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Capstone: Big Data

Assignment Eleven

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**Draft Manuscript (Discussion and Conclusion)**

**My results**

We merged the parking and the pollution data set to distinguish and explore the different methods that we could use to see if smart parking can contribute in helping save the environment. First, the variables that we used were the “total spaces,” “vehicle count,” “garage code,” and the “ozone layer.” Afterwards, we performed the stepwise model selection by AIC and chose the ozone layer as the dependent variable and the total spaces, vehicle count, and garage code as the independent variables. After this, we fitted the model and then performed a multiple regression analysis. By performing the multiple regression analysis we are able to determine the relationship between the independent and independent variables. Subsequently, we plotted the residuals vs. fitted, the normal QQ plot, squared location, and residuals vs. leverage plots to identify any potential outliers.

Moreover, we then did some data visualizations to better understand and visualize our data. We created a couple of bar charts, an R scatter plot, histograms, and a bubble chart. A time series analysis was also performed in order to understand and analyze the impact that our variables had on the ozone layer. A very interesting fact was that one of the bar charts showed that when the vehicle count increases, the ozone layer decreases which means that there could be environmental disasters. As well, in the future we would like to perform cross validation to determine and analyze the accuracy of the model.

**Competitors article’s results**

The first article, “A Cloud-Based Smart-Parking System Based on Internet-of-Things Technologies” by the IEEE the results state that the proposed reservation-based parking policy has the potential to shorten and summarize the operations of parking systems. To begin, the authors state that to evaluate the performance of the proposed smart parking system, they need to be able to determine each parameter for every system performance as a term of “cost.” The cost is time that the driver spends in the parking system for service. When cost is minimized or reduced, then other expenses such as fuel, monetary, and environmental pollution costs can also be minimized. Moreover, the study is based on the total average time for the service to the driver and the total average total time in the system (waiting, travel, and the service). A lower cost value equals to a “better system performance). The authors then took the lowest time cost value as the ideal solution.

In the simulation that the authors performed, they took as an example 50, 60, 70, 80, 90, and 100 vehicles that arrived. The arrival time was about fifteen minutes which means that of β is 0.2, meaning that the proposed network achieves the best and greatest performance compared to the other. Our proposed network reduces the total time average that the driver stays in the system by about 50%. Therefore, we can say that the algorithm performed by the authors achieved greater performance than the one system that didn’t have any parking planning. As well, if the total free parking spaces are combined with the distance parameter for parking, the network performance will immensely improve.

The second article, “Smart parking system based on reservation” by the International Journal of Scientific Engineering and Research states that the study that was proposed for the parking system improves performance by reducing the number of users that fail to find a parking space and minimizes the costs of moving to the parking space. What they did here is that they created a simulation and used “real-world” traffic traces to generate all parking demand. The parking demands are usually the people who are looking for parking spaces around an area. Then they classified the total highway traffic into incoming traffic and outgoing traffic, in order to represent the traffic that was coming and leaving a certain area. The traffic that was coming is used as reference of parking demand. The authors use the following example and explain how they created parking demand simulation.

Assuming that a parking lot has a hundred vacant spaces and they receive 120 requests from other drivers then the remaining twenty drivers won’t be able to park. The waiting time is considered and evaluated for the drivers who want to park their car. Also, an interesting point that the reservation-based policy shows is that the average driving distance is slightly decreasing at peak time, rather than increasing. This happens because drivers know ahead of time if there is an available parking spot or not. Drivers have the opportunity to reserve their spot before reaching their destination. Therefore, the smart parking system based on reservation also plays a major role in the reducing of average driving distance between peak hours.

**Conclusion**

By running all of these analyses on our model we were able to distinguish which variables had the most impact on our model and which of these variables had the most impact on the ozone layer. In particular, the time series analysis helped us in extracting meaningful data and helped us identify several patterns in the correlated data. This helped us in improving our model. Likewise, with the ending results of both articles we were able to determine that smart parking does help immensely in helping save the environment. Additionally, by implementing smart parking we will be able to spend less money on gas, reduce traffic and stress, improve air quality, real-time data and trend insight, new revenue streams, increased safety, optimized parking, less accidents, less time spent, decreased management costs, and enhanced driver experience. As well, it helps in reducing traffic congestion and reducing the amount of traffic volume while searching for a parking spot. The smart parking management system has been implemented in various parts of the world, such as in the United Sates, United Kingdom, Europe, Japan and India. The reason why smart parking has so much praise and it’s spreading all around the world is because there is real time data and evidence that shows that smart parking is helping in easing traffic congestion and helping drivers have a better user experience.