## SParkSys: A Framework For a Smart Parking System Praveen Meduri and Eric Telles, Department of Electrical and Electronic Engineernig College of Engineering and Computer Science

# PROBLEM STATEMENT

With population densities compounding around cities, there is a dire need for smart parking solutions to communicate real-time parking data.





Figure 1: CSUS Parking

Figure 2: Car Detection using Haar-Cascade Algorithm

Figure – 1 Shows CSUS Parking, Figure – 2 shows our car detection algorithm in action

#### BACKGROUND

World is becoming increasingly Urban. Future Cities need to utilize smart solutions to the multitude of problems in scaling.

The problem of finding parking is a hard and enduring one. UCLA researches reported that an average of 30% of drivers struggle to find parking during busy times of the day [1].

Computer Vision and Machine learning Techniques like Haar- Cascade algorithm can be judiciously used to build a Smart Parking System.

### SUMMARY OF WORK

We used Haar- Like features, shown in Figure – 3 to detect cars. For example, one of the features used to identify a car is shown in Figure -3. It is possible to infer the presence of a car by looking at the difference in pixel intensities between the white and the dark regions. The reflection from the car top appears brighter. By itself, this one feature is a weak predictor of the presence of a car. Depending on the size of the image, there may be hundreds of thousands or even millions of features. For a 24 x 24 pixel image, there can be over 180,000 features. We trained a classifier based on positive and negative images of cars to look for features that detect cars under varying light conditions. The approach is based on AdaBoost scheme.





Figure 3: Haar – Like Features to detect car

# IMPACT ON COMMUNITY

- Reduced commute time and over all better commute experience
- Informed parking choices available to denizens of a smart city
- Reduced traffic gridlocks caused from drivers cruising the city for available parking spaces
- Plays an important role in enabling a smart city.



Figure 5: A Few other Haar-Like Features



Figure 4: Integral Image to calculate the haar feature values.