

## Advanced Data Mining Approach For Handoff Procedure's in Lte Technology

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### **Abstract**

*With expansion in the innovation, the requests of the individuals are expanding as individuals are more intrigued by the web offices with higher information rate. Despite the fact that 3G advances convey essentially higher bit rates than 2G innovations, "LTE" (3GPP Long Term Evolution) got a blast in the field of advancements with new offices like Internet applications or versatile broadband ( Voice over IP (VoIP), feature spilling, music downloading, portable TV and numerous others material) all around. It is very much necessary to extract the useful information of the user using LTE technology to understand he performance and durability of this new technology. In this paper we present a novel architecture for mining the data for extracting useful information regarding the success rates of various handoff procedures in LTE technology.*

**Keywords:** *Lte, Handoff, Dataprocessing, Dataclassification, Ramdomization, Random Tree*

### **1. Introduction**

Frameworks like 3G WCDMA are being sent everywhere throughout the World, while the innovation is by and large consistently improved with enhancements that can promise expanded client bit rates, give better limit and scope execution [3]. since the working clients are expanding step by step consequently the necessities of the clients are likewise at stature. New versatile framework expected those can give higher bit rate. In Nov. 2004, 3GPP started an undertaking to characterize the long haul advancement (LTE) of Universal Mobile Telecommunications System (UMTS) cell innovation. The exploration on LTE is as yet going however it has been institutionalized by 3GPP. The radio interface is termed Enhanced UTRA (EUTRA) also, the radio system Enhanced UTRAN (EUTRAN). Requirements for 3GPP LTE incorporate the procurement of top cell information rates up to 100 Mbps in downlink (DL) and up to 50 Mbps in uplink (UL) under different portability and system sending scenarios[6]. For a superior correspondence through LTE the handover strategy ought to be exact. Handover is one of the key methodology for guaranteeing that the clients move openly through the system while as yet been associated and being offered quality administrations [8]. The constant association amid client portability among cells is permitted because of handover strategy, yet then again, the handover additionally brings a critical increment of Medium Access Control (MAC) overhead furthermore expands the postponement of parcel conveyance to the destination client [4]. Handover is an intense technique to acquire a QoS handover comprise of withdrawing time, which is a crevice in the information transmission. Hence while a man is on a call the confine time must be low so that choice for the handover must be set aside a few minutes for better correspondence. For the VoIP administrations, it is truly critical to have a quick HO choice calculation to stay away from further defers and the danger of a call drop.

Separating a truly valuable information from the different quantities of information sources that gives a fundamental data by isolating patterns, symbols, attributes and so forth is known as information mining. Information examinations procedure examines the different information assets to make and place them into partitioned classes of datasets. Information mining is a multi-disciplinary field which is a blend of machine learning, insights, database innovation and counterfeit consciousness. This method incorporates various stages: Business understanding, Data understanding, Data readiness, Modeling, Evaluation, and Deployment. Different social networking sites are absolutely reliant on information mining process as the measure of information that gets transferred each and every hour is in huge amounts of terabytes so it makes information mining procedure to be all that much noteworthy. Albeit not any online networking sites but rather a wide range of areas like doctor's facilities, IT commercial enterprises, internet shopping and so on are likewise bringing information mining as a huge approach in their information support work. Affiliation, Classification, Clustering, Neural Network and Regression are the different information digging strategies utilized for mining the information.

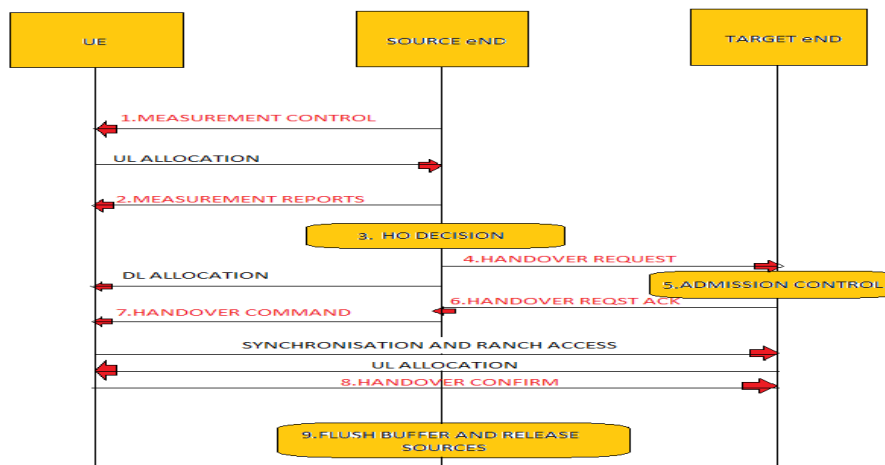
## 2. Overview of Handoff Procedure in Lte

In the LTE framework the HO can be depicted as system started, system controlled and UE-helped [5]. A handover method can regularly be isolated into four sections: the estimations control, the estimations report, the handover choice, the handover execution [9]. The brief methodology for handover in LTE is given beneath:

The UE setting in the source eNodeB contains data with respect to meandering confinements that where given either at association development or at the last Timing Advance (TA) upgrade.

- After getting the range limitations data client hardware (UE) estimation is designed by source eNode, then the UE triggers the handover by sending the estimation report to the source eNode.
- When the source eNode gets the estimation report, it peruses all the report and as needs be settles on the handover choice. Source eNode sends the read report to the objective eNode which contains all the obliged data by the objective eNode and solicitations for the handover.
- For to make a well correspondence the objective eNode makes a confirmation control on getting the solicitation which makes the handover more solid if affirmation is allowed however in the event that not conceded then the solicitation is rejected. On the off chance that the confirmation is conceded then the objective eNode sends the Ack to the source eNode and afterward frame another radio connection for handover.
- The objective eNodeB produces the RRC Connection Reconfigure Message including the Mobility Control Information, to be sent by the source eNode towards the UE. The UE gets the RRC Connection Reconfigure Message with obliged parameters and is summoned by the source eNodeB to perform the HO.
- The source eNodeB sends the Sn Status Transfer Message to the objective eNodeB to pass on uplink PDCP SN beneficiary status and downlink PDCP SN transmitter status of the E-RABs for which PDCP status conservation applies (*i.e.* for RLC AM). The source eNodeB may preclude sending this message if none of the E-RABs of the UE might be treated with PDCP status safeguarding.
- UE performs Synchronization to target eNodeB and gets to the objective cell by means of RACH subsequent to getting RRC Connection Reconfigure Message which incorporates the Mobility Control Information, UE.
- UL designation and timing development is reacted by the objective eNodeB.

- When the UE has effectively gotten to the objective cell, the UE sends the RRC Connection Reconfiguration Complete Message to affirm the handover, alongside an uplink Buffer Status Report to the objective eNodeB to show that the handover system is finished for the UE. The objective eNodeB checks it and sent in the RRC Connection Reconfiguration Complete Message and sending and accepting of information between the objective eNode and UE starts.
- If by one means or another the UE changes its way then the objective eNodeB sends a Path Switch Request Message to MME to illuminate that the UE has changed cell and User Plane Update Request Message is produced by the MME sends to the S-GW.
- The S-GW switches the downlink information way to the objective side. The S-GW sends one or more "end marker" parcels on the old way to the source eNodeB and after that could discharge any U-plane assets towards the source eNodeB and MME affirms the Path Switch Message with the Path Switch Ack Message.
- After sending UE Context Release, the objective eNodeB illuminates achievement message of handover to the source eNodeB and triggers the arrival of assets by the source eNodeB. The objective eNodeB sends the message after the Path Switch Ack Message is gotten from the MME.
- Upon gathering of UE Context Release message, the source eNodeB discharges radio and all the assets related to the UE setting.



**Figure 1. Handoff Procedure Carried in LTE Technology**

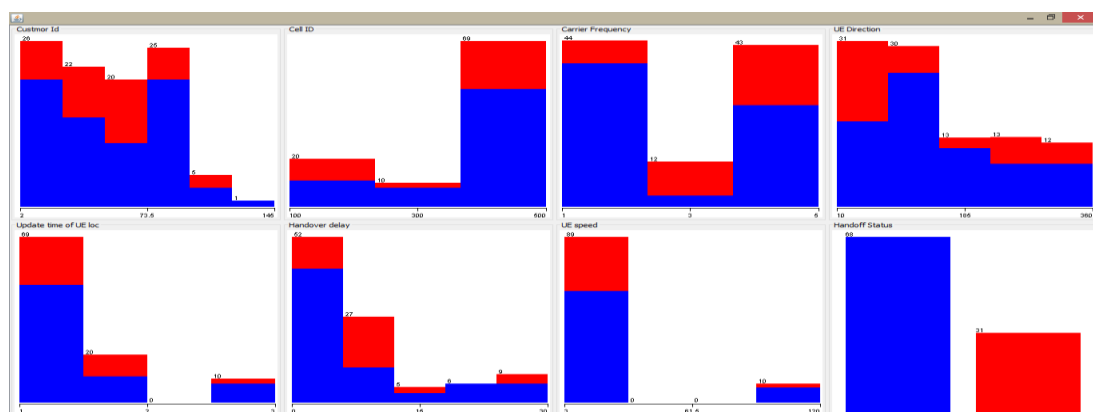
### 3. Experimental Setup of Data Mining on Handoff Procedure in Lte

There are various numbers of approaches that works on none a days, but are not capable enough to overcome the various problems of data missing values and classification problems. So in our proposed approach we try to apply a classification algorithm that classifies the data to build a powerful setup for data mining on handoff procedures in LTE. In order to carry the experiment of data mining on dataset of customer's handoff information, we have derived the data from various telecommunication data resources that provide the data on the basis of the surveys they make. In our data set the numbers of attributes used are 8 and the total numbers of instances are 100 of different customers connected to different cells.

**Table 1. Various Handoff Procedure Attributes with Description and Domain Used for Building Handoff Procedure Dataset**

S.No.	Attribute	Description
1	Customer Id	Unique customer ID's connected to different cells.
2	Cell ID	Unique cell ID's for customers to get connected.
3	Carrier Frequency	Carrier frequency value in Ghz (1-5 Ghz).
4	Update time of UE loc	Updating time of customers' data in ms (1-3 ms).
5	Handover delay	Delay time in handoff procedure in ms(0-30 ms)
6	UE speed	User equipment speed in km/h(3,30,120 km/h).
7	UE Direction	Direction of customer to cell in degrees (0-360).
8	Handoff Status	Whether a successful handoff or not (Y/N or 0/1).

PHASE 1: The phase is considered to be the data preprocessing phase. At the point when an information is transferred to the server there are ordinarily the information having missing values in them which can come about into bogus suppositions of different handoff procedure. Hence the missing qualities should be dealt with for which we attempt to present the missing quality calculation of information preprocessing calculation known as randomizing data preprocessing algorithm. Randomizing is the procedure in which the given dataset is standardized separated from the class property in standardized interims of time. In our exploratory setup there are no missing qualities among 100 handoff procedure of dataset yet at the same time when we apply information preprocessing calculation the different yield results come that keenly mines the information into different graphical representations Figure 1 demonstrates the different connection bases handoff success and failure rate. The blue line symbolizes the success handoffs and the red one failed handoffs.



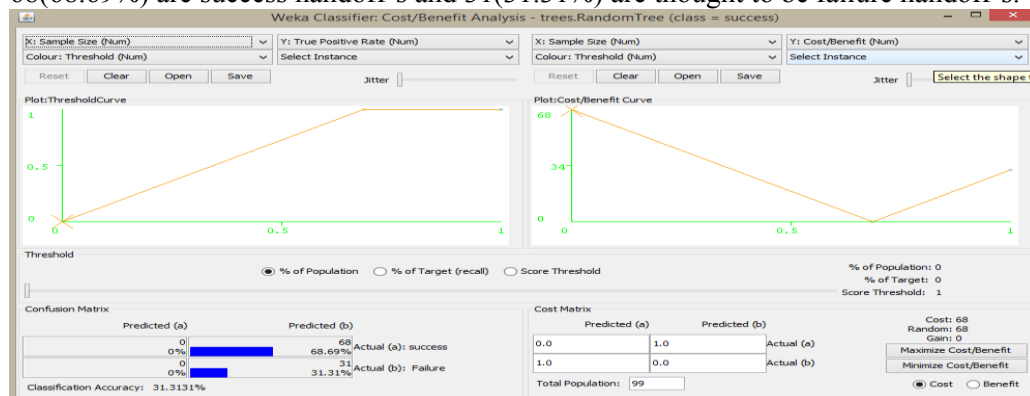
**Figure 2. Various Results after Data Preprocessing Phase that Gives the Number of Success and Failed Handoff Procedures Bases of Single Attribute**

Phase 2: The phase 2 is considered to be data classification phase. The real part of the proposed methodology is the information grouping strategy which characterizes the information through information arrangement calculation into different distinctive classes makes it simple to separate different helpful data out of it. The grouping calculation that we are utilizing here is the RandomTree order calculation. The proposed calculation is taking into account building the tree of irregular measure of estimations of the instances. The arbitrary tree calculation is tried on the information set of various handoff procedural charts which perform vastly improved than the other order calculations. The execution aftereffect of the arbitrary tree calculation is 100% most astounding among all other arrangement calculations. The disarray network of the calculation lets us know about the execution and characterization capacity of the arbitrary tree.

**Table 2. Confusion Matrix of the Amount of Instances Correctly and Incorrectly Classified**

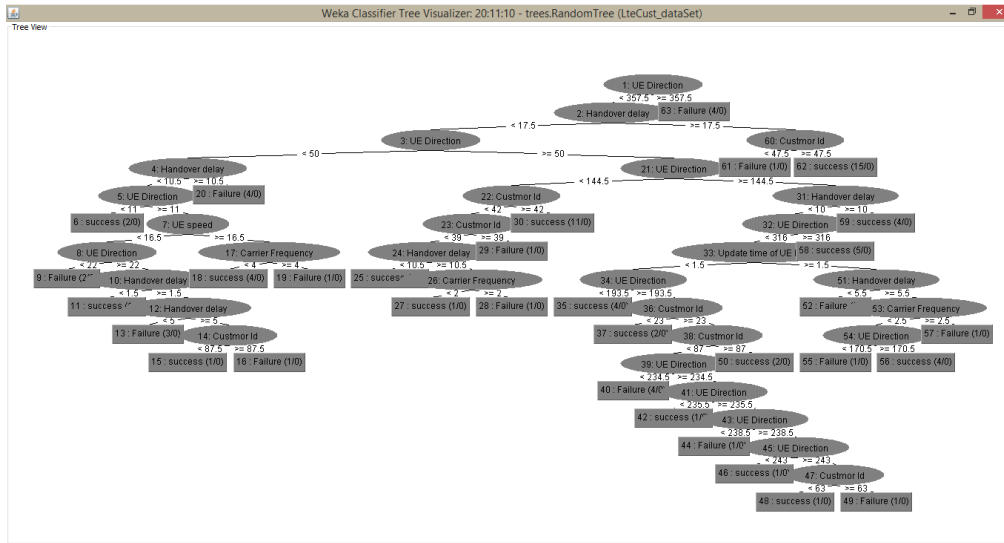
	a	b	←classified as
a	68	0	a=Success
b	0	31	b=Failure

The confusion matrix above of arbitrary tree order calculation tells that out of 68 estimations of "a" i.e. success 0 are the wrongly characterized qualities and out of 31 estimations of "b" i.e. failure 0 are the wrongly grouped cases subsequently the execution of the irregular tree calculation in high. The exactness of the calculation is tallied with the execution rate as well as with different variables too that should be excluded and of which the cost/benefit qualities and limit qualities plays an essential role. To be a powerful calculation the two qualities must be conversely corresponding to one another that method for the edge quality is high then the expense esteem must be sufficiently low to suit the entire qualities. In figure two a graphical examination is being finished with the limit values and cost/benefit values by looking at an edge curve and cost/benefit curve with one another which clearly demonstrates the connection among them. The bends demonstrates that among the aggregate of total handoff procedure's estimations of the datasets 68(68.69%) are success handoff's and 31(31.31%) are thought to be failure handoff's.



**Figure 3. Comparison Between Threshold Curve and Cost/Benefit of Successful and Failed Handoff Procedures**

Since the data classification approach used here is the decision tree based approach that forms the tree before making any classified decision of the various data sets underneath is the tree forms after the classification results formed on the datasets of various handoff procedures.



**Figure 3. Overall Tree Structure of the Dataset’s Used and the Outcome Results of the Whole Experiment Covered**

To ascertain the execution nature of the calculation, the calculation relies on different QOS parameters that make a similar investigation with different other existing grouping calculations of that to make the proposed approach as unrivaled among every one of them.

**Table 3. QOS Based Comparative Analysis of Various Data Classification Algorithms with the Proposed Approach**

Algorithms	Correctly Classified Instances %	Incorrectly Classified Instances %	Kappa statistic	Mean absolute error	Root mean squared error	Relative absolute error%	Root relative squared error%	Total Number of Instance	Time to build
NaiveBayes	67.6768	32.3232	0.1076	0.4045	0.4556	93.7224	98.2392	100	0.12
StackingC	68.6869	31.3131	0	0.4316	0.4638	100.01	100	100	0.06
DTNB	68.6869	31.3131	0	0.4327	0.4638	100.2744	100.0078	100	0.05
RandomTree	100	0	1	0	0	0	0	100	0.01
RandomForest	97.9798	2.0202	0.9522	0.1576	0.2108	36.5142	45.4564	100	0.02
J48	71.7172	28.2828	0.1481	0.4049	0.45	93.836	97.0215	100	0.05
Ridor	73.7374	26.266	0.209	0.2626	0.5125	60.8575	100.4982	100	0.01
DecisionTable	68.6869	31.3131	0	0.4327	0.4638	100.2744	100.0078	100	0.04
ZeroR	68.6869	31.3131	0	0.4315	0.4638	100	100	100	0.01

Grading	68.6866	31.31	0	0.3131	0.559 6	72.560 8	120.65 61	100	0.03
SimpleCart	94.9491	5.0505	0.8794	0.0842	0.205 2	19.516 6	44.247 1	100	0.03

#### 4. Conclusion

In this paper, we have proposed a coordinated methodology for mining the handoff procedure's success and failure rates form enormous information for which randomizing methodology is utilized for information preprocessing and random tree approach for information grouping. We have made a trial setup for our calculation to execute and distinctive execution diagrams and information mined qualities have been taken after information preprocessing and characterization of information. Toward the end, we made a near investigation of arbitrary tree calculation with numerous other order approaches and presume that the irregular tree calculation is the main calculation whose ability of arranging the cases accurately is 100% with no wrongly ordered occurrences and zero lapse rates. The CPU usage is likewise low as the time taken to mine the entire information set is less *i.e.* 0.01 sec which is minimum among all calculations.

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