IOSR Journal of Engineering (IOSRJEN) **www.iosrjen.org**
ISSN (e): 2250-3021, ISSN (p): 2278-8719
Vol. 08, Issue 8 (August. 2018), ||V (IV) || 17-20

A Survey on Data Mining Techniques for Maximizing Ride-Sharing Route

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Abstract: The concept of Ride-Sharing (RS) is very important valuables of environment because it saving energy and destroy the traffic pressure or traffic congestion. Riding sharing helps to improve resource utilization by sharing the resource for multiple users. Generally maximizing route ride sharing is more difficult and crucial process, because ride sharing includes shared route's distance, total travel distance, route percentage, and waiting time and peak-time traffic. The previous studies have used several features to maximizing route ride sharing, which has been collected from shared route percentage (SRP). The main drawbacks of the previous studies are that need accurate and more number of SRP. Data mining is an effective way to solve such problems in the road network. This paper surveys about the recent data mining various techniques and methods used to ride-sharing (RS) problem.

Keywords: Ride-sharing, Dynamic ride-sharing, shared route percentage, bigraph matching, join-based sharing, and search-based sharing.

Date of Submission: 06-08-2018 Date of acceptance: 23-08-2018

I. INTRODUCTION

Ride sharing system have emerged recently with the development of Global Positing system (GPS), Mobile communication technologies and Wireless communication Technologies. A daily routine of a taxi driver may consist quite a lot of pairs of cruising time and busy time. That is, taxi driver may cruise the road network searching and looking for valuable passengers for a while (Which may include waiting at some taxi stands), and then pick up passengers and drive to the designated destination (occupied time). As the passengers get off the taxi, it starts cruising the road network again. It is at this moment that a sharing route system could be used to help the taxi driver know where to cruise such that his profit can be increased. Ride-sharing means suggesting right places for getting passengers generally sharing economy. Its aim is to improve the resource utilization by allotment resources for several users (riders, drivers).

These shared resources increasing revenue to taxi drivers, reduce waiting time, traffic jams as well as minimizing the fuel consumption, city or urban trip, etc. Therefore, the problem of right sharing is a difficult and crucial task. Mainly focus on the problem of ride-sharing that is RS oriented problems. So, it is a new service called Grab Single Mode that a passenger request is sent to multiple taxis, as these taxis have likely equal chances to grab the passenger request, this might lead to unreasonable allocation of taxis. Another more type of service is called Join-based RS and search based RS. The Join-based RS is suitable for peak-time traffic, where the numbers of riders and drivers are large and the join-based matching is a reasonable choice. In this search based ride sharing drivers and riders did not have the travel requirements. To maximize the overall resource sharing by both driver and rider curial process. Therefore is making efficient ride sharing for both riders and drivers because of machine learning algorithms and with the help of computer technology.

1.1. Ride-Sharing

The term ridesharing, related to mobile app based on ride, this term is called "sharing economy". In this ride-sharing is applied to commercial ride-booking services, it provides users option of sharing a ride and its cost with other passengers. The alternate term of ride-sharing is, ride-hailing. The ride sharing based mobile applications, which dynamically match the passengers to drivers. These services reduce the empty seats, that are filling the empty seats, and it reduces the emissions. This services which transfer passengers between multiple drivers. Ridesharing is a service that order or arranges the one-way transportation. The ridesharing works is based on request, drive, arrive, and ride pooling.

1.2. Dynamic Ridesharing

Dynamic ridesharing facilitates the ability of drivers and passengers ride matches departure time is closed. It provides the services are flexibility and convenience. It matches the way in dynamically, so the shared resources is completes the empty places. It is very helpful for society. It reduces the traffic pressure and pollution. Easily maintain time of source to destination traveling. It is a service, which means it automatically matches the ride requirements, and it offers short notice without agreement between driver (rider) and passenger. The dynamic ridesharing is an important component of smart mobility. Generally, dynamic ridesharing is matching for ride requests and ride offers to make dynamic and efficient services. This dynamic sharing is sometimes use the shortest path algorithm, it reduce the travel cost.

II. LITERATURE REVIEW

This paper [1] author has presented the new method for optimization of dynamic ride sharing system. This method is very effective one. It optimizes the traffic pressure problem and solves it. The dynamic ride-sharing is used to reduce the traffic jam and carbon emissions. This paper various data mining techniques such as dynamic ride matching, Minimal Route Bi-searching algorithm are used to efficiently matches rides and satisfying multiple or number of participant constraints for rider requests. The rider request may be the following details based are time bounds maximum allowed deviation distances and minimized the route ride. This algorithm is to developing a prototype and evaluated system on GPS (Global Positioning System). Finally, the system to reduce the travel distances and computation cost. It analyzes the computation cost to compare the recent ride searching method, so it to maximize the efficiency.

This paper [2] author is extremely usefully has presented the approach namely, "price-aware real-time ride-sharing at scale at auction-based approach", which reduces an important problem of en-route. This problem is mostly coming from real-time ride sharing. This ride-sharing enables on-the-fly matching between ride givers or riders and drivers. Many riders and drivers request the various constraints, so that constraints maximizing overall profit or cost of the platform.

The previous approach only satisfy the minimizing total travel distance of only drivers, but this approach satisfy the both type that it satisfies the riders and drivers requests, obviously. In this paper introduced a distributed auction-based framework. It performs the rider route or driver route distance is calculated by using the mobile app. This app is automatically provide the information or notify the every nearby both riders and drivers profiles, their journey, the rate or cost, and current number of riders and drivers in the vehicles are carry out this type of information. Finally, this approach give big befitted usage is shorter trips for riders, which means better service quality. Then, increases this approach is overall profit of ride-sharing platforms like higher service rate and shorter trips, so it is very useful approach.

This paper [3] author has presented optimal demand-aware for ride-sharing routing, it consider the problem of analyze travel demand pointed information or details to improve ride-sharing routing. This concept is provide the cost-effective and timely manner, ride-sharing routing which the drivers of a vehicle selects a route to transport that is multiple customers with same as journey and cost planning, it is similar.

This concept solves the demanding problem, so get the important benefit for releasing the economical and societal usage of the side-sharing and routing. It takes the demands such as (a) customer based travel delay problems, (b) Before not know the travel distance exactly, so that not consider and continuously, making the online decisions. This approach is take approximately 2 levels for solve this problem. This level is NP-complete, that is weak actions. It uses this 2 level approach to get optimal solution of the problem, then to reduce the time complexity. This concept based ride-sharing that allows the multiple customers (riders or drivers) with similar timing to share a vehicle.

In this paper [4] proposes the algorithm for "trip-vehicle assignment in ride-sharing" has presented by author. This type of ride-sharing is based on resource allocation. This algorithm is solves resource allocation that is number of source and destination location are requested, and number of locations for car availability. The resource allocation task is to assign cars from requirement based, so share with one car rather than two request basis. This algorithm solves the problem namely, a combinatorial optimization problem, and then this problem that shows the NP-hard (Nondeterministic polynomial time). In ride-sharing provides the efficient transport service and to reduce traffic congestion.

This paper [5] solves the Taxi ride sharing problem, this problem opted solving approach has presented by author. In this paper, Simulating taxi ride sharing at scale (Stars), which reduce the traffic congestion, the gasoline consumption, and then pollution (air and sound pollution). This approach is selected the real-time concept and it supports and analysis the taxi ride sharing. It providing a elaborate combination of parameters, that it consider this problem, what kind of reason to assign for solve this problem solving, so it takes the efficient and valuable solving reasons are different angles, different stakeholders interests are considered, and understand the constraints. It mainly focus the computational complexity and to reduce it. It describes the optimal algorithm for linear number of trips and it makes the efficient indexing scheme or method. In the

Scalable approach is combined the parallelization of indexing scheme. This approach is to improve the city-wide ride-sharing solutions. In this concept finally carry out the efficiency of performance analysis.

In this paper [6] author has trendy presented, elaborately and proudly the concept of "Dynamic ridesharing technologies". The main goal of this concept is to analyze new models or scheme and approaches that can be combined transport systems in good manner and then this system is response to populate. To follows this approach to give the opportunity for par transit services in metropolitan area. This paper is clearly understood how to utilize the ride-sharing technologies, then so that to achieve higher vehicle utilization. In the system provides a new resource to all riders or travelers or drivers, who face the mobility challenges for RIDE eligible travelers. This approach is to increase the passenger choice, use of existing vehicle capacity that value, increase vehicle utilization, and to reduce greenhouse gas emissions.

This paper [7] enthusiastically author has presented the amazing concept "shared-use mobility", which defines the urban area based ride-sharing concept. This paper describes the traffic jam in urban area how to reduced this problem, which means use the mobility options through reduce the traffic pressure. The trendy technologies improve the mobility concept via app, which are determines the bike-sharing and car-sharing in urban area. This new services provides more mobility choices, source and destination solutions to help the riders so easily connect with and transit. It reduce the traffic congestion, vehicle miles (large distance) traveled and mostly reduce the gas emissions. This approach based on the main concept is to reduce the transportation costs for households, increase importantly and convenience.

This paper [8] author has presented the concept namely T-Finder, recommender system based on the pick-up behaviors of high-profit taxi drivers along with recommends people with some locations where they can easily find vacant taxis. Firstly, Passengers are used by the mobility patterns and taxi drivers' picking-up/dropping-off behaviors learned from the GPS massive path (trajectories) of the taxicabs. Initially, in this system is to provides taxi drivers with some locations and these location oriented routes to, toward which they are more likely to pick up passengers quickly that is during the routes or in these locations and then maximize the profit of the next trip and recommends people with some locations where they can easily find vacant taxis with effective manner, obviously.

In this paper [9] author truly has presented, the concept is ride match optimization. This paper explains the how to optimizing the ride matches for dynamic ride-sharing systems. The aim of this paper is travelers with similar journey and time consumption. It reduces the number of cars that is personal or official use of cars, improving the availability of cars that utilized seat capacity.

It matches the riders or drivers or travelers in real-time needed component for complete ride-share system by using effective and efficient optimization technology. Then, it defines the real-time ride-sharing, identify the optimization problem for find out the better way in ride-share matches in a more operational scenarios, then it develops the following approaches like, to solving the ride-share optimization problem, and it tested. The dynamic ride-share provider to establish ride-shares like, participant or rider geographic density, traffic patterns, and then roadway availability and transit design.

In this paper [10] author has presented the impacts of detour-aware policies on maximizing profit in ridesharing. This paper introducing this concept, and then it provides the efficient solutions to maximize profit for ridesharing services. This concept based pricing model that is its one part of section is discount provided for passengers. It uses necessarily the exponential-time optimal algorithm. The ridesharing service provides to generate the significant savings by using the heuristic methods for matching multiple ride requests. This kind of savings that are shared between the service providers is to increase the profit, and then it shares the ridesharing passengers that is gives the discount to the passengers. It reduces the profit from the fraction or divides the savings. In this paper, additionally introduce one algorithm namely IDFLA for optimal profit-maximizing discount factor for service provider. This system is offered a better ride experience, increasing the provider market share. It reduces the number of matched riders. It easily adopted the ridesharing. It quickly finds the optimal set of ride-matching. It generates economic savings by reducing the miles that is, distances and provides the discount to passengers. The main goal of this paper is profit maximization.

This paper [11] author has presented dynamic ride sharing, but that implementation and analysis based MAT Sim. This approach is solves the urban area problem are, affects the traffic externalities, difficult traffic congestion and pollutant emissions that is gas. It use the approach namely, "traditional ridesharing", it refers to carpooling. It is a form of travel, but it uses the existing infrastructure and more efficiently the vehicle. It uses the mobile internet technology, noting but mobility, and then it eliminates the traffic extern abilities. The dynamic ridesharing also known as real-time ridesharing, so get the traction.

It provides matches the ridesharing between the drivers and passengers. It is optimal matching in real-time and it uses the detour computation that alternative ridesharing. The methodology of MAT Sim means, Multi-Agent Transport Simulation, it a platform and it can perform network loadings with huge or millions of persons or passengers or vehicles and trace out each agent. This algorithm is developed and then, it used into simulate and analyze regular and share the taxi service.

This paper [12] author has presented the SCRAM, a sharing considered route assignment mechanism for fair taxi route recommendations. A goal of this model to provide recommendation fairness that is honest service for a group of competing taxi drivers, without sacrificing driving efficiency, and it is very effective one. SCRAM achieves better recommendation fairness for competing taxis. SCRAM is more efficient in terms of driving cost per customer. Experimental results show that SCRAM achieves better recommendation fairness and higher driving efficiency than other approaches.

Table1.0. Comparison table

	Technique	**Advantages**	**Disadvantage**
1	Dynamic ride matching and Minimal Route Bi-searching algorithm	Effectively optimizes the traffic pressure problem. Minimize the total travel distance.	Only point out the participant constraints.
2	Auction-based framework	This model problem of en-route and Minimizing total travel distance for both rider and driver.	This model is expensive, both in terms of memory and compute time.
3	Ride-sharing routing Model	Highly solves the demanding problem. Reduce the time complexity.	Flexible scheduling process is not possible.
4	Approximation algorithm	This provides the efficient transport service and to reduce traffic congestion	Complex data structure
5.	Stars	Effective approach to reduce traffic congestion, gasoline consumption, and pollution.	Needs more storage size will not scale Well for a large road network.
6	Matching Algorithm	This model increases vehicle utilization.	Automatically match large number ride request is difficult process.
7.	Mobility Model	Effectively Reduce traffic pressure.	This model Only can adopt for Urban area.
8.	Recommender system.	This system maximizes the profit. Easily find vacant taxis with effective manner.	This model is Less effectiveness and robustness.
9	Ride match optimization Model	More accurate way to solve ride-share optimization problem.	Operational scenarios need to match the ride. More Complexity.
10	IDFLA	This model Provide discount so that improve the profit in ridesharing services.	This model Techniques available have not used big road network data set.
11	Traditional ride sharing model	Effectively solve urban area traffic externalities.	Needs more real time parameters and deep study is necessary.
12	SCRAM	Achieves better recommendation fairness and higher driving efficiency.	Most tedious process to get and providing driving routes.

The above table 1.0 depicts the working methodologies of various data mining techniques which can be used to ridesharing and it apply to maximizing the Shared Routes.

III. CONCLUSION

Ride-Sharing is one of the major problems in nowadays which lead many problems to rider and driver. Maximizing ride-sharing route is possible only by the consideration of some of the important attributes. This analyzing method of the attributes can be achieved by the inclusion of data mining techniques. Data mining

methodologies embraces methods such as recommender system, approximation, ride sharing routing model, SCRAM, etc. Further implementation has to be done in order to achieve almost 100% better maximizing ride-sharing route.

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Dr.R.Priya1" A Survey on Data Mining Techniques for Maximizing Ride-Sharing Route." IOSR Journal of Engineering (IOSRJEN), vol. 08, no. 8, 2018, pp. 17-20.