

Assignment 1; Literature Review on Machine Learning Tools and Techniques in Local Transportation Systems in New Orleans, Louisiana.

Public transportation and sustainable cities are synonymous with one another due to the crucial role it plays in both the natives and visitors of cities (Miller et al, 2016). This is especially true of cities that rely on tourism as a major revenue earner, such as New Orleans or The Big Easy, as it is affectionately called (Gotham, 2007). There are multiple ways of moving around the city inclusive of taxis, streetcars, busses, ferries and passenger pedal bikes, majority of the listed options are used primarily by locals to go about their daily business, however there is a significant contribution of tourists who utilize these while visiting to see the many sites throughout the city and in an attempt to modernize the public transportation system, the New Orleans Regional Transit Authority (RTA) has embarked on a machine learning program to increase efficiencies in public transportation, increase safety levels and as a byproduct create a more reliable public infrastructure which is an indicator of a developing city (Zukowski, 2023). This is one of the latest iterations of the “smart city” which aim to boost economies, reduce energy consumption and improve the living standards of residents through the integration of machine learning (Bharadiya, 2023).

Machine learning is broadly defined as the use of computers to accomplish a task that utilizes algorithms to train itself and make informed predictions (Mahesh, 2019). New Orleans RTA has partnered with both private and public stakeholders to make this vision, a reality for all who utilize public transportation and this will be accomplished through the use of smart sensors, camera systems and software. Data

processing will be done by computers via machine learning with a combination of stakeholders making decisions based on the feedback received. The main purpose of this exercise was to increase safety for both pedestrian and vehicle safety, specifically the street cars which had 114 collisions in 2018, involving motorists, bicyclists, pedestrians and passengers on street cars (Zukowski, 2023). NoTraffic's artificial intelligence sensors were installed at Canal Street Ferry Terminal and Four Seasons Hotel by Blackstar Diversified Enterprises and these two locations were the initial point of recording data. The use of a locally owned, small business, also reduces fears of workers who are of the belief that artificial intelligence will take their jobs away and make them redundant. (Alexis, 2024). The data which was collected, processed and analyzed indicated that changes could be made in order to increase the safety of private and public property and the pedestrians who utilize public transportation.

Numerous models were utilized to make this vision a reality such as neural networks utilizing static features in time series patterns with information gathered from the passenger counters situated on public transportation through the city (DOT ,2016). This installation allowed for an accurate representation of the number of people who moved via public transportation, versus private transportation. This binary option of public and private opens an avenue for questions to be asked including the why and when individuals utilize either of these options, and from these responses', improvements can be made to public transportation services. Primarily the purpose of the installation of these sensors and use of software as a service (SaaS) was for an increase in safety of all involved, however it was noted that using the data collected, there could be vast improvements in traffic management by optimizing

traffic flow, changing of schedules for transportation and an added benefit for the environment, a reduction in greenhouse gases, by reducing the time vehicles spent idling in traffic congestion (Ionescu, 2023). The use of predictive analytics for data processing and predictive modeling would be utilized in order to track the different methods of public transportation in order to determine lengths of delays, how to increase the efficiencies of the public transportation services and potentially returning an affected transportation mode to its original schedule following a delay caused by maintenance, congestion or a passenger issue.

The scheduling of arrival and departure times of public transportation is a difficult task to accomplish due to many issues, some of which may be attributed to maintenance, personnel, passenger and even traffic to give several examples, may occur and the use of the data collected from the sensors can result in improvements of scheduling with the use of a deep learning neural network utilizing time series patterns (Khayyer et al, 2020). Time series patterns are a sequence of data points which are captured over a period of time and in this instance the number of persons boarding, exiting, length of time taken at a stop and length of time taken due to traffic on a particular route are some of the examples which can be gathered from the data. Analysis of this data can result in route change time occurring, decreases in the number of stops at particular times throughout the day, and potentially introducing more vehicles to an underserved route while reducing the need for more vehicles on an overserved route. An improvement of public transportation has knock on effects such as reductions in road congestion, noise and air pollution and increased safety from less vehicles being operated, in some instances a congestion charge occurs for individuals who decide to use their private transportation and these are

then invested in public transportation (Schmöcker et al, 2003). This is only a first step in a larger plan to create smart cities with the inclusion of connected vehicles, vehicle automation and big data. This pilot project will have numerous benefits to the participating cities ranging from increased job production, to reduced congestion, and reduced transportation and maintenance costs thus costing the public and government less (Dopart, 2016). Additionally, the creation of work from the construction to network to university lecturers for the construction of data centers to store, process and analyze the data collected from the sensors is another added benefit which will continue to benefit the New Orleans community for a long time.

Unfortunately, the added benefits which have been listed prior, do not always materialize with the use of machine learning, and an example of this would be the large investment required in order to purchase and install hardware requirements, and this is neglecting the additional costs for setting up a data center, the electricity required to run the data center and the machine learning software that would be required for the data processing to occur (Skhosana & El-Shamir Ezugwu, 2021). Furthermore, the data collected and processed is collected over a short term and individual travel patterns are subject to changes in the long term, and this will ultimately affect the machine learning algorithm (Zhao et al, 2018). Furthermore, the introduction of advanced technology is not without the need for human interaction to ensure that the algorithm is running efficiently and properly, and in the long run, this can be an avenue for job creation, in the short term it creates a gap which reduces the positive effects of machine learning on public transportation. Additionally, the learning curve required for the implementation is quite steep and while installation of devices can be scheduled, the procedure of adapting will be lengthy, and that all

stakeholders are acutely aware of what to expect; both in terms of positive and negative aspects (Supply Chain Now, 2020). Finally, there is the largest issue which plagues any type of technology and that is cyber security, and with the recording and storage of so much data pertaining to the entire city, there is no shortage of ways that a bad actor can utilize this information and hold an entire city hostage with several keystrokes. (Maqbali et al, 2021). The barrier to entry will be another challenge for the elderly who are unfamiliar with smartphones or “tap to pay” options which would also be integrated, and this will require an education campaign in order to assist with the transition from traditional payment methods, and to further expand on this point; incorporated technology should be beneficial to the entire community

The introduction of machine learning into New Orleans is a step in the right direction for the city in an attempt to modernize a popular tourist destination while requiring investment from both public and private entities, but for a common, positive goal.

The positives which were primarily to increase the level of safety for passengers and public assets, have been expanded to create jobs and avenues for education, locally within the greater Louisiana area, while the decrease in greenhouse gases is a victory for the entire world, which is a step in the right direction to combat global warming which affects the entire population of planet earth. The continued improvement of the public transportation system will not only contribute positively in helping the environment but will also have financial impacts as well; the increased efficiency of the public transportation systems will result in reduced costs for fuel from less idling time for busses and taxis, in addition to the fuel cost reduction, an increase in passengers using these services will increase revenue for local government to reinvest as the confidence in public transportation continues to

increase from the increase in reliability both in terms of maintenance and punctuality (Dopart, 2016). The increased confidence levels of the public, along with the partnership between private and public sector entities bode well for the introduction of machine learning into the public transportation industry of New Orleans and while there is a long track to go, this is a step in the right direction with many lessons to learn from as with all technological advances.

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