

## **Motivation and Background:**

As college students, we are obliged to contribute our learnings and use our knowledge in computer science to assist the betterment of the population. The city of Haverhill has constituent services for non-emergency issues to respond to residents' needs in time; this 3-1-1 service is meant to improve the quality of residents by providing fast-responding services to people in need. We can utilize our computer science perspectives by collecting data from the city of Haverhill, and to turn them into meaningful comparisons and clear, vivid and concise visualizations to help the city government to make the most cost-efficient decisions on placing their various divisions of service into dedicated precincts and wards. Specifically, we will be merging information between customer data with the QAlert system, and map them into the various wards and precincts.

## **Goals, Hypothesis and Outcomes:**

1. Categorize data into sub-groups, specifically:
  - a. Date of the year: we will divide the data into two time frames, namely holidays and non-holidays. This way, we are able to plot decision boundaries with more precision, because the behavior and needs of residents fluctuate during holiday seasons.
  - b. Cyclicity: Depending on weather, the type of requests are likely to vary. In winter, residents are more likely to call on deicing services while in summer, they are likely to request heat reduction.
  - c. Types of services required: whether it is an issue caused by animals or the outdated piping system, we will be categorizing the form of the request and use this information in our mapping.
2. Data mapping and visualization:
  - a. We will examine the data specific to each precinct/wards, and first determine their rank of services preferences against the population, to acquire meaningful statistics, such as %population of district against the city, %drainage services required against total requests etc.
  - b. Now, having thorough knowledge of each district, we will be comparing the data to make meaningful analysis. This means, we will be plotting visualization maps on the districts of Haverhill, from the generalized data such as #requests and %requests per population, to service specific maps such as #utility requests, or #animal damage requests etc.

## **Non-goals, out of scope topics:**

Now, most requests are handled by 311 call center. We can construct an online website for customers to submit their requests and their requests can be shown on map immediately. And these similar requests are grouped in one category automatically. Customers can see the

progress of their requests online. Also, we can provide suggestions and solutions to some specific areas to prevent these accidents happening. For example, improving the infrastructures in areas where there are many requests. When there are many complaints about traffic lights in some specific areas, we can improve the lights in this area. Moreover, we can reduce the cost of salaries of employees.

**Open questions, uncertainties:**

Although what we are working on is a fast-responding system for non-emergency issues, there are some uncertainties which can make them urgent:

1. Time of day: On the one hand, most requests are made during the day when there are many staff in office are available for the requests, but maybe it is overwhelming for them to deal with such a large number of requests. On the other hand, if some requests occur late at night, nobody can answer the request until the next morning when office staff go back to work.
2. Season: Particular requests are made more frequently in particular seasons. For example, there are more issues about air conditioners in summer and issues about heating radiators in winter. System should be strong enough to predict the distribution of requests in such seasons and the specialist in such fields should be enough to handle requests for citizens.
3. Area: It is difficult to get access to some remote regions to offer help. For this reason, the system should use big data and analyze the distribution of requests from these remote regions. Government can build more bases around these regions based on the data to answer requests more quickly and efficiently.

**End result/product :**

1. Merge existing databases with precinct and ward information with QAlert database.
2. Map out the customers' requests onto the geographical maps.
3. Report about further insights on customers.