HIVSSC: HIV ASSOCIATION ASSISTANCE FOR PROVIDING SUGGESTION BASED ON SENSOR SYMPTOMS CLUSTERING

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Abstract: Social Sensor Network is a mixture of social networks with sensor data. An integration of social (Face Book, Twitter and MySpace) and sensor networks could help us to several applications in an effective manner. One of its applications is search and retrieval of multimedia documents. Previous days, social sensor networks are participated and provide lesser probable information's to every applications. To overcome those problems we introduce a new framework also known as HIVSSC. In HIVSSC framework we have to deal with social sensor network based healthcare applications. In this healthcare application we find HIV disease and also provide good recommendation and awareness to the HIV affected peoples. This framework initially exploits the process of collecting HIV affected peoples list from Smartphone Gadget then it can be clustered with symptoms which were acquired from different body sensors. To perform efficient clustering we introduce a new algorithm known as Sensor Symptoms Clustering. Communication to be done with inter cluster and intra cluster based upon distributed server which will perform effective routing and load balancing based upon hybrid load balancing algorithm. From those servers, network users can get good recommendations from one another to take further moves (treatment). Our experiments to be simulated on omnet++ simulation and our proposed framework should provide professional clustering, load balancing and recommendation results.

Index Terms: Social Network, Body Sensor, HIV, Recommendation, Load Balancing, Clustering.

1. INTRODUCTION

Social Sensor Network is a combination of social and sensor networks progressed through internet with helping device also known as Smartphone. Social [Face Book, Twitter and MySpace] media and sensor may work together and will provide extraordinary development in different domains like wireless sensor networks, mobile computing, signal processing and data mining. Owing to increasing the number of mobile accesses must need some control and monitor the Smartphone applications in anywhere and anytime. At present revolution of network technology play an important role of decision making for handling mobile crowd sensing in Internet-of-Things. A promising current network [1] should overcome the technical challenges of randomness, mobility; space-time complexity also maintained some applications of sensing data and transferring data. Crowd sourcing sensing operation must prove the trust worthy between social community and active patterns. Integration of social sensor networks should reveal impression about positive and negative relationships [2]. Social media can give great provisions to the smart cities for controlling traffic management [3]. Occurrence of traffic congestions in smart cities to be reduced and resolved by smart social senor based traffic management system. As discussed in [4], community structure oriented solving sensor network management problems. Problems discussed with dense sensor networks such as energy efficient transmission, spectrum and device management. Sensor information's are taken into creating community in the social network and maintained it with sufficient information's gathered from the internet. Several applications shall be progressed effectively and properly with association of social sensor networks. Social sensor networks and its kinds of applications are shown in fig 1.

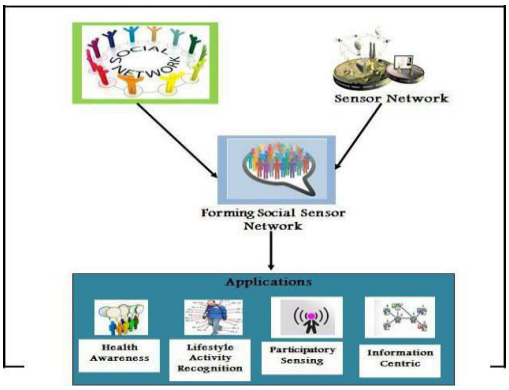

Figure 1: Sensor Network Applications

Every applications includes sensor information's and people's involvement. To improve health awareness between human beings integrating body sensor networks with social network to periodically monitoring patient's health status and subscribe corresponding solutions instantly. Activity recognition based applications enable sensing Smartphone to gather lifestyle of the particular human being. Sensing lifestyle input's can be differing and proceeded approach for that to be different. Participatory sensing is a process of acquiring sensory information from any mobile devices and it can be interpreted. This application is a most warm able application applies onto equalization of non-cooperative game theory and search and retrieval of multimedia documents. But this kind of sensing application frequently requires user contributions to take decisions and increase utilization of network. Information centric sensor applications should follow onto the dense sensor networks.

In that networks to avoid malfunctioning sensors in the network management. Sometimes malware detection process should conserve more time and it will degrade the performance of sensor networks.

To overcome above mentioned problems in the applications of social sensor networks we have to provide more health awareness and probable solution to the HIV affected peoples. For that reason we create a new framework named as X. Our contributions of proposed framework X consists of

i) Collection of HIV infected peoples from hospital central data server using Smartphone Gadget Sensor.

ii) After conforming the patients those who are affected by HIV and identify other symptoms using different kinds of body sensors.

iii) Cluster the peoples based upon HIV and symptoms gathered from body sensor. Cluster the peoples in three kinds because stages of HIV can be segregated into three. There are

- Acute HIV Infection
- Chronic HIV Infection and
- AIDS

Clustering process to be done based upon newly created clustering algorithm known as Sensor Symptoms Clustering

iv) Balancing the loads when more number of peoples can sending request to the server at a time because peoples are in mobility nature. To perform effective load balancing use hybrid load balancing algorithm for load balancing and also avoid congestions in the network.

v) Finally, Cluster members are communicate with inter cluster or intra cluster manner. Recommendation should be enriched between those two (inter or intra) clusters. According to the recommendations peoples can easily get the solution for their confusions, queries and take further treatment in an immediate manner. Banditnet algorithm will be used for making suggestion to the cluster members.

The remaining sections of this paper can be organized as follows. Section II discussed with review of literatures. The formulated problems in our previous work described in Section

III. Section IV presents overview of social networks and body sensor networks. Our proposed framework can briefly demonstrated in Section V. In Section VI, experimental results of proposed framework and compare those results with state-of-the-art technique. Finally, we conclude the paper in Section VII.

2. LITERATURE REVIEW

Researchers of Aashima Arya and Naveen Bilandi discussed a few concepts for healthcare using wireless body area networks. In this paper [5], they told an initiative scheme for improving india's healthcare systems using wearable and implantable body sensor nodes presented in telecommunication and information technology. The wireless body area sensor network (WBAN) must be participated for improving remote health monitoring system performance can be reviewed by robustness, wearability, reliability and scalability. With the help of personalized monitoring system users could interact with social network, organize systems and user interface to advance their quality of living. This kind of WBAN patient health monitoring system need to simulate some traditional parameters of electrical, physical and Mechanical environments. Authors of [6], discussed some social issues which could be raised by advancement into the wireless sensor networks and healthcare perspective. Issues are related to privacy, security and some legal issues. Security issues can be carried out by attacks and threats in the wireless sensor networks. Issues can be made more on wireless networks because its vulnerability to be high compared to wired networks. Different kinds of attacks and threats involved and make more issues to patient health monitoring system. Privacy issues are discussed with users presented in the wireless sensor networks. Privacy issues and legal issues can greatly developed by the newly created body sensors attached with human body. It could make some issues to the patients in wireless networks. Honggang Wang, Zhaoyang Zhang, Xiaodong Lin, and Hua Fang [7], told about sensing mobile environments based on socialized WBAN's. Here, they had to connecting WBAN and social networks. Idea proposed in this paper was to control epidemic spread into others with the help of social interactions made by Smartphone connecting device. In that situation we had to collect vital signs from human being and connect with it into social information's.

Problems gathered from this Socialized WBAN system was increased economic cost, due to the reason of failure sensor nodes in WBAN's exploit data unavailability and also uncertainty of social interactions. Previous authors also discussed in [8], to

improvising health awareness. Researchers Hala ElAarag, David Bauschlicher and Steven Bauschlicher told in [8], improvements a health awareness with integration of social networks and body sensor networks. They clearly mentioned the implementation of particular concepts in both manner (software and hardware). Here, use Intel-shimmer EMG senor based heart monitor could be used to combined WBAN's into the social interactions.

According to those interactions peoples can collect more beneficial information's and awareness about particular disease. But it could take more time to monitor the patients and also provide interactions between multiple human beings in the social networks. Here, we discussed about HHC to quickly adopt by the users but it will not provide full fledged awareness to the human beings. Data availability could be lack sometimes number of users increased in the networks. Authors of Md. Abdur Rahman, Abdulmotaleb E1 Saddik and Wail Gueaieb [9], describes the concept of integration of social networks and body sensor networks at the process of augmenting context awareness. This paper was help to solve the problem of forcefully altering user contexts from advanced 5G technology of heterogeneous networks and also community of interest to be covered by according to the given text. But in that paper we are not perform any usability test for identifying Quality of user experience. Then will not consider the privacy problem of private information sharing through the web. In [10], authors explained the process of health monitoring based on wearable and implantable wireless sensor networks. Paper told the importance of body sensor networks and which could minimize the medicine usage to the users instead of that they recommend advanced social interaction with peoples suggestions to lead their life an independent with quality care. Quality of WBAN could be properly maintained and add some additional sensor applications to enlarge specifications.

But in this paper they were not introduce the sensor for monitoring environmental conditions and not to take any remedy for particularly affected peoples presented in that environments. Research authors of Saeid bahanfar, Ladan Darougaran, Helia Kousha and Shahram babaie told [11], combination of hardware and software oriented reliable communication and data aggregation. BAN should provide more emergency services for patient health monitoring applications and then find criminals when they could perform any misbehavior. With the help of BAN could recognize individual person should be authorized one or not using fingerprint of the individuals collected from the persons at the earlier stage. Drawback of this paper took higher timing for performing all individual sensor works. In paper [12], discussed some advanced wireless sensor network based communication for reliably monitoring human's healthcare. This paper clearly explained the residency monitoring with the help of several kinds of home monitoring sensors which could be added into the main server of the wireless sensor networks. This system must increase the quality of health, life and security in supported for living communities but it took more cost for design and implementing that senor based healthcare monitoring system. One of the research paper [13], described the social behavior of the bacteria, also called as bacterial nanonetworks. Here, communications between the molecules are made by bacteria's. Nano sensors are used to perform the process of environmental sensing. Sensor behaviors are classified into cooperative and non-cooperative manner. Social behaviors based sensing information's are gathered and it could be only following the nanonetworks system itself. Authors of Chen-Khong Tham and Tie Luo [14], discussed about the purpose of participatory sensing from the factors of market equilibrium and Quality of Contributed Service (QCS). With the help of market equilibrium methods we had to embrace service consumers, data contributors and service provider. That kind of process could provide good QCS with some less period of time. But, this paper does not told the achievable quality of dynamic pricing in participatory sensing and also not evaluate whether the user contributions are to be in the form of continuous valued measurements. Paper [2] told positive and negative relationship in to the online social communities. Here, the propagation schemes are used to solve the problems of reducing end-to-end propagation cost and also provide propagation extensions for expanding network parameters. This paper developed under the concept of influencing social sensor communities with the involvement of positive and negative relationship types. For reduction of cost influence propagation using backward induction dynamic programming, reduction of negative influences use forward induction dynamic programming and then perform message deterioration and avoidance. Using this influence propagation scheme we have to easily identify action and idea of the target person. But it will not consider the signed networks for properly maintaining multi-level relationship types, practical applications and also multi-model sensor observations. Researchers in [15], could clearly described about intrusion detection in mobile sensor networks. This paper explained to decide group size based upon simulating primate society. More tedious work is to evaluate how to group the mobile sensors in larger environments. In larger

Environments they had to consider the parameters like wireless interference, inter or intra group communications, patrol efficiency and coverage. To avoid intrusion in network communications we had to group members as in small and large sizes. For triumphant transmission probability and provide good

patrol time network chosen smaller groups. But in this paper authors not consider about other kinds of attacks and channel attack. We will try to concentrate onto some other attacks because these attacks will damage the wireless sensor networks. Soufience Djahel, Gabriel-Miro Muntean, Ronan Doolan and John Murphy [3] were discussed the concept of Traffic Management System (TMS). In smart cities traffic management is an important task because it could help us to avoid injuries and accidents and also provide some security for controlling traffics. For that purpose they describe different kinds of updated technologies and phases involvements in TMS. TMS also discuss about social media and smart cars to allow perfect traffic congestion detection process. Here, discussed the life cycle of smart transportation for protecting traffic management system. Process includes in this system was data sensing and gathering, data fusion, processing and aggregation, data exploitation and service delivery. This could provide more beneficial results in TMS. They add some interesting traffic related applications for users in the smart cities. This TMS doesn't mention about security threats targeting and also some open challenges included in the traffic management system. Researchers of Cristina Alcaraz, Pablo Najera, Rodrigo Roman and Javier Lopez were told in [16], about combination of wireless sensor networks and internet of things. Here, the IOT devices are thoroughly integrated into wireless sensor networks. In that the overall discussion about security more arises at a time of integration. Security integration approaches can be classified into topology based approaches and stack-based approaches. Topology based approaches should supports access point solution and hybrid solution. A stack-based approach always supports gateway solution, TCP/IP solution and Front-End solution. After analyzing these concepts well it have some drawbacks. Some applications cannot directly connect to the web. Integration of security approaches will need some advanced connection of WSN and IOT. In paper [17], they created an interesting science platform for the process of aquatic environmental monitoring. Aquatic environmental monitoring must need the support of wireless sensor networks and it could provide relative applications of underwater resource monitoring and easy to acquire prior damage information's and transmit helpful information from sea to land. Sensor could be participated for knowing emerging aquatic environmental monitoring. Here, sensor can submerge into the sea water. Sometimes it behaves like a fish according to the designers design. In this paper the authors are not develop an application of surface vehicle in a marked regions and portions which will help us to provide continuously capturing image and sensor data to the scientists or citizen. Authors John Gekas, Eurobank Research, GR and Athens clearly explained the concept of distributed mobile sensing with the help of social data mining. Here, human activities are classified with knowledge of recorded location and environmental variables. Hardware equipments to be needed to provide modern results. Paper [18], develop an important application for our daily usage and provide multiple benefits to the mobile clients. Social data mining system processed with the help of enhanced hardware based application. Hardware device is to be connected with user's Smartphone which could receive signals about activities and produce results according to that. The
[18] has some drawback of limited additional hardware interaction and need dynamic sensor based Smartphone for easily recognize human activities in a daily manner. Researchers in [19], expressed internet of things and Smartphone related topics. Here, they were told integration about IOT technologies and human. Term internet of people can be extended from the term of internet of things. With the help of these integration peoples could connect to lots of applications. Social sensor network connected with IOT devices with the help of some professional qualities like Be personalized, Be social, Be predictable and Be proactive. Service oriented system must have several components such as application manager, action repository, device registry and application repository. In that both IOP and IOT had few lacks. IOT lacks are called as sociological profile features and predictability. All devices in this application should perform under platform specific solution only. Authors of S.Prabhakaran, Dhaneshwari kumara and RIA Ahuja [20] fully focused to develop android applications to forecasting future illness and human body temperature can be predicted. Here, sensors are directly inserted into the Smartphone for analyzing temperature of human beings. So that capacitive touch screen layers can be enabled in the Smartphone. According to the layers in the screen sensor can easily identify the temperature and immediately inform to the user by giving message to their mobile number or they had to install the application in mobile it will shown results to the particular human being. Reason for performing these capacitive layered Smartphome, because human body generates electric current continuously. This capacitive sensing sense based on human body generated temperature. This kind of android application should not provide an alert system for regularly intimate results to the particular user. Android applications will enhance into the steps of healthcare monitoring. Paper [21], describes the process of secure symptoms matching approach for mobile healthcare system which could exchange information between users who had same symptoms observed from body sensors. This mobile healthcare social network system must consider the factors of mobility and sociality. In this system patients can enroll their information's for providing authentication and further activities are processed according to the enrollment in secure manner. Here, same symptoms of two patients can communicate and exchanging recommendation according to their necessary needs. But this scheme

does not supportive for disclosed symptoms. Process will require integrating some advanced unselfish mannered mechanisms to do effective way of communications. Authors of Alberto Rosi, Simon Dobson, marco mamei, Graeme Stevenson, Juan Ye and Franco Zambonelli [22] told about social networks based concepts are work in pervasive manner. In this situation we have to accessing properties and inclination of every individual and groups in the network. For those purpose the social network process to be integrated with pervasive computing. Pervasive network services can be connected with social networks with the help of social network overlay and app specific socio pervasive network. Process could achieve social sensing data in pervasive service infrastructures. Without finding direction it will not provide accurate and efficient results.

3. PROBLEM DEFINITIONS

Social Sensor Network is a combined version of social and sensor data network thoroughly processed due to internet. Several applications were processed under social sensor networks. Body sensor based healthcare applications are most emerging in current field. Integration of body sensors and social networks based healthcare controlling and monitoring does not provide accurate results of clustering, packet delivery ratio and response time. For this extent several traditional schemes and techniques were analyzed for clustering, packet delivery ratio and response time. But it could not achieve good results on the parameters. But these above mentioned schemes and techniques yet not achieve efficient results for those parameters. To overcome those problems we have to introduce a new framework HIVSSC for providing healthcare awareness about HIV. In our proposed concept we consider the parameters of Growth Rate (GR), Cluster Formation Time (CFT), Response Time (RT) and Efficiency. These parameters are needed to consider in social sensor networks. Because input values are collected from Smartphone gadget and body sensors. From body sensor collects symptoms of every stage and clusters those peoples according to the stage of symptoms. Cluster formation time to be considering for performing efficient way of clustering in our proposed system. Cluster details are maintained and processed by the server which can perform load balancing (Routing) for continuous delivery of information's to every users in every zone. From that we have to detect packet delivery ratio to improve our concept more efficient. Necessary recommendations (suggestions) to be collected from cluster members based on ratings.

Suitable recommendation algorithm can only predict and serve suggestion in an accurate manner. Reason for considering the parameter of GR will analyze how will work our proposed system. Growth rate can be measured with usability of our proposed system will increasing number of users. Finally, Efficiency is the parameter which is used to find how increase the overall performance of our proposed framework.

4. PROPOSED FRAMEWORK

Our proposed framework fully works under social sensor networks. In social sensor networks we are getting inputs from sensors and associated with social networks for getting supports and services, encouraging and achieve better results of newly developed social sensor network application based on network simulation parameters. This system, mainly deal with HIV based healthcare monitoring and suggests little information about HIV awareness. Overall framework HIVSSC should cover the portions of clustering, Routing mechanism and recommendations. To perform these operations we have to develop new algorithms, techniques and to achieve good results for our proposed framework. Framework is used to help overall world peoples to known detailed information about HIV symptoms, suggestion for treatment and also HIV prevention awareness details. Overall framework architecture is shown in fig 2.

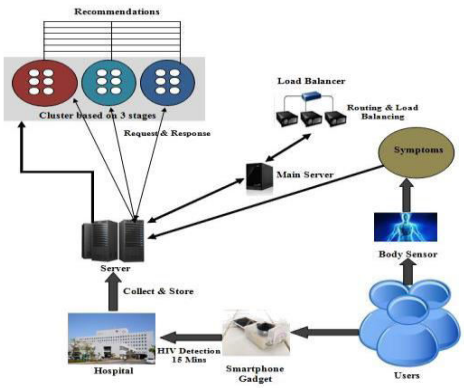

Figure 2: Overall HIVSSC Framework Architecture

4.1 Sensor Process

Sensor process is an initial stage of our process. Every user in the world can check their health which is affected by HIV or not. Checking and conforming HIV within 15 minutes to the help of Smartphone Gadget. This device can be placed in government hospitals in every zone. Zone to be differ for different countries. After conforming HIV those people details are forward to the server which will be maintained in every zone. HIV can directly affect people's immune systems. So that reasons other diseases can easily inject into the immune system and take treatment for that. HIV symptoms are collected from human beings based on body sensors. Body sensors fit into Smartphones, sensors sensing symptoms from human body when people can touch their mobile phones. HIV symptoms are detected by several body sensors for monitoring

temperature, TB, Pressure, Skin Blotches and Muscle Joints. These symptoms are collected from different kinds of body sensors. Collected symptoms are moving onto next stage of framework.

4.2 Clustering

Clustering is a process of forming groups with similar categories. Our framework clustering is a mainly important portion for dividing the stages of HIV and further form a cluster. HIV stages are classified into three kinds which knowledge can be gathered from currently available symptoms. These symptoms can be reduced or added in future. There are Acute HIV Infection, Chronic HIV Infection and AIDS.

i) Acute HIV Infection

Acute HIV Infection is the first stage of HIV. This primary stage of HIV is also known as acute retroviral syndrome. Period of this stage could be within 2-4 weeks. Peoples must carefully follow the instruction and treatment provided by doctors for control severe infection and it will extend the period sometimes. Symptoms of this stage are fever, sore throat, fatique, headache, swollen glands, rash and muscle and joint aches and pains.

ii) Chronic HIV Infection

Chronic HIV Infection is the second stage and it is also known as asymptomatic HIV infection. Generally HIV infection will destroy CD4 cells presented in human blood. Second stage of infection shall be predicted critically, because it will not have any symptoms and it is also called a clinical latency in medical term. This stage will spread the infected virus into other peoples, when infected peoples not regularly taken the medicines, treatments and counseling. Without any taking treatment of this stage will lead to AIDS. This is a final stage of HIV.

iii) AIDS

AIDS is also called as Acquired Immune Deficiency Syndrome and it is the final stage of HIV infections. In this situation person CD4 cell count should be less than 200 cells /mm^3 and have additional infections onto the immune system. Infected peoples immune systems are totally damaged it will lead to life in critical stage. If the people can maintain proper treatment and they had increment in life duration. Without any treatment, AIDS infected people only survive their life period about 3years. Symptoms described for this stage are recurring fever, swelling, pneumonia, skin blotches, rapid weight loss and TB.

Limited symptoms of HIV infection can be taken from body sensors. According to that cluster the peoples who are infected by HIV and progressed with social network (face book, twitter and MySpace). For this purpose we have newly create Sensor Symptoms Clustering Algorithm (SSCA). HIV stages and cluster formation processes are done by SSCA and pseudocode of SSCA presented in fig 3.

Psuedocode for Sensor Symptoms clustering algorithm (SSCA)

1. INPUTS: $U_i = \{U_1, U_2 \ldots U_n\}$, $S_t = \{S_{t1}, S_{t2}, S_{t3}\}$,
   $S_e = \{S_{e1}, S_{e2}, S_{e3}, S_{e4}, S_{e5}\}$ and $C_i = \{C_1, C_2, C_3\}$
2. Initialization: $U_i = 0$
3. If ($S_{e5} \leftarrow U_i$) Set $U_i \rightarrow S_{t1}$
   $C1 \leftarrow S_{t1}$
   Else if ($S_{e1} \leftarrow U_i$) Set $U_i \rightarrow (S_{t1} \| S_{t3})$

   Call Stage = findstage (S_{e5}):

   Else if (S_{e2}, S_{e3} & $S_{e4} \leftarrow U_i$)
   Set $U_i \rightarrow S_{t3}$
   $C_3 \leftarrow S_{t3}$
   Else
   Set $U_i \rightarrow S_{t2}$
   $C_2 \leftarrow S_{t2}$
   End If
   End If
4. End

Figure 3: Psuedocode for SSCA

SSCA perform in simple manner for easily identify stages of every affected persons. Fig3., explains inputs of users U_i, sensors $S_{e1}, \ldots S_{e5}$, clusters $C_1, \ldots C_3$ and stages $S_{t1}, \ldots S_{t3}$. When will user can symptoms can be enter our SSCA start its work. User symptoms come from se5 sensor means person directly comes under S_{t1} and put it into 1st cluster. Sensor S_{e1} enter into the system it must be check whether it will comes under S_{t1} or S_{t3}. For which purpose we have to write a function is should be presented in fig 4. According to those results server could conforming placement of exact cluster.

```
Private stage findstage (Se5){
If (St1.Se5 is presented){
St3;
}
Else {
St1;
}
Return stage;
}
```

Sensor inputs are to be comes from 2nd, 3rd and 4th sensors we have to move on to stage 3 and allocated by cluster 3. Sometimes HIV affected person's does not have any symptoms and then it will be considered as S_{t2}. Cluster formation it will be more helpful for easily identifying status of every patient's and they have to associated and made communication between those members. Fig 4 is a diagrammatic representation of cluster formation.

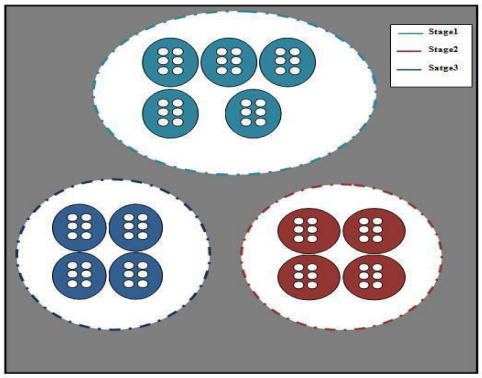

Figure 3: Stages of Clusters

4.3 Routing Mechanism

Routing is an important portion covered in social sensor networks. Transferring information (packets) between users and servers done by routing (path) selection process. After construction of clusters peoples can need to communicate with group members through servers. An important parameter of routing is a routing table which will collect all users (neighbors) details (Location, ID) in the network. Path selection is an important factor in routing mechanism. Because according to the path selection transmission delivery to be done properly and it should evaluate performance of particular algorithm and protocol. In our proposed work we have several servers (Zone servers, Main server) to perform all network access process and maintain all information's. Zone servers are separately placed in every location (district, state, country). Only one main server can have index for all servers information's and handle in proper way.

Our process we need additional process of load balancing at a time routing because main server can get lots of request from users. Here, main server can perform very actively to overcome the problem of routing come load balancing. To perform these works in an effective manner introduce hybrid load balancing algorithm. This hybrid load balancing algorithm should perform both the processes of routing and load balancing. Monitoring healthcare applications in social sensor networks is a very important and difficult task to progress successfully. In fig 5 describes the pseudocode for routing process and fig 6 describes the pseudocode for load balancing.

Pseudocode for Routing – Hybrid Load Balancer

1. INPUTS: R_T, $U_i = \{U_1, U_2, \ldots U_n\}$, $Z_S = \{Z_1, Z_2, \ldots Z_n\}$, M_S and D_S
2. Initialization: $U_i(R_q) = 0$
3. Send $U_i(R_q) \rightarrow Z_S$
4. Send $Z_S \rightarrow M_S$
5. If (D_S is present @ $Z(R_T)$)
   Activate P_{RT}
   Find D_S
   Get $Z_S \leftarrow M_S$ (Reply)
   Get $U_i \leftarrow Z_S$ (Reply)
   Else
   Activate R_{RT}
   Collect NZ
   R_T Find D_S
   Get $Z_S \leftarrow M_S$ (Reply)
   Get $U_i \leftarrow Z_S$ (Reply)
   End If
6. End

Figure 5: Hybrid Load Balancer – Routing

Routing can be performed by hybrid manner. Here, users in the network should pass request to their zone server Z_S. Z_S send that request to Main Server M_S. At this moment the main server can check if the user requested query it present in its particular zone or not. The destination zone is to be analyzed by routing table in the server. If it is presented in their zone only activate proactive routing protocol P_{RT}. P_{RT} should analyze routing table and it should find the exact destination location D_S into the zone server. Routing table contains Users, area within state and zone which is represented by every state in the world. After finding D_S response message passed from M_S to Z_S. Then it will be passed from Z_S to U_i. At that moment of route finding the M_S need to done the process of load balance.

Users	Zones
U1	A1 (Z1)
U5	A3 (Z2)
U3	A5 (Z1)
U8	A4 (Z3)
U9	A7 (Z3)

Figure 6: Routing Table (User, Area and Zone)

Pseudocode for WRR

1. INPUTS: UR_i, Q, T_q and W_i
2. OUTPUT: Scheduled data in server
3. Operation:
   i.Q=Φ; T_q & W_i = null
   ii.UR_i Enter into Q
   iii.Sort UR_i based on descending order of W_i iv.Set Tq = n;
   v.Allocate Q=
   vi.Rearran ge RUR_i in Q
   vii.Repeat Steps 3 to 5 Until End of Process 4.

END

.

Figure 7: WRR Load Balancing

For balancing loads in the Ms we have to perform Weighted Round Robin (WRR) scheduling algorithm. Process of WRR can be explained in fig 7. Inputs of WRR process are User request URi, Queue Q, Time Quantum Tq and Weight Wi. Output of the WRR process is a scheduled data in server. Operations performed in WRR is first initialize Q is an empty, Tq and Wi are null. After that URi are enter into the system and it will be sorted into Q. In Q it can be sorted with descending order of Wi. Next step of WRR is to set Tq for all URi processes. According to those factors URi to be allocated in to Q. In case anyone of the URi process to be completed and it will removed from Q. Again Q will be rearranged with remaining user requests RURi. Steps from iii to iv should be repeated until the process to be end. From theses process of WRR load balancing to be performed in proper manner and it could balance all URi from each and every zone in the world. After finished WRR process the routing mechanism shall be started again. If the user requested query was not present in particular zone server must activate Reactive routing protocol RRT. In RRT should analyze routing tables in neighborhood zones and check whether the particular needed Ds location is presented. Finding Ds is an important part in network because without any communication between these sender and receiver transmission cannot be successfully executed and also known several internal processes. After finding Ds response message passed from Ms to Zs. Then it will be passed from Zs to Ui. At that moment of route finding the Ms need to done the process of load balance. Load balancing performed by the load balancer in an efficient way by performing WRR scheduling. WRR procedures and steps are already explained briefly. Same process will applied into this step. Flowchart of WRR working steps are depicted in fig 8. WRR scheduling performed in load balancer at the stage of completion of routing. In fig 9 clearly explains the process of zone based routing. Normally hybrid routing protocol perform combined process of reactive and proactive protocols. According to the routing performance user will get proper destination for retrieving accurate results at necessary and exact timing. Peoples presented in every stage they have to communicate with others from same stage. For same stage peoples can communicate with proactive and reactive routing because same stage peoples in each and every stage.

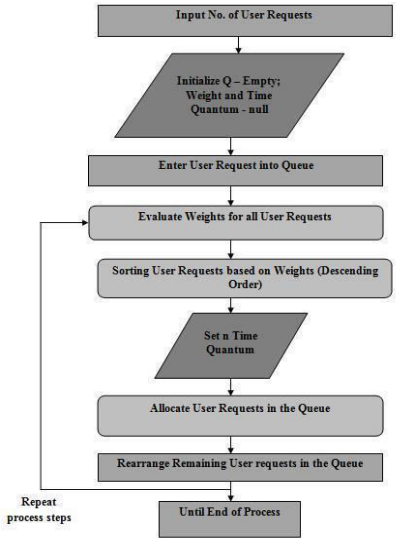

Figure 8: Working Steps of WRR

Reason for choosing WRR scheduling in our process is it will overcome the defect of starvation. Starvation is a process of idle stage to be continued for a long time for one resource. At a time 3 processes to be entered into the queue it could consider priority manner. If the process 1 has several jobs to finish means 3rd process could wait longer time. To avoid such a situation we had done our load balance by the way of Weighted Round Robin (WRR) scheduling. In our concept we had to choose hybrid routing protocol for performing routing mechanism. Reason is in our core concept based on zones in the country and world. Our communication can be made between zones with several users.

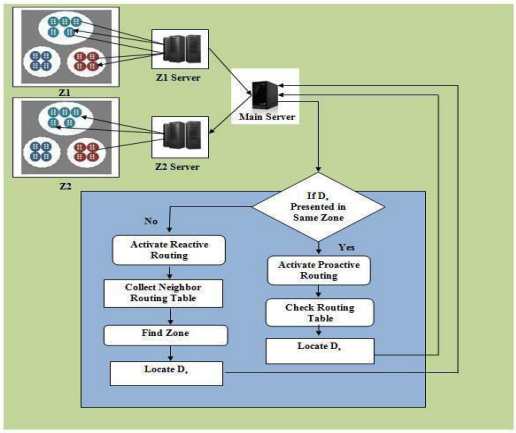

Figure 9: Zone Based Routing Process

4.4 Recommendation

Recommendation is also called as a suggestion which could be received from other members. Usually, recommender 12. Systems create opinion provisions based on communities which will help other users to get useful items from huge search space. Recommender systems are work carried out getting ratings from lots of users. Location based ratings and items based ratings also consider in to the recommender systems. Our proposed concept must need help from recommender system. Because each and every users participated in the HIVSSC framework must communicate with group members for the purpose of knowing to hospitals, treatment ideas and remedy for such symptoms. For that purpose we have to introduce a fast recommendation algorithm. Here, users are placed in groups and pass their request to the server. Server can check details of every user request and provide suggestions accordingly. Ratings are the important factor in recommender system because ratings are provided by previously visited users. So every user can get optimal solution for their queries. Users locations based recommendation can be take into our process. User locations are getting from their latitude and longitude. In our recommendation system we have three factors to consider which can be retrieved from [25].

i) Spatial ratings for non-spatial items (S-NS)
ii) Non-spatial ratings for spatial items (NS-S)
iii) Spatial ratings for spatial items (S-S)

Here, users have to give ratings to the hospital locations for tacking treatments and opinions. So hospitals are considered into items. According to the user location and item location based ratings are gathered from users and it can be suggested for other users who want to need necessary information's. Fast recommendation algorithm will provide exact and proper response to the users. Our fast recommendation algorithm process can be explained in fig 10.

Pseudocode for Fast Recommendation

1. INPUTS: $U_{Ri} = \{U_{R1}, U_{R2}, \ldots U_{Rn}\}$, $I = \{I_1, I_2, \ldots I_n\}$, TR= Fixed, R_{ec}
2. OUTPUT: Recommended Data
3. Enter U_{Ri}
4. Collect Location $\leftarrow U_{Ri}$
5. If (U_{Ri} < TR)
6. Set Condition 1;
7. End if
8. If (U_{Ri} > TR)
9. Set Condition 2;
10. End if
11. END

Condition 1:
TR= Fixed
(U_{Ri} < TR)
{
U_{Ri} Enter into Intra Zone; S-NS;
Collect Ratings based Item R_{ec} ; }

Condition 2:
TR = Fixed
(U_{Ri} > TR)
U_{Ri} Enter into Inter Zone
If (U_L is Awareness by U_i) {
NS- S;
Ratings based item R_{ec};
Else If {
S-S;
Ratings based item R_{ec};
}
}

Figure 10: Fast Recommendation Algorithm

Three factors involved in our process should be carried out for retrieving recommendation purposes. S-NS factor have the tuples of user, ulocation, rating, ilocation. NS-S factor have tuples of user, rating, item, ilocation. S-S tuples are user, ulocation, rating, item, ilocation. According to these tuples recommendation can be carried out. First of all we have to set the threshold value to be fixed. When user request U_{Ri} enters into the recommender system first it will check the threshold value because threshold value can be set by the location of every user. Location to be gathered by the values of latitude and longitude values of particular user location. User request will be less than for fixed threshold it will go the first condition. In first condition it will take the factor of S-NS. User request enter into intra zone, same zone peoples can be communicate with each other. Recommendation can be retrieved based on ratings which was already put by other users. Items are recovered from this factor based upon ratings given to the item for particular location. User request will be greater than threshold value it will go the second condition. In second condition we enter into inter zones. In this condition we have to check the awareness of user location. User location already known means recommendation should be performed by NS-S factor. Here, user ratings to be updated to the items based on user location but user does not known to item locations. Here users are in different zone can be communicate with each other. User location awareness is unknown to the system means it should follow S-S factor for performing recommendation. Intra zone recommendation can be depicted in fig 11(a). In this factor totally five tuples were presented. According to these five tuples recommendation can be performed.

Here, for providing recommendation user location and item location cannot be known. At that situation user request can retrieve recommendation information from unknown location based suggestions. Our fast recommendation algorithm must provide suggestion to the users in the system in a fast manner. Because division of recommendation policies are done based on the threshold values. After that it could provide recommendations to the users in a fast manner. Efficient way of recommendation must be based on inter zone and intra zone. In inter zone different stages peoples communicate with others for resolving their problems. Different zone peoples also have different stages of HIV symptoms. According to the symptoms and current needs of the particular user the recommendation results to be provided. Intra zone contains different stages of peoples in same zone (country, state and district). Inter Zone based recommendations are depicted in fig 11 (b).

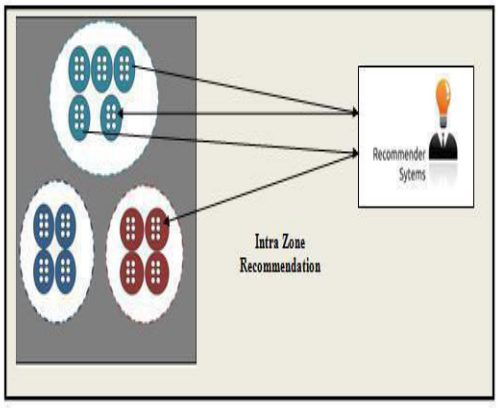

Figure 11(a): Intra Zone Recommendation

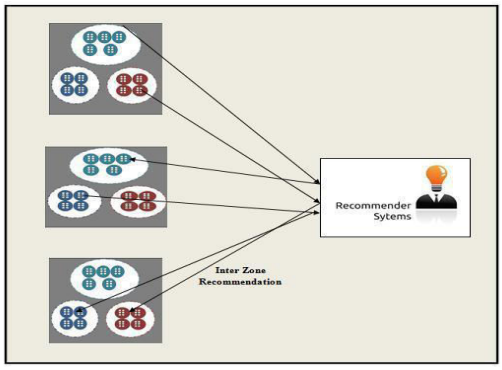

Figure 11 (b): Inter Zone Recommendation

4.5 HIV Awareness

HIV awareness takes an important effective role in current world. HIV is a more dangerous virus infection for human beings and it can be periodically increased in overall world. Some developed countries of United States of America, china it could spread more and more. Lots of peoples infected by HIV and they are not had proper awareness for how prevent infections severely and how to prevent spreading infections to other peoples. Now-a-days several awareness programs and counseling's to be conducted for creating awareness to the peoples and securely preventing themselves from HIV infections. HIV affected people can preventing themselves in earlier stages by the way of taking regular treatments, counseling's and some diet controls. Properly done those processes infections does not affect more injuries and it will helpful them for extending their life period. For some kind of people it could be controlled in 1st stage. They have to get longer days to live. If the infectious peoples don't care about their health and infections it could affect and damage their immune system worst. Damaged immune system could be a main reason for critical injuries and earlier death. Social sensor networks more helpful and support for HIV affected peoples to provide advanced healthcare provisions and preventing procedures through internet. Conversation make between two persons in social sensor network safely. Here, they were not having any interruption and confusion's about their health conditions from other sources.

Because who are the members of this HIVSSC system they only communicate within the groups based on their symptoms. Referred some current theories and notifications which could be released by some medical research communities about HIV infections, our proposed system will provide some instructions and awareness about HIV prevention. Normally, HIV can be spread through the factor of blood, fewer factors can transmit HIV from one body another body. Here, discuss a fewer advanced suggestion of its factors are rectal fluids, semen, vaginal fluids and pre-seminal fluids. Several HIV infection preventing strategies are released for human beings. Prevention HIV infection reducing factors are also suggested for human beings. Commonly explored pharmaceutical suggestions are HIV vaccines, antiretroviral drugs to limiting viral load, low dead space syringes and condoms. Prevention made on mother-to-child spreading infections at the stage of pregnancy and also after birth in the infant by the way of giving bottle feeding instead of breast feeding. Infected peoples were getting fewer pre-exposure prophylaxes from their health care providers. To avoid more getting HIV use condoms at the situation of every time have anal and vaginal sex. Infected human beings mostly avoid taking drugs, alcohol, if they have to take drugs don't inject drugs without sterile drug injection and water and also never share it to their friends and others.

5. PERFORMANCE EVALUATIONS

In this section we compare our proposed HIVSSC framework with some previous techniques. Techniques are different but parameters taken by the previous system and proposed system are same. In our HIVSSC framework we have the parameters of cluster formation time for clustering, efficiency, packet delivery ratio for routing mechanism and response time for recommendation. Here, previous system algorithms are listed for clustering LEACH-MOD protocol, recommendation could be carried out based on LARS*, HGMR for multicast routing. From those analyses we have to compare and prove our proposed framework should provide more efficient results. To extend of all those algorithms and protocols could be used to identify performance of HIVSSC process in social sensor networks. Working process of these previous algorithms is described as below:

- **LEACH-MOD:** Process of LEACH-MOD clustering contains nodes which should select their cluster head and members. In every time slot transmission could be occurred based on geometric process with probability. Here, packets are not successfully delivered to the receiver it just retransmission to the users. Cluster formation time should be increased at the time of cluster head selection and also transmission. ∟
-
- **HGMR:** Hierarchical Geographic Multicast Routing could reduce byte overhead which was combined with each data packet. Here, large group can be divided into several sub-groups. Main drawback of this HGMR was inefficient in the process of packet transmissions. ∟
-
- **LARS*:** In LARS* based recommendation method should provide continuous query and aggregate response for that. But movable users move around the distance of 1 to 30 miles. From that particular distance user queries to be processed and getting responses. Unaware of user location change LARS* does not provide efficient recommendation results to the users.

5.1 Simulation Environments

We conduct our experiments on omnet++ simulation framework. This simulation tool should help us to perform proposed HIVSSC framework with previous algorithms and protocols. Omnet simulation was conducted with some considering parameters are at hand in table 2

Table 2: Structure of omnet++ Simulation

Parameter	Values
Number of nodes	20-30
Protocol Name	Hybrid Routing Protocol
Mac type	Mac/802_11
Channel	Wireless Channel
Interface type	Phy/WirelessPhy
Transmission Range	200m
Packet Size	512 byte
Transmission Rate	5 packets/sec
Nodes Speed	25 m/s
Map Size	1000 x 1000 m
Movement Model	Random
Traffic Model	Constant Bit Rate (CBR)

For conducting our experiments 20-30 nodes can be used. Each nodes are in mobile nature and it can be move from random way from (1 to 25) m/s. Simulation should be conducted in the area of 1000 * 1000m. To perform traffic management in social sensor network we have to use Content Bit Rate (CBR) at a time of packet transmission. Usually, transmission range is defined by 200 m. Each traffic source generation upto 512 bytes data packets. Simulation consists of IEEE 802.11 MAC protocol are uniformly distributed. Nodes presented in our simulation must moves depend upon random waypoint mobility model which can be created and executed by OMNET++ simulation framework.

Speed of the mobility nodes are 25 m/s. Actual raw data of each and every nodes was 2Mb/s. Table 2 clearly have the details of parameters involved in this simulation in an appropriate manner.

5.2 Performance Metrics

We consider the following metrics are to be conducted for experiments on omnet++ simulation framework between existing and proposed system. There performance parameters are

- Cluster Formation Time
- PDR (Packet Delivery Ratio)
- Response Time

Those parameters are clearly explained and plotted with its graphical representation in next section.

5.3 Comparative Analysis

We do the experiments of our proposed system work with existing system algorithms when concentrating variance of each parameter as presented in the performance metrics as follows. Comparative analysis can be done with previous algorithms.

Table 3, 4 and 5shows the overall performance results of different parameters as consider in the performance metrics when considering network size and number of nodes.

Table 3: Performance of Cluster Formation Time when considering Number of nodes

Parameter / Algorithms	Cluster Formation Time
LEACH-MOD	3.4s
SSC	3.292s

Table 4: Performance of PDR when considering multicast routing

Parameter / Algorithms	PDR
HGMR	86.6%
HIVSSC	89%

Table 5: Performance of Response Time when considering Number of Ratings

Parameter / Algorithms	Response Time
LARS*	32ms
Fast Rec	25ms

5.3.1. Performance of Cluster Formation Time

Cluster Formation Time can be defined as the time taken for clustering nodes (HIV users) within the network because more number of users can be participated inside the network. Fig 12 shows the performance result of cluster formation time when a number of nodes insides the network.

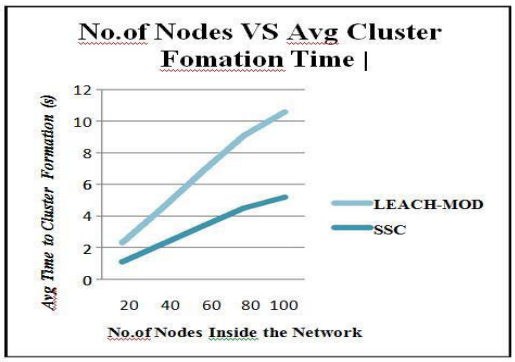

Figure 12: Performance of Cluster Formation

Comparison to be with previous LEACH-MOD algorithm and proposed SSC algorithm. Figure 12 represents when number of nodes increase cluster formation time also increased. Cluster formation time can include some error probability. This can be calculated by

$$\tau_A = \frac{1}{i+\epsilon}$$

Where,

– i -No.of Remaining nodes to form cluste

ε – Error Probability (Success(FP) +Not Success(FN))

At the time of this calculation adaptive transmission to be achieved with 0-1. In LEACH-MOD[23] number of nodes increases in the network formation time can be increased largely. But our SSC algorithm should perform clustering based on sensors. It does not take too much of time. So our SSC algorithm achieve efficient results for varying number of nodes and could got lesser formation time. We compared two algorithms when number of rapidly increased inside the networks.

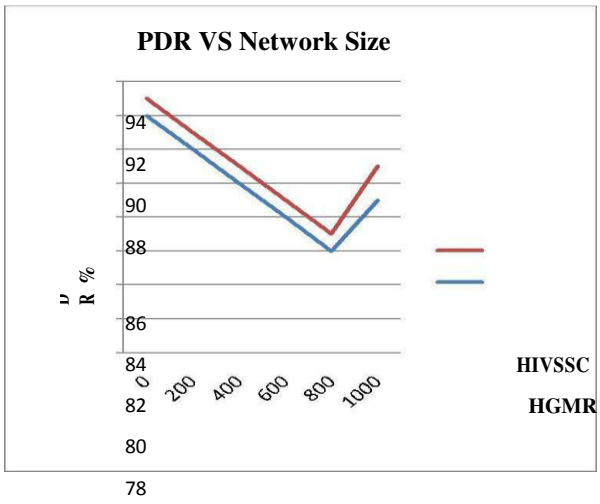

Figure 13: Performance of Multicast Routing

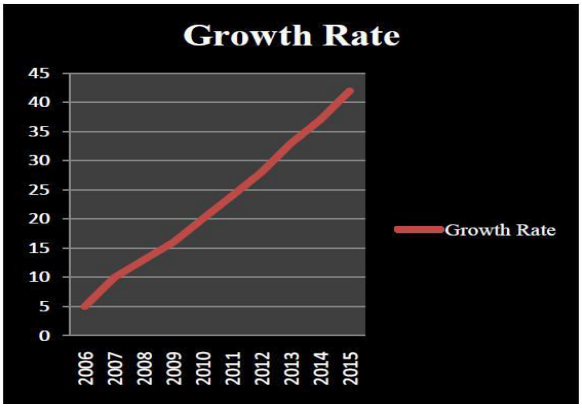

Figure 14: Growth Rate of Proposed Frame Work

5.3.4. Performance of Response Time

Response time is also defined as fastest answer came from every query passed from a user side. User can travel to long distance the query response time to be reduced.

5.3.2. Performance of PDR

Packet Delivery Ratio is to be defined as amount of packets received by destination from actual packets send by sender. Figure 13 shows the performance results of PDR evaluating at the time of increasing network size. Network can be varied with 0-1000. HGMR [25] provide PDR results in lower manner. When increasing a network size PDR can be reduced in previous algorithm. But in our proposed hybrid routing algorithm perform efficiently to provide higher PDR results.

5.3.3. Evaluation of Growth Rate

Growth rate is an important factor for analyzing reachability of our HIVSSC framework. According to the reachability in social sensor network we have to see the great future with tremendous growth rate.

Fig 14 shows the growth rate of our proposed HIVSSC framework. In that we have to see increasing number of users used this system year wise.

Compare to LARS* [24] technique our proposed HIVSSC framework should provide efficient responses with reduced time. Here, response time can be measured according to number of ratings increased. Fig 15 explains the response time of our framework.

5.3.5. Performance of Efficiency

Efficiency is to be measured by overall work carried out by number of users. Overall efficiency of our proposed HIVSSC

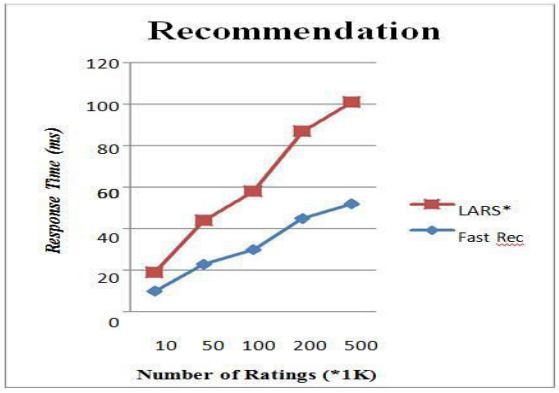

Figure 15: Performance of Recommendation Algorithm

framework can be measured by increased number of users in the system. Our framework should increase its efficiency according with increasing number of users utilized this system. Our framework should achieve overall efficiency of 96%.

Figure 16: Overall Efficiency

6. CONCLUSION

Social Sensor Network is a combined working nature of social and sensor networks. Efficiency is the most important factor in social sensor network because working together process must provide efficient results based on our proposed framework. Effective cluster formation, routing and recommendation methods are discussed in our previous section. Healthcare monitoring based on WBAN is an important factor in social sensor network. To achieve better results in our proposed framework of HIVSSC perform newly developed clustering method, multicast routing mechanism with load balancing and recommendations. In our proposed system we have to analyze and plot growth rate of HIVSSC framework. Then we have to find the efficiency of our proposed framework. Comparison of existing with proposed based on the parameters of cluster formation time, packet delivery ratio and response time. Above mentioned parameters

should perform the processes of clustering, routing and recommendation. Our proposed method cluster formation could be done with 5 kinds of body sensors. According to that three stages of HIV form clusters. After that load balancer should perform the process of routing mechanism and load balancing. Finally, perform recommendation in an effective manner to get responses in a faster manner. HIVSSC framework should provide HIV awareness to the affected or infectious peoples. According to these awareness and keep followed by the peoples growth rate of proposed system to be increased. To reduce number of affected HIV peoples we had created and developed this kind of framework and provide efficient results. Efficiency of this framework can be evaluated by overall performance of clustering, routing with load balancing and recommendations. From this framework peoples can easily get lots of suggestions through social networks and take immediate action for any queries to save human from HIV. Thus our proposed system should provide efficient and effective results in the social sensor networks.

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