

# Survey on predicting the next location and recommend the services

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**Abstract :** Nowadays there is rapid growth in the field of location prediction. With the help of the location of the user, we recommend location-based services to them. Location-based services used in many ways it can help to understand user mindset using rating and preference and recommend the services to a user which enhances the business of companies. Location based services also provide ease to the user so that they can easily access their service which they want or need. For predicting the location there are many machine learning algorithm applied to the gathered GPS data, mobility log and Geospatial data set. like a decision tree, probability-based method, Bayesian Method, Markov method. This survey is based on by identifying which method provides better results

For Recommendation, we have three methods which are Content based, collaborative filtering, and a combination of both. The survey is useful to understand which one is suited of location prediction problem.

**IndexTerms -** collaborative filtering ,Decision Tree,Probability-based method,Geosocial data,Location Prediction,Recommendation of Services.

## I. INTRODUCTION

The current scenario PCS (personal communication system) is used in a huge amount. It collects the data from various sources which helpful in future prediction system. A PCS allows the dynamic relocation of mobile users because of this system based on wireless access. The main use of PCS is users mobility prediction.

Mobility prediction is defined as the location of a mobile user's next movement where the mobile user is traveling. Next location of user prediction is done with the help of mobility data and its geosocial data. For predicting accurate location is a tedious task, so for a given solution to problem effective location prediction queries is applied.

Many application areas like recommendation system, traf-fic control, healthcare, bioscience, urban planning, personal account security, social relationship prediction and military benefits the location-dependent queries is efficiently processes. Location prediction system is used for predicting the user's lo-cation and recommend services according to their preferences.

there are many issues in predicting the user location through his and her friends check in scenario like [12] first problem identifying most Influential friend in large friend set which effect lot the moving pattern of the user. The user's check-in is more likely to be influenced by his or her friend if their check-ins are close in space and in time then that friend is most influential which predicted by many machine learning algorithms.

Second problem is identifying the exact dynamics of social influence or social groups. It is crucial because offline friend-ship influences the user a lot and online friendship changes in time to time. For analyzing exact dynamics of users by using time series analysis of data.

Due to the rapid growth of location-based marketing system and navigational services, location prediction is a necessity for every company.

Location prediction application framework consists of two major modules: [13] i) offline prediction module and ii) on-line prediction module. In the offline prediction module, it captures the stay locations to represent the user's movement behavior and in online prediction module, based on the check-in se-mantics according to time and social influential factors, which is identified with help of cluster-based prediction technique.

This survey paper describe numerous ways to predict the location of the user by using machine learning techniques. Some researchers proved probability techniques are efficient for location prediction but Bayesian model is showing more suitable results. For analyzing the social dynamics clustering, the hidden Markov model and decision tree are used and for recommendation purpose collaborative, content-based and hybrid method are used.

## II.RELATED WORK

Next location prediction is done in two phase in first phase they predict location by using previous data record and after prediction in the next phase recommend the services.

For prediction find out the stay points by using Mobility log and GPS trajectories [1] and then detects spatial features by using stay point .It collects the point of interest data, check-in data for stay point detection which matches users spatial features, then fetch its a temporal and sequential feature that applies on decision tree modal and predict future location of a user.

Predicting the next location of user GPS data, WiFi signals, bus-trip records, credit card transactions, and check-in data are used and applying the PSI approach [2]. POI of the user is finding out by using the clustering method. In PSI approach user moving preference depends on its social groups. So it finds out each individual users moving pattern and its group moving pattern and combined with prefix span pattern and detect next location.

Ensemble method [3] is used for offline location prediction ,improving privacy and reduce the power consumption with the help of network usage.Ensemble method divide the user area into the region and finds the probability distribution for the likelihood of the trip and uses Markov model for the nonregion.

Density estimation model [5] analyses the characteristic of all check-in scenarios and gather the feature which is used for finding the similarity . Density estimation model improves the robustness and more generality of the prediction method.

Probability-based Location Prediction Algorithm [6] uses for maintaining clocking region which used for securing the users information.

A Recurrent Model with Spatial and Temporal Contexts [7] uses recurrent neural network in each layer of RNN. RNN is using with time and distance specific transition matrices for different geographical distance and find more specific prediction by using ST-RNN.

Twitter API is used to find the user information and count of a follower.Geo-coding API [10] is applied for finding the location of the follower and apply k-means clustering to form cluster user based preferred location. Clustering method is used for finding user's preferred location by using feature similarity cluster.

Web service recommendation aims to predict missing QoS (Quality-of-Service) values of Web services by utilizing the personalized influence of users [4] and services when measur-ing the similarity between users and between services along with Web service QoS factors, such as response time and throughput, usually depends on the locations of Web services and users. It uses a decision tree for analysis.

Device of a unified rating prediction model by combine user and item geographical relationship, [8] user and user geographical relationship, and social interest similarity from social networks for location information of person that is basically called as location depended on social network.So location information uses for finding the location of user.

For personalized travel recommendation that analyze social network photos and identify travel group .For collection of the user profile information it is captured by Flickr and detect spatial and temporal feature which is predict the interest by using probabilistic Bayesian learning framework [2].

Location prediction algorithm [11] improved the user and item similarity approach by extracting the item feature and applying various item features weight to the item to confirm different item features. Method is uses collaborative filtering algorithm and detects best match .It is test the performance with help of Mean Absolute Error (MAE).

Twitter, Facebook, Gowalla and Brightkite data set by using temporal-spatial Bayesian model [13] find out top N influential friends and analysis their random walk.Random walk of friends reflect next location of the person.

Track and Go is focus on developing web application which takes data of user by tracking app which name is moves.Moves app provided data to track and go application if user grant authorized permission to them.Track and Go uses Random Forest Classification [14] and find out users next location and help to plan their travel with shortest route with help of Google map.This web app also provide emergency button which alarms the users friend and family that she is on trouble.

Personalized Point of interest recommendation services is provides help in user perspective and also provide help in launching new product and services.In their proposed work they uses check in sequences of person and find out their next location by using personalized Markov chain and region localization.So it proposes new novel method which uses matrix factorization and Markov chain (FPMCLR) [15].This method reduces the computing cost and predict location by local moving sequence of user that gives better result .

Mobility of mobile user prediction is done in this ap-proach.It predict next inter cell movement of mobile user in a Personal Communication Systems network.It based on three phases.the first phase mined the user's pattern by user mobility pattern (UMP) mining [16] the user historical data. Second phase it extract the pattern of movement by applying graph traversal on user's moving pattern and last phase identify the exact next location.

GTS-LP approach [18] is used to identify users behaviour and buying pattern.It captures users geographic-triggered mov-ing pattern, temporal triggered pattern, and semantic-triggered moving pattern, to analyse the probability of the user in visiting a location. It can form GTS map and match original pattern and find out the behaviour by using different datasets.

Mobile location based prediction captures million of mobile users foursquare data and predict their next location by using supervised learning MD5 technique [19]. It aim to find out feature which is the cause movement of the users and identify top POI.

Cluster based approach [20] used to find next location of mobile user by using frequent behaviors of similar kind of users which have common behavior in semantic trajectories in the same cluster.

### III. CHALLENGES

There are many challenges occur while developing the location prediction system

- Many users cannot disclose their exact location in the social network and provide general information .This problem can be resolved by using network-based estimation.
- Many user tags in multiple locations by uncleaned checkin data of social platforms, it increases the cost of data process and analysis.
- Use of raw location data without any semantic information makes it hard to the personal purpose of daily route.
- For recommendation if billion of product and million of a user so time complexity of the system is increased. Some items that are very similar can have different names or contexts but

- recommendation system can not recognize it, for resolving this problem Collaborative Filtering (CF).
- New user information not available to the recommendation is not appropriate.

#### IV. CONCLUSION

The location attribute is a very influencing feature in prediction and recommendation system. Predictive location could allow the marketer to reach the customer at right time, the customer will be more responsive as this gives high contextualization. Many of the existing algorithm has used Kmeans for predicting the next Geo-location of user but Kmeans is using euclidean distance which is not giving appropriate result in case of distance measure in two points on earth. So in a given algorithm is using Haversine distance and using HDBSCAN clustering to finding out the result.

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