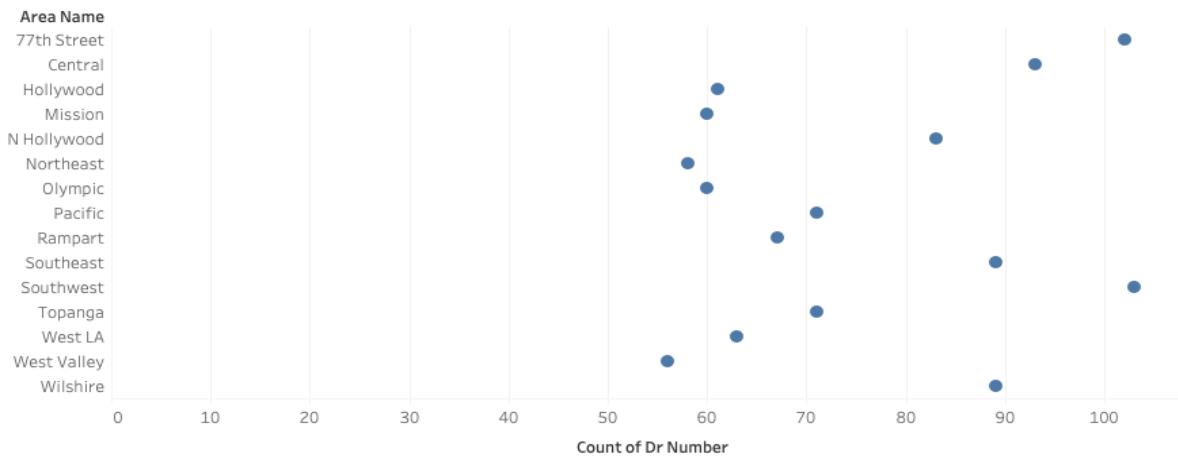


Chart 7:

We can find out from this chart what the top ten age groups are of those affected by criminal activities.

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Chart 8:

The following are the 5 most common places for criminal activity to occur.

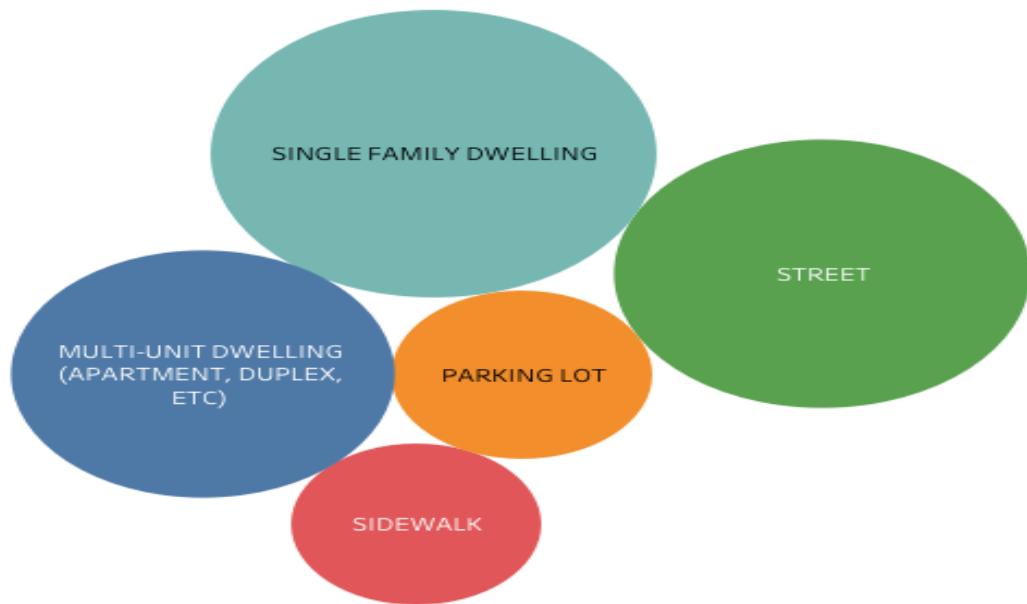
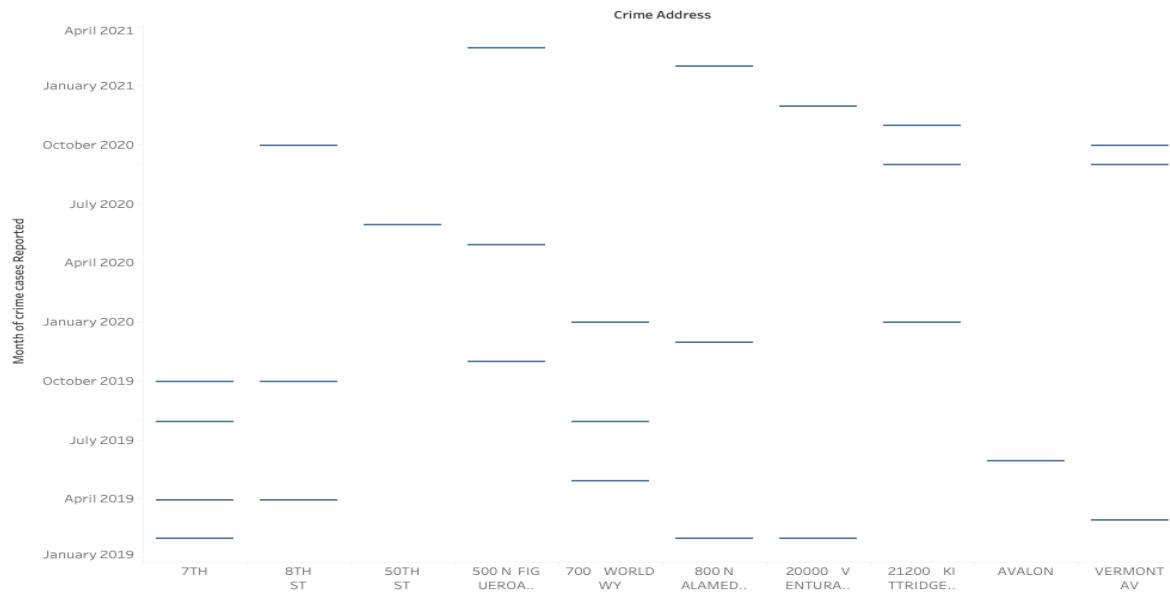


Chart 9:

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Based on each area, this chart depicts the number of criminal activities that happened each month.



Summary & Conclusion

People all over the world are affected by this pandemic. In the midst of law enforcement officials' efforts to prevent the virus spreading to other people, crimes can happen in one corner. Designing a good database can help to prevent criminal activity and save lives. Moreover, it may make the lives of law enforcement officials easier. The public would also live-in peace without worrying about crime. Thus, we developed a database design so that it could act as a monitoring system for all the criminal activities that took place in Los Angeles. Using such information, law enforcement officials can have deeper insights into each criminal activity and make informed decisions on how best to protect the people in the future. Together with fighting viruses, they could fight to create a secure place where crimes cannot take place. This database design would ensure law-enforcement officials have the means to accomplish their aim.

Future Work

In the future, we are planning to cover the entire state of California in order to create a crime-free environment across the state.

In that case, because the data would grow exponentially, we planned to move from SQL to NoSQL. MongoDB will be used in the future since it can be used on any platform such as on-premises and in the cloud. Moreover, it can manage, store, and search data with textual, spatial, or time series dimensions. Since our project acts as a tracking system, the time series dimension is essential.

Future Plan:

Our task will be to gather all crime activities that have happened throughout California. We will gather details about the people who carried out criminal activities. Additionally, we will gather information on their punishment, such as incarceration, for their criminal activity. Depending on the age of the person who took part in the crime activity, we will categorize the data as adult or non-adult.

We will focus more on the above points in the future.

References

Data sources:

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