# CITY OF LOS ANGELES' 311 - SERVICE REQUEST

*DSO 545: Statistical Computing and Data Visualization*

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# ABSTRACT

**Aim:**

Exploratory Analysis of the 311 Call Center and Service Request Data for the City of Los Angeles.

**Project Description:**

The Statistical Computing and Data Visualization course focuses on the practice of Data Cleaning, Reshaping Data, Basic Tabulations and aggregations to be able to produce high quality visualization.

With this project, we aim to Discover Patterns (Identify trends and patterns in 311 service requests across time, geography and population segment that can help formulate useful hypotheses), Recommend Actions (From identified trends, recommend actions or strategies that can improve request fulfillment, reduce request volume, or shorten response time) and Propose Evaluation Framework (As part of actionable recommendation, an evaluation framework will be included to verify the assumptions and effectiveness of proposed solutions).

# EXECUTIVE SUMMARY

Graffiti is a growing problem that demands more allocated resources

- Increased by 25,000 in a 12-month period
- Persistent problems, i.e., graffiti reappear after cleaning, in several key precincts
- Possible solutions: youth and community outreach programs, shorter response time to discourage tagging, spray-proof wall paint

Better mechanism for handling duplicate requests desired

- A large number of service requests are duplicate. Duplicate requests can drain on resources otherwise dedicated to more time-sensitive requests
- Richer info on request status beyond Open/Closed
- Grant user ability to modify/update requests

Opportunities to improve quality of service across departments

- Front-load resources for handling requests as they come in earlier in the week and in the morning
- Centralized dashboards for partnering departments:
  - Requests escalated to department supervisors if not resolved within expected time
  - Month-to-month KPIs for performance tracking, e.g., average response time, request volume, % of escalated requests
  - Filter by request type relevant to specific departments, e.g. Lighting Problems for Board of Public Works, Homeless Encampment for Police Department

# INTRODUCTION

**Rationale of the Study:**

Analysis of 311 calls can be of great use for a wide variety of purposes, ranging from a rich understanding of the status of a city to the effectiveness of the government services in addressing such calls. Ideally, the analysis can also support a prediction of future 311 calls, which would enable the assignment of service resources by the city government.

**311: Non–Emergency Calls**

311 is a special telephone number that provides access to the citizens and tourists to the city's non-emergency municipal services. The number format follows the **N11 Code** for a group of short, special purpose local numbers as designated in the North American Numbering Plan. Reported 311 problems are passed along to government services, who address and solve the problem. The records of 311 calls are publicly open and updated daily.

The distinction between 911 and 311 and been popularly described as: "Burning building? Call 9-1-1. Burning Question? Call 3-1-1"

**History**

The first use of 311 for informational services was in Baltimore, Maryland in 1996. It was intended to connect callers to the same call center as 911, but 311 calls were assigned a second priority. The largest 311 operation in North America is in Toronto and it was implemented in 2009. 311 is available in several American Cities, US Counties and smaller towns.

311 service in Los Angeles is available in English, Spanish, to the hearing impaired and in more than 150 other languages through the use language translation services. 311 agents process customer inquiries for various requests using **Citywide Services Directory (CSD)**.

Los Angeles, launched its MyLA311 Mobile App in 2013. MyLA311 provides mashup of the city's social media updates, locates local attractions and maintains a traditional 311 reporting component. The app allows its users to not only submit 311 service requests using their

smartphone's GPS System and Camera but also allows them to locate city resources and pay city bills.

**"MyLA311 is a major leap forward in making City Hall a tech friendly place" said Mayor Antonio Villaraigosa in a statement. "Angelenos now have a direct mobile portal to vital services and key city information. This will spur a more open and transparent government."**

Major features on the app developed by 3Di Systems include the "Find City Info" mapping tool which allows users to locate different places such as local parks, swimming pools, golf courses, lakes and libraries; and "City Hall News".

# DATA AND METHODOLOGY USED

**Source of Data:**

311 call data and service request data is available to the public on LA Open Data.

**Dataset Description:**

1) **Call Center Tracking Data:** Basic 311 call tracking information including date and time of call, type of information requested, how the request was handled, and which departments were notified.

   Variables in the Data Set:

   - **Date –** Created date of record
   - **Time –** Created time of record
   - **Department.Abbrevation –** Unique abbreviation of Department Name
   - **Department.Name –** Unique name of Department
   - **Service.Name –** Service requested by caller
   - **Call.Resoultion –** Resolution for service requested
   - **Zip.Code –** Zip Code of the caller

   Variables Created: (performed inner join with zipcode dataset)

   - **City –** Location (City) of the caller
   - **Longitude –** Longitude of the caller's point of location
   - **Latitude –** Latitude of the caller's point of location
   - **Year –** Year of the request created date
   - **Month –** Month of the request created Date
   - **Weekday –** Weekday of the request created Date
   - **Hour –** Hour of the request created Time

**2) MyLA311 Service Request Data 2016:** Service request data from MyLA311 for 2016. This includes requests submitted via 311, call centers, email, mobile apps, website, and other sources.

Variables in the Data Set -

- **SRNumber –** Service Request Number
- **CreatedDate –** Request creation date and time
- **UpdatedDate –** Request updated date and time
- **ActionTaken –** Action taken by Department on the service request
- **Owner –** The department who created the request on the system
- **RequestType –** Service requested by user
- **Status –** Status of the request (Cancelled/Closed/Forward/Open/Pending)
- **RequestSource –** Medium of the request recorded (Mobile App/Call/Email..)
- **MobileOS –** Operating System if RequestSource is Mobile App
- **Anonymous –** Is the user anonymous? (Y/N)
- **AssignTo –** The group the service request is assigned to
- **ServiceDate –** Date and time of processing the service requested
- **ClosedDate –** Date and time of closing the service requested
- **AddressVerified –** Is the address of the user verified? (Y/N)
- **ApproximateAddress –** Is the address of the user approximate address? (Y/N)
- **Address –** Address of the user
- **HouseNumber –** House number of the user
- **Direction –** Direction of street extracted from Address
- **StreetName –** Street name extracted from Address
- **Suffix –** Street suffix extracted from Address
- **ZipCode –** ZipCode extracted from Address
- **Latitude –** Latitude of the Address

- **Longitude** – Longitude of the Address
- **Location –** Combination of Latitude and Longitude for the Address
- **APC –** Area Planning Commission
- **CD –** Council District Number of the Address
- **CDMember –** Council District Member of the Address
- **NC –**Unique Neighbourhood Council Number
- **NCName –** Name of Neighbourhood Council
- **PolicePrecinct -** Division area patrolled by a police force

Variables Created -

- **Month –** Month extracted from CreatedDate
- **Year –** Year extracted from CreatedDate
- **Day –** Weekday extracted from CreatedDate
- **Hour –** Hour extracted from CreatedDate
- **Day –** Weekday extracted from CreatedDate

**Data Cleaning:**

1) Converted dates from a factor format to POSIXct format using Lubricate Package in R
2) Extracted weekdays, months and hours for all date variables

**Tools and Packages Used:**

1) R
2) R Studio
3) dplyr
4) gridExtra
5) ggmap
6) ggplot2
7) shiny
8) stringR
9) wordcloud

# DATA ANALYSIS AND INSIGHTS
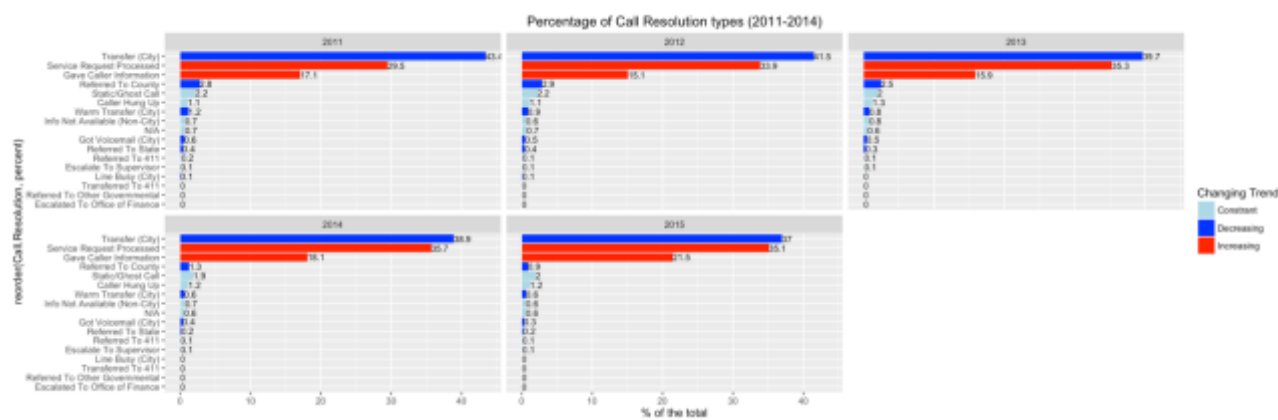
**Quick Look into the Dataset:**



**Findings:**

1) Most used sources to make a 311 Request: Call, Driver Self Report, Mobile App
2) Most requested services on 311: Bulky Items, Graffiti Removal
3) Location with highest number of requests: Zip Codes – 90011, 90026
4) Department receiving most requests: LADBS (Department of Building and Safety)
5) Police Precinct receiving must requests: Northeast, Newton
6) Most frequent resolution types: Service Request Processed, Transfer(city)

**Historical Data:**



Number of Requests made for different Departments



Percentage of calls for different Resolution Types
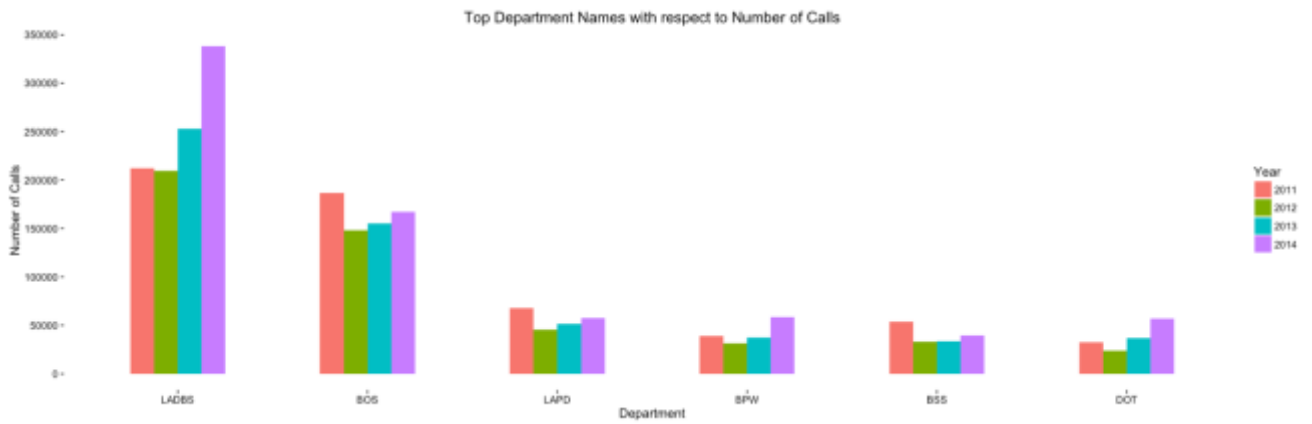
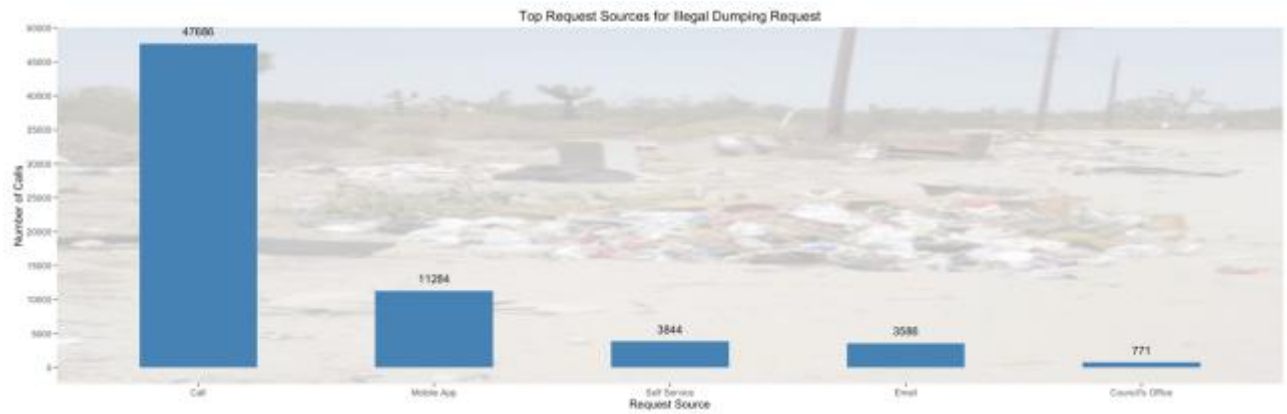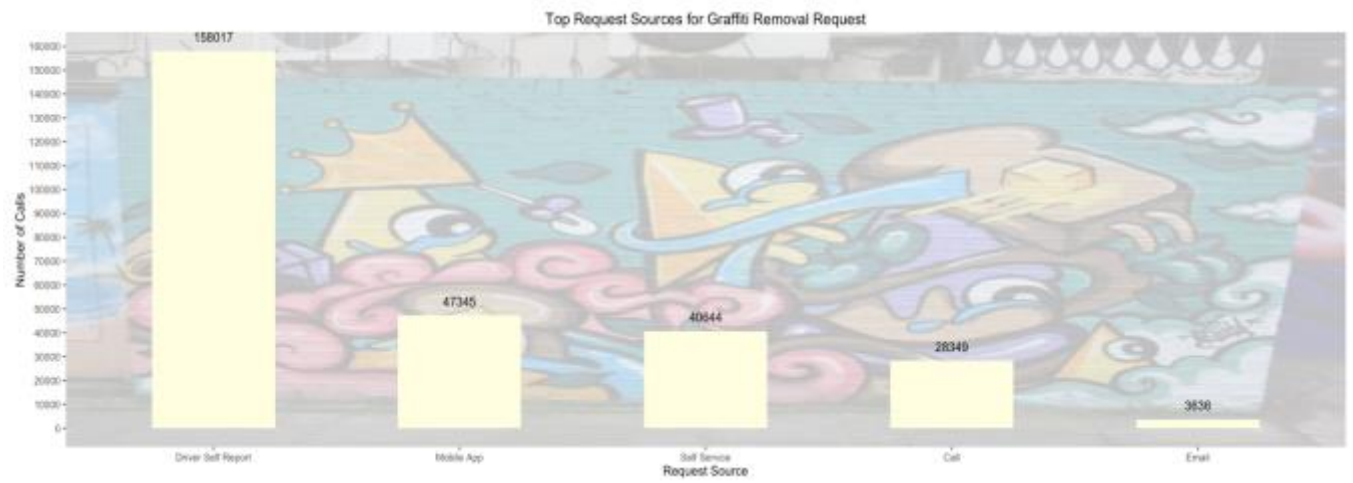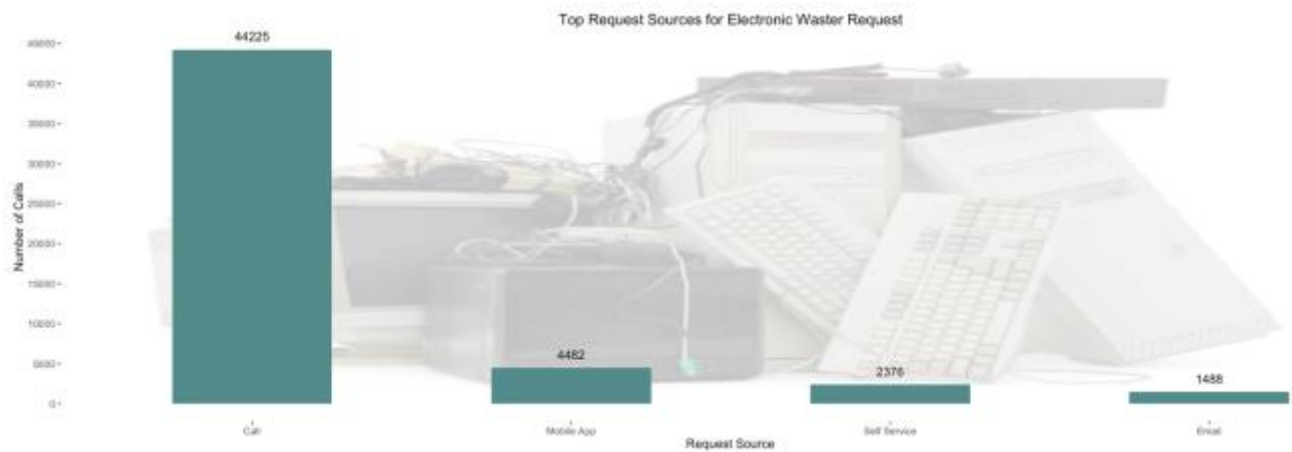Top 6 departments with respect to number of requests made (Year Wise)
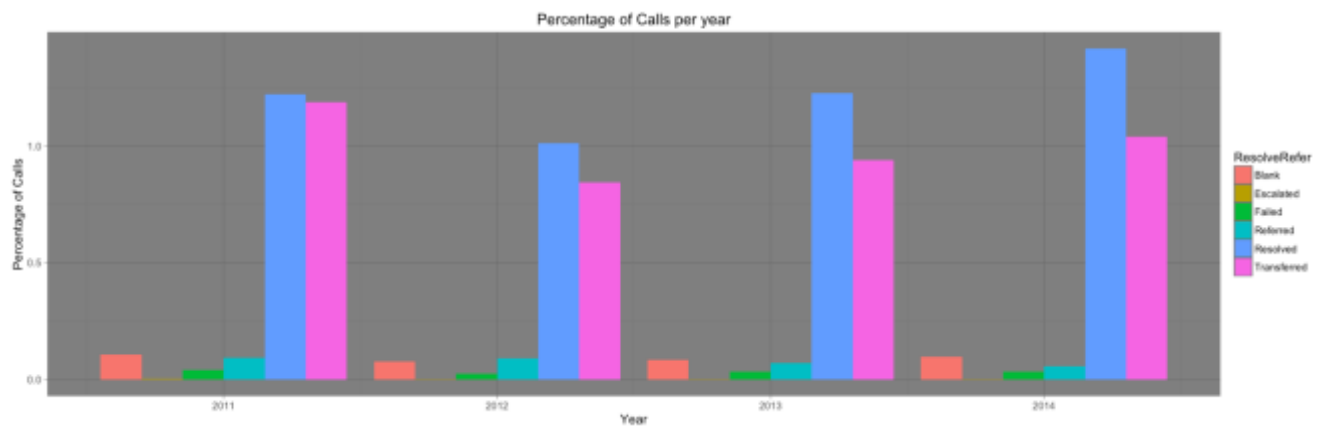


Percentage of top six Call Resolution types (Year Wise)
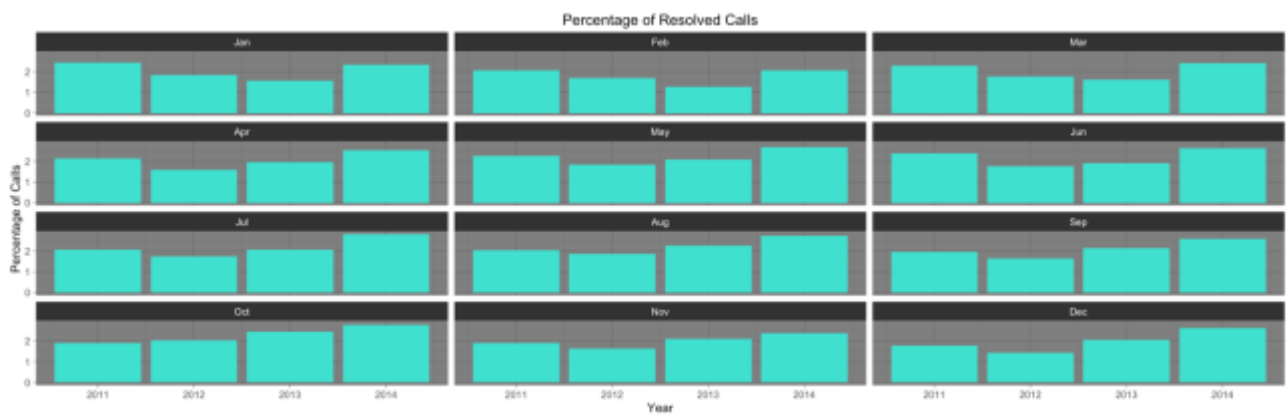


Percentage of Calls Resolved (Year and Month Wise)

Call distribution by Month and Year

**Findings:**

On analyzing the data, we observed the following:

1) Over a span of 5 years, LADBS (Department of Building and Safety) received the most requests
2) For different resolutions possible we notice an increasing trend (in percentage) for resolution types "Service Processed" and "Gave caller information". We also see an increase in the percentage of calls resolved. This reflects on the high efficiency of the different departments of LA City.

**Current Trends:**



Distribution of Calls in 2016

Top Request Sources for Graffiti Removal Request



Top Request Sources for Illegal Dumping Request


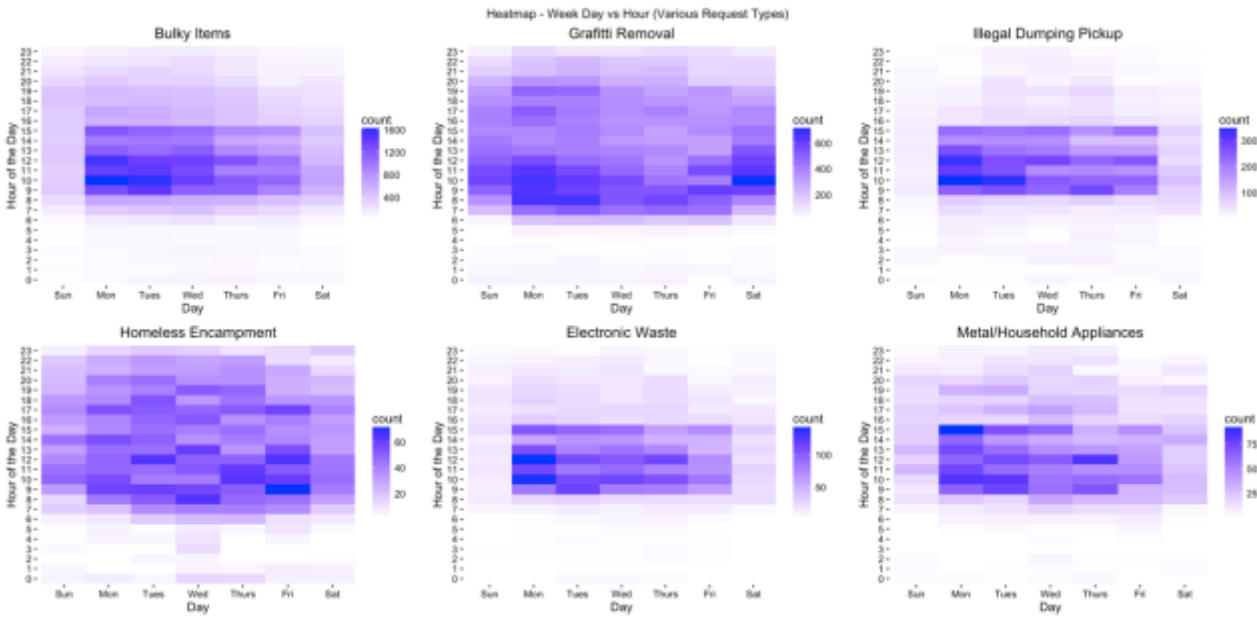
Top Request Sources for Dead Animal Removal Request

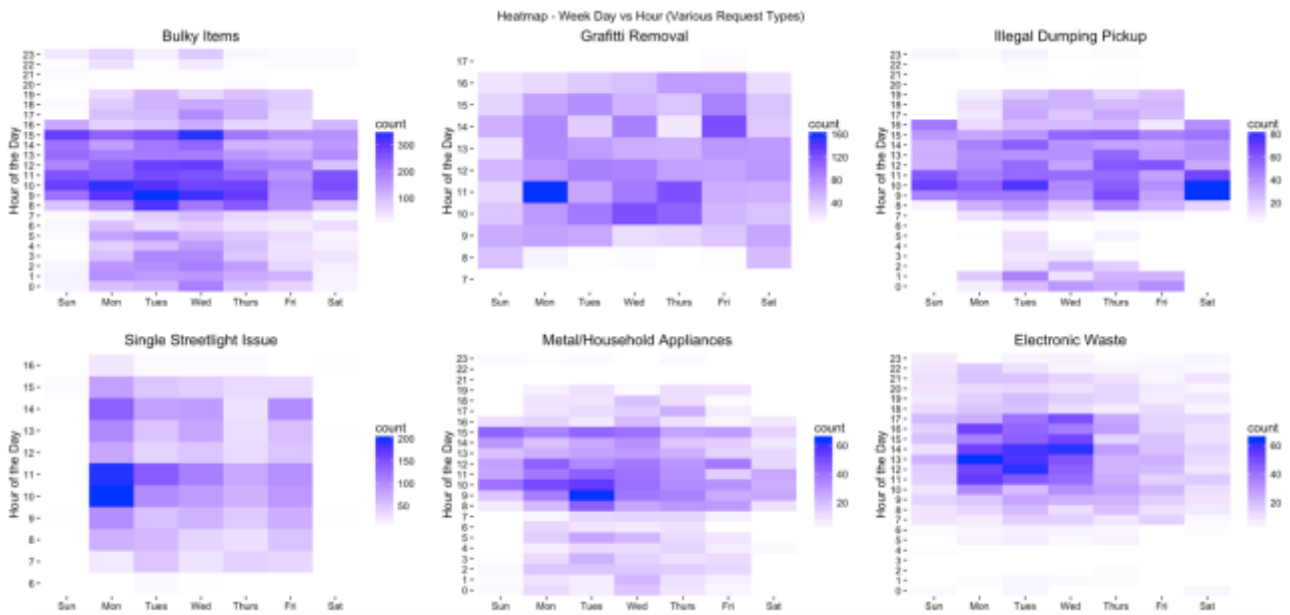Top Request Sources for different Request Types (only top 6 request types considered)
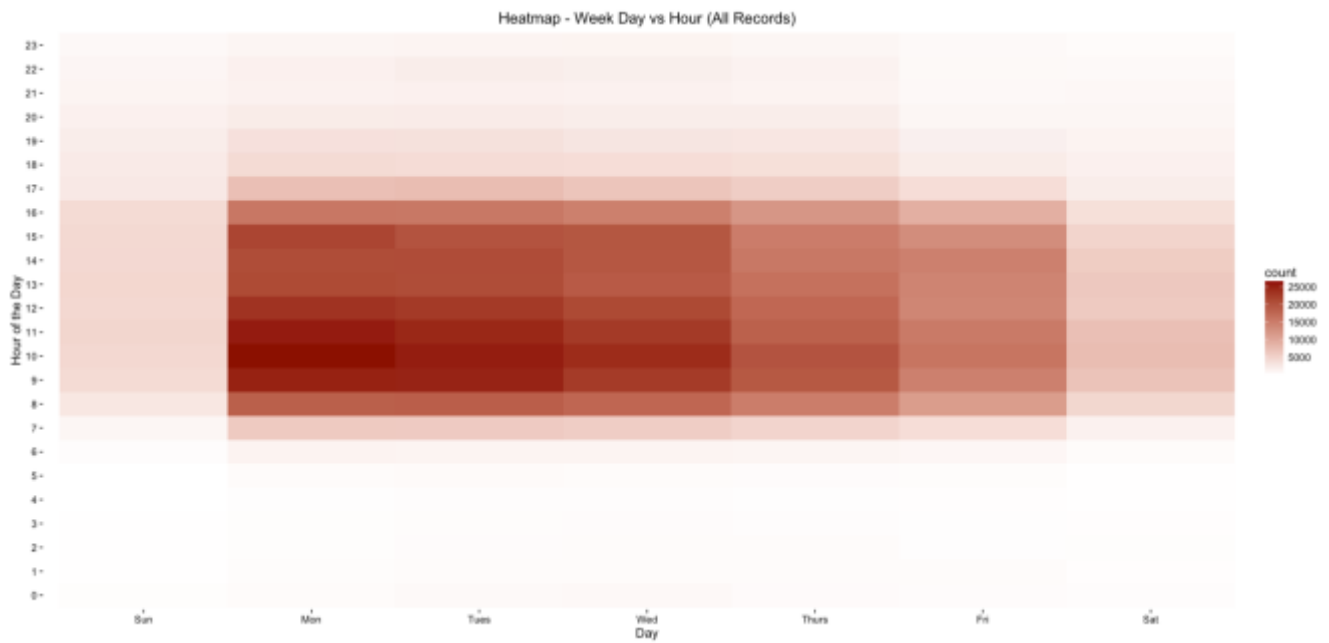
Overall Heat Map
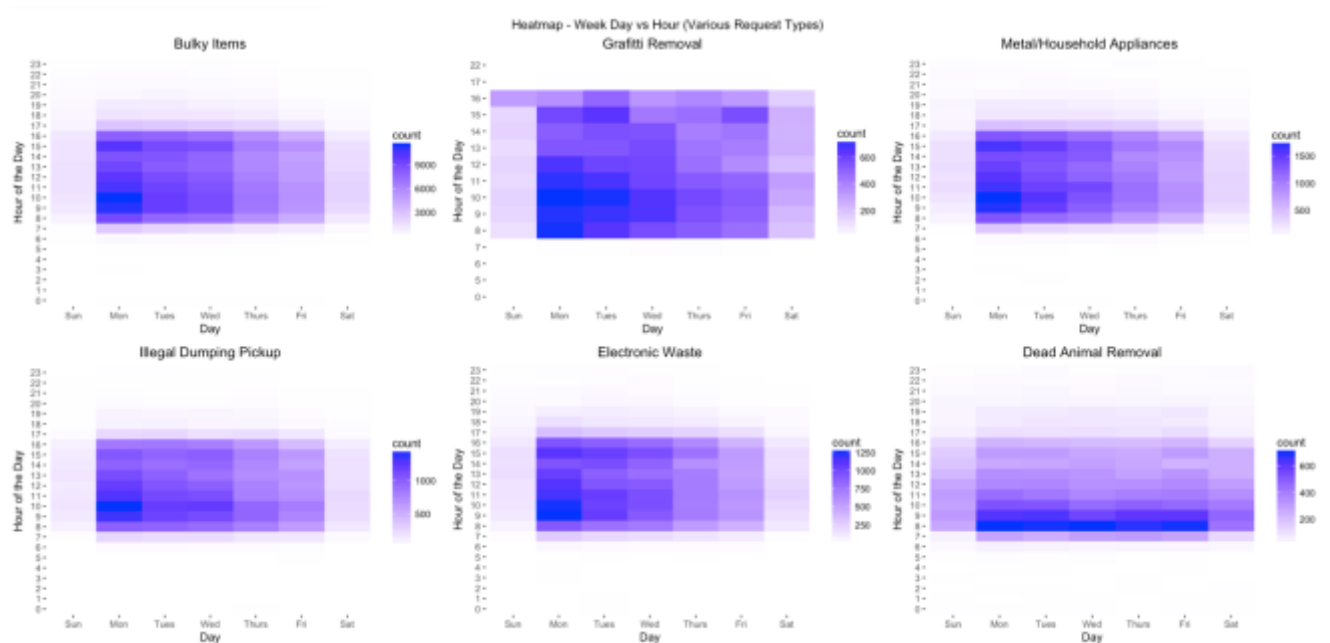
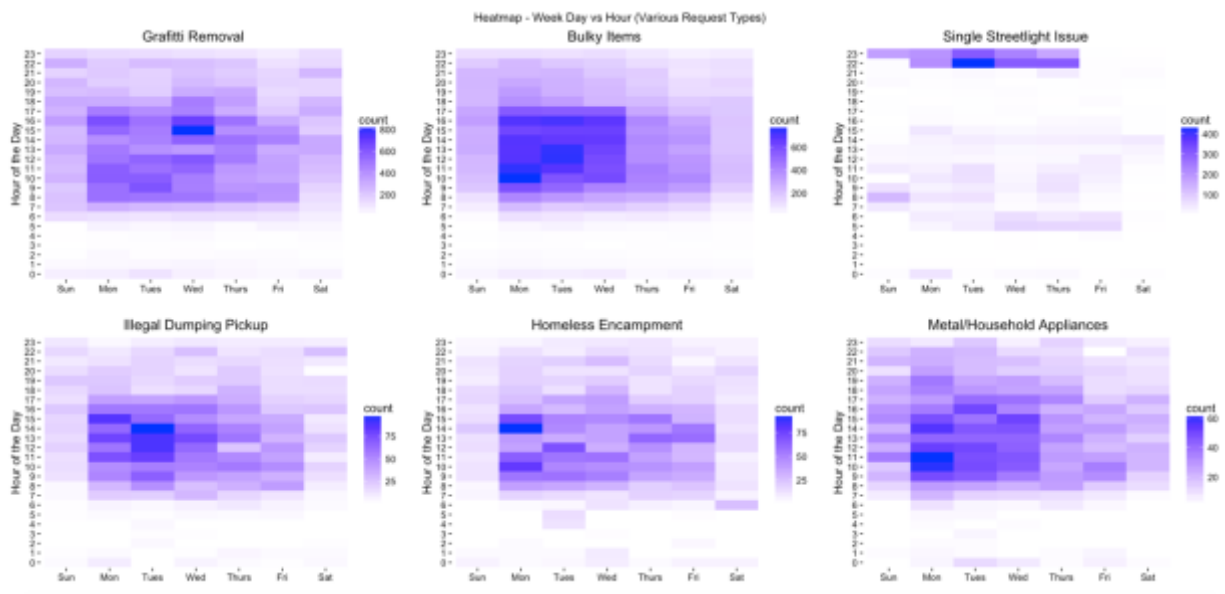

Request Source: Call

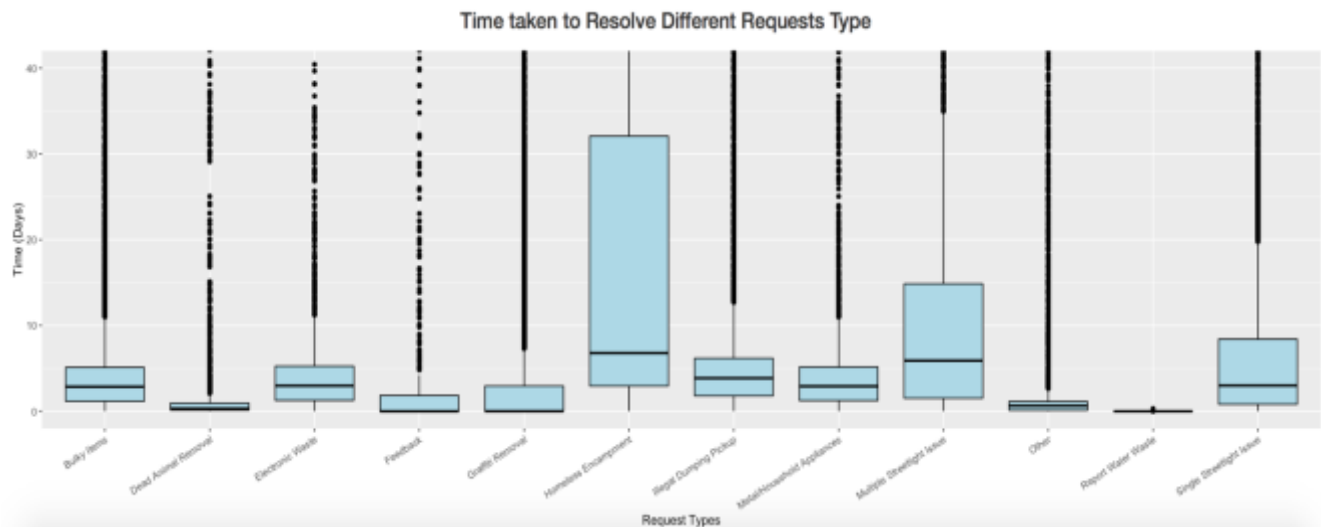Request Source: Mobile App



Request Source: Email

Request Source: Driver Self Report



Request Source: Self Service

Time to Resolve Different Requests

**Findings:**

On analyzing the data, we observed the following:

1) Overall, the preferred source to make a service request is a phone call (58%) followed by the mobile app (15%).

2) An exception to the overall trend is seen for Graffiti Removal (top 5 requests sources studied). For Graffiti Removal 57% of the requests come through Driver Self Report and 17% are made through the MyLA311 Mobile App.

3) The heat map for requests made through calls only, show that Dead animal removal calls occur first thing in the morning.

4) The heat maps for requests made through the mobile app, show that the distribution of requests is more spread out through the week, e.g., graffiti removal requests on weekends and homeless encampment report occurs first thing in the morning.

5) On an average, most requests take nearly three days to be resolved. Whereas Homeless Encampment and Multiple Street Light Issue request on an average take approximately six days to be resolved.
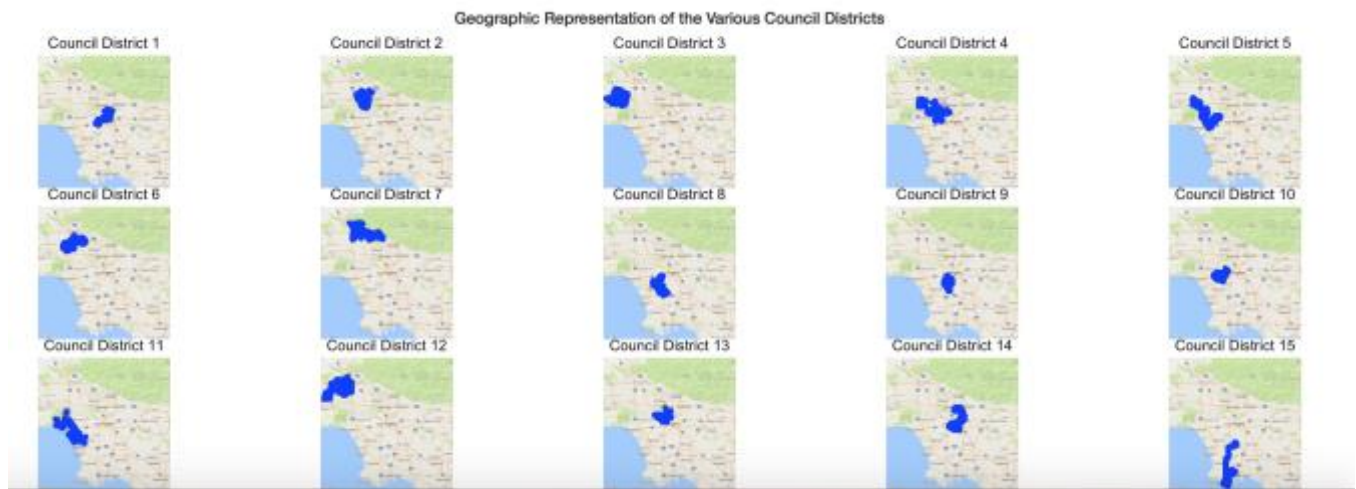
**Geographic Trends:**



Geographic Representation for Top 6 Requests Type
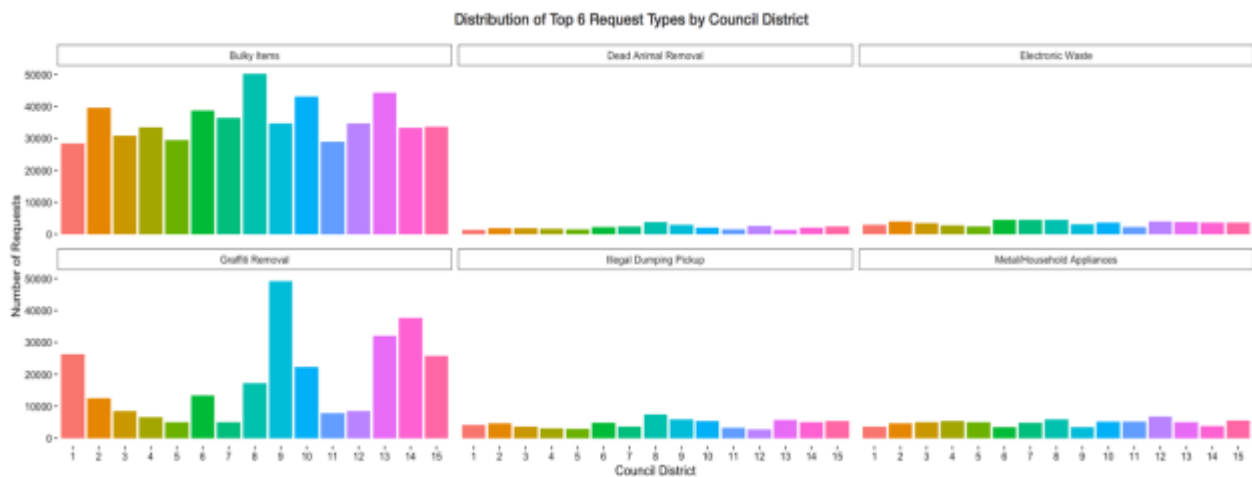


Distribution of Top 6 Requests Types by Council District

Geographic Representation of the Council Districts

**Findings:**

1) Council District 8 includes the neighborhoods of Baldwin Hills, Chesterfield Square, Crenshaw, Leimert Park, Jefferson Park, West Adams and other communities of western South Los Angeles. There is high occurrence of Bulky Items requests in this council district.
2) The Ninth Council District encompasses the western section of Downtown Los Angeles and much of South Los Angeles. A large number of requests for Graffiti Removal are received from these areas.

# AREAS OF FOCUS

**Graffiti Removal:**

Before taking any steps to tackle the increase in volumes of requests for Graffiti Removal we need to understand the difference between Street Mural and Graffiti.

A **mural** is any piece of artwork painted or applied directly on a wall, ceiling or other large permanent surfaces. The technique has been in common use since the late 19th century.

**Graffiti** on the other hand is writing or drawings scribbled, scratched, or sprayed illicitly on a wall or other surfaces in a public place.



- Requests increased by 25,000 in 12 months
- Persistent problems in several precincts

**Duplicate & Multiple Requests:**

It was observed that multiple requests are logged into the system that come for the same service request, from the same location and around the same time. This raises the possibility of duplicate requests being entered in the system or multiple requests made for the same service by different users. Currently the MyLA311 Mobile App doesn't allow the users to edit their service request to include more details if required.

This results is probable over estimation of the number of requests made for a Request Type.
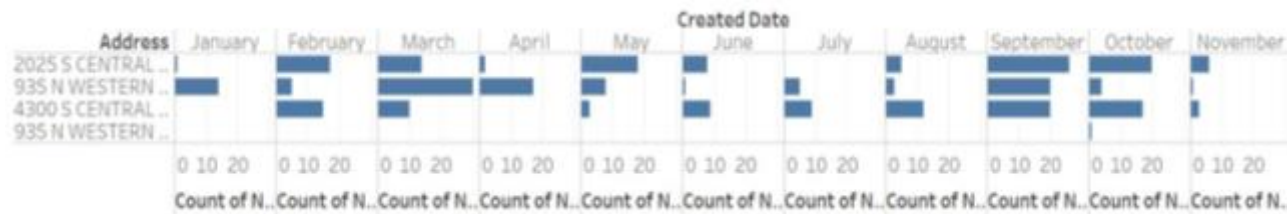


**Service Quality:**

The median time taken to resolve most complaints is around three days. Homeless Encampment and Multiple Street Light Issue takes approximately six days to resolve.

# RECOMMENDATIONS

**Graffiti Removal:**

1) **Youth and Community Outreach:** Campaign to raise awareness about the costs of cleaning graffiti. After-school programs for at-risk youth**.**
2) **Faster Processing Time:** This discourages taggers from attempting spray again knowing that it will be removed quickly
3) **Spray – Proof Wall Paint:** While this may deter taggers initially, they simply will find other nearby locations without spray-proof fortification.
4) **More frequent Law Enforcement:** More frequent night patrols in precincts with higher percentage of graffiti reports

**Duplicate & Multiple Requests:**

1) **Richer information on Request Status:** More transparent accountability allows users to see request progress as it is being processed**.**
2) **Suggest possible Duplicate Requests:** This prevents users from creating multiple requests on the same issue at the same location
3) **Grant users ability to modify requests:** This allows users to add more context to their service requests and remove requests when they are no longer valid.
4) **Provide estimated processing time:** This assures requesters that work is being done and allows escalation to processing department when the estimated time has passed without resolution

**Service Quality:**

1) **Front Load Resources:** Aside from dead animal and homeless encampment, most requests tend to come in earlier in the week and in the day. We should involve a higher number of personnel during these times.

2) **Monthly KPIs:** These include: average response time, request volume, % of requests escalated, etc.

3) **Central Dashboard for Processing Departments:** Filter for requests relevant to specific department, e.g., Lighting Issues for Board of Public Works, Homeless Encampment for Police Department.

4) **Auto Escalation:** Notify supervisors of processing departments if request open time exceeds expected processing time to ensure KPIs stay on track.