SEMINAR PROJECT PRESENTATION

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CRIME TRACKING SYSTEM

ABSTRACT

- **Crime Tracking System (CTS)** aims to facilitate the process by automating data entry, storage, and retrieval using a mobile interface and a database to efficiently store said data.
- The Emergence of the field of data science has opened new doors that have high potential in facilitating the process of criminal investigation.
- Data science enables criminal investigators to create tangible and quantifiable information on criminal social network profiles then analyzes crime concurrence based on location proximity.

- Aiming at availing the relevance of integrating data science analysis techniques in the criminal investigation, this study examines the suitability of **cluster graphs** and geolocation proximity (through **heat maps**) as two of the data science analysis techniques to facilitate criminal investigation process
- On one hand, **cluster graph** analyses the social network of a suspect and examines its centrality, parallel betweenness and community affiliation.
- On the other hand, **geolocation proximity** provides an investigator with previous crime occurrences through the use of the heat map visualizing technique.
- These concepts are tested by embedding them in a mobile application developed to facilitate investigation process.

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KEYWORDS

- crime tracking
- crime analysis
- social network
- Analysis
- Geolocation
- Heat Map
- Clustering
- Data Mining

INTRODUCTION

- The process of crime investigation involves gathering and analyzing vast amounts of data.
- For investigators who need to track the status of criminal cases and to get valuable suggestions on their potential suspects, the **Criminal Tracking System (CTS)** is an information system that will provide an anywhere/anytime single point of access to the criminal cases logs and their potential suspects.
- The system will store detailed information of every criminal case within online central repository, the Crime Date and Time, the case opening Date and Time, the location of every crime scene, the victim's names, the potential suspects and the evidence found.
- The system will save the investigator 25 percent time on criminal cases by providing the investigator with fast and easy access to crime cases logs, identifying serial crime case and listing all crimes committed by a suspect.
- Unlike the current human driven processes, our system will generate news feeds required to keep the investigator informed about recent crimes cases

LITERATURE SURVEY

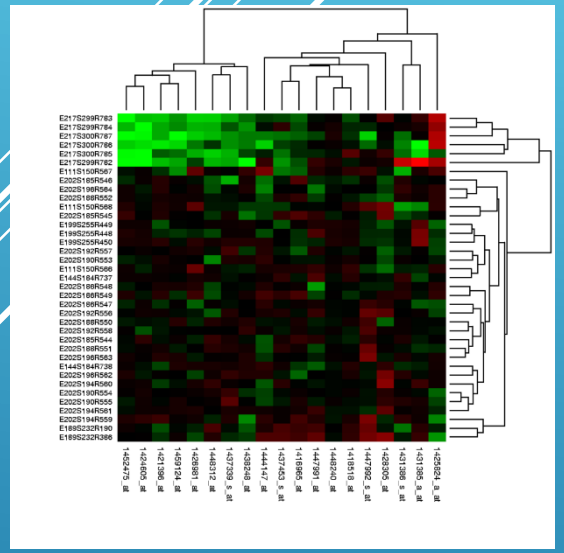
- In the past, gathering and analysis of crime data was all done manually, Therefore, investigation of a single crime took a lot of time and effort.
- The emergence of data science has introduced new tools and techniques to automate and broaden the range of data collected for crime investigations.
- One such example is suspect profiling using social media platforms. It provides a summarized narrative about a suspect and their background details gathered from their social media profiles.

- The first feature enumerates the crime and criminal profiling tools that have been introduced by several researchers in the literature; for example, the work carried by David J. Icove [1] is a similar concept to Serial Crime Detector of the CTS mobile application. Both operate by suspect profiling and crime pattern analysis to solve crimes. They both attempt to create a suspect profile based on crime details gathered by identifying particular patterns or behavior linked to other past crimes.
- The second feature involves the concept of geographical profiling The work by D. Kim Rossmo et al [2] is essentially the same idea as the CTS HeatMap system. Both concepts make use of a geographical map to analyze and predict the occurrence of crimes in particular areas of concentration .Furthermore, the paper by Rui LI, Kin Hou Lei, RaviKhadiwala, Kevin Chen-Chuan Chang called ”Twitter Based Event Detection and Analysis System” [3] extract location data such as GPS coordinates longitude and latitude from a tweet to detect, analyze and anticipate events such as criminal activities.
- The third feature is concerned with structured and unstructured data mining. the paper “Crime Data Mining: An Overview and Case Studies” [4] contains a string comparator that examines crime records for deceptive information.

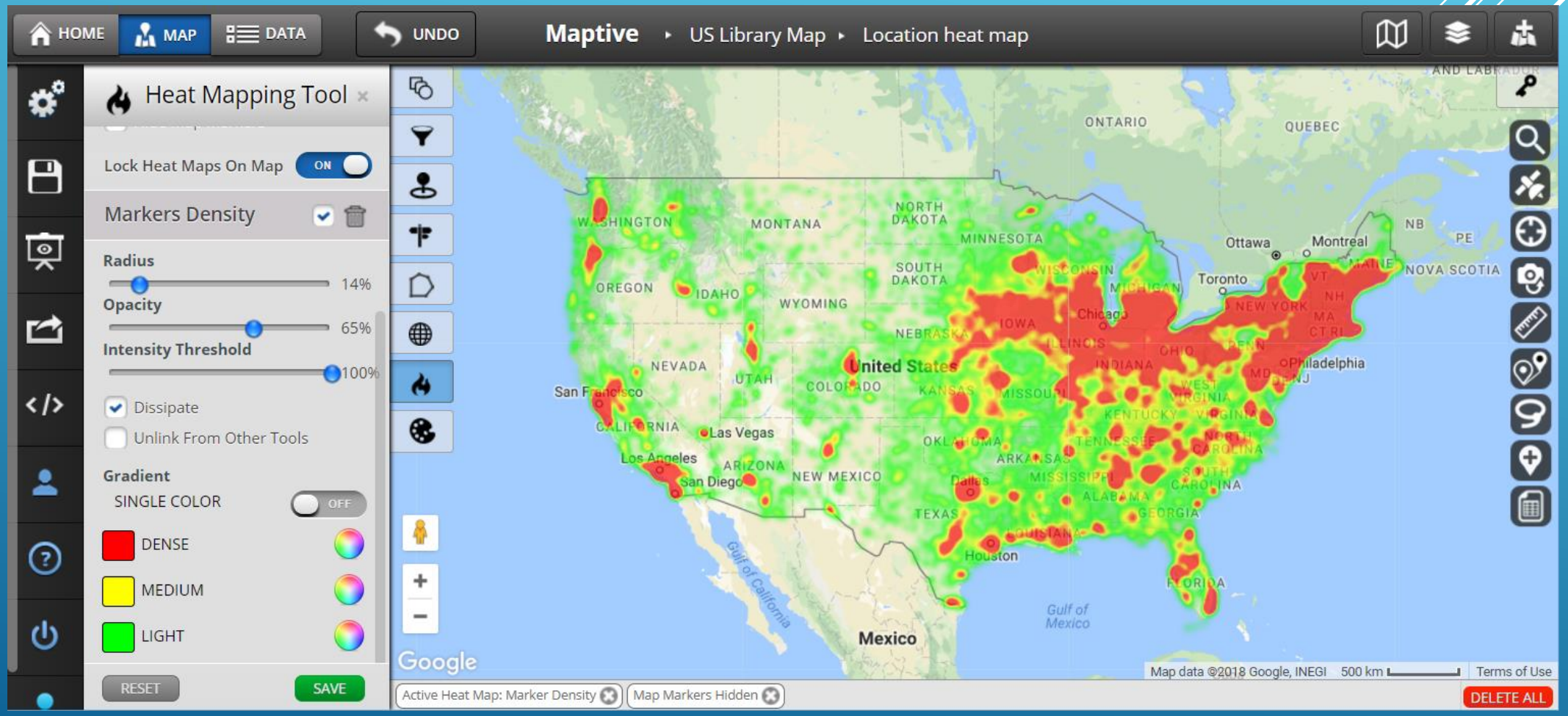
- The fourth feature is focused on the concept of network analysis, the social network connection in particular. The paper [5] by Jennifer Xu and Hsinchun Chen delves deep into the approach of using cluster graphs to create a visual representation of the relationship between individuals to uncover non-obvious patterns. It also creates a visual representation of a suspect's criminal network.
- The CTS Social Network Analysis system that creates a cluster graph to visually present a suspects social network connection to draw a conclusion about the suspect's relation to organized criminal networks.
- The fifth feature contains the concept of using tracking systems. In the research, [6] describes a tracking system as an Android mobile application to detect or prevent child kidnappings. This system automatically detects the GPS coordinates of an Android phone associated with a child. It is similar to the CTS mobile application which has an automated geographic location update function that displays the phones current location in term of longitude and latitude

HEAT MAP

- A heat map is a data visualization technique that shows magnitude of a phenomenon as color in two dimensions.
- The variation in color may be by hue or intensity, giving obvious visual cues to the reader about how the phenomenon is clustered or varies over space.
- There are two fundamentally different categories of heat maps: the cluster heat map and the spatial heat map.
- In a cluster heat map, magnitudes are laid out into a matrix of fixed cell size whose rows and columns are discrete phenomena and categories, and the sorting of rows and columns is intentional and somewhat arbitrary, with the goal of suggesting clusters or portraying them as discovered via statistical analysis.
- The position of a magnitude in a spatial heat map is forced by the location of the magnitude in that space, and there is no notion of cells; the phenomenon is considered to vary continuously



HEAT MAP (GENERATOR)



HEAT MAP ALGORITHM

Array Implementation

```
for each coord
            cell = coord projected to grid
            increment cell value
end

for 0 to # of passes
    for each row
        for each col
            if grid[row,col] > 0 then
              grid[row,col] += 1
              increment_adjacent_cells(row, col)
            end
         end
    end
 end
```

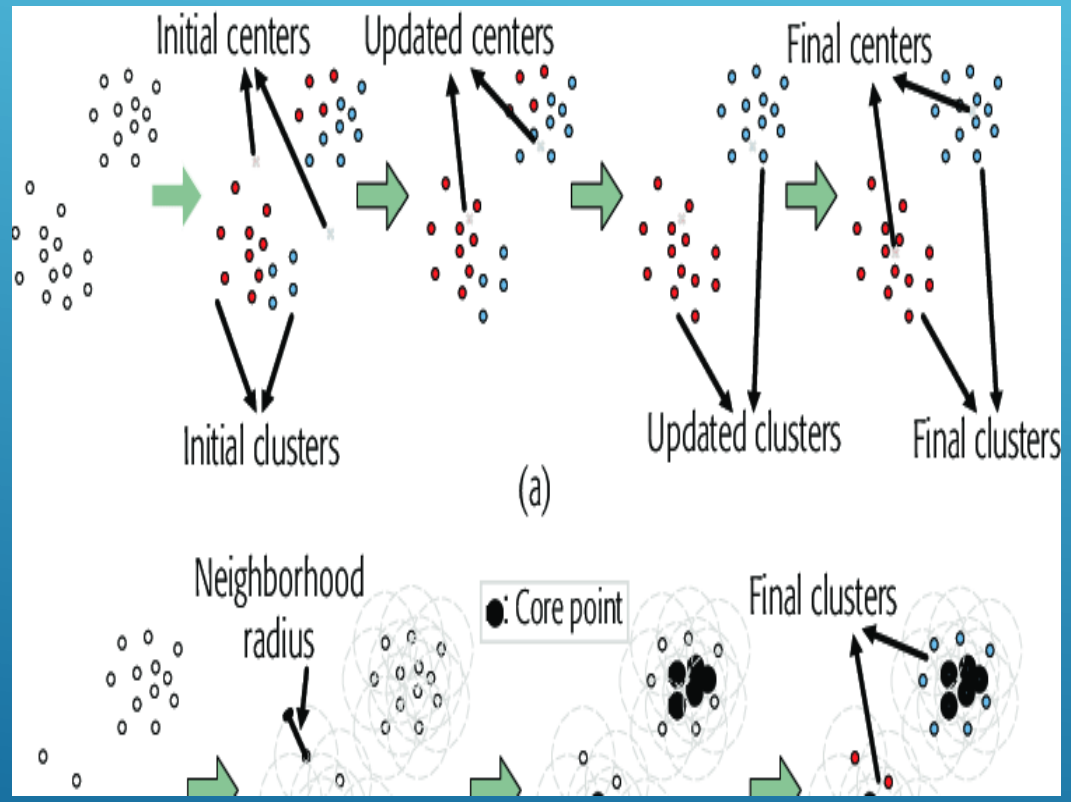
Queue Implementation

```
Add an element to queue (first in heatmap(x,y, val))
 While (!queue.isEmpty())
 {
elem = queue.pop()
queue.push(elem.x + 1, elem.y, val-1)
queue.push(elem.x - 1, elem.y, val-1)
queue.push(elem.x, elem.y + 1, val-1)
queue.push(elem.x, elem.y - 1, val-1)
}
```

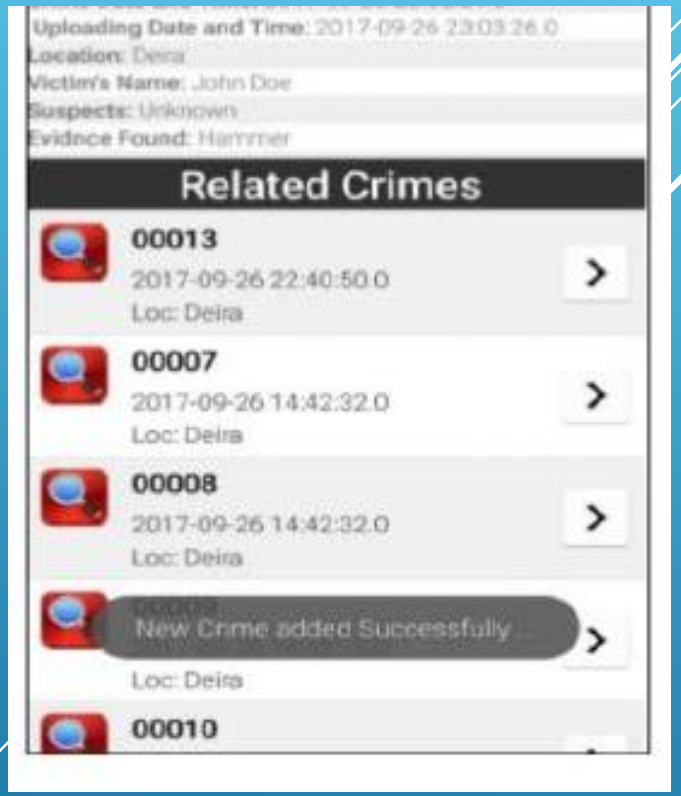
PROPOSED SOLUTION

- Mobile application for criminal investigation tracking system that tracks the investigation status of criminal cases with logs and also predicts primary suspects.
- The system will help the investigators to speed up the investigation process and track status of multiple cases at a time.
- The system keeps logs of a case which includes case summary, people involved, disputes, past criminal history of those involved, Items recovered on scene and other details.
- This also include the Facebook Data Mining System and the Heat Map System.
- The Facebook Data Mining System is used to extract a suspect name from the CTS database and inspect through Facebook website for similar names that could potentially be the suspect's account. This system will then extract data such as suspect profile photo and their 2 degrees of separation (friends of friends) to apprehend any criminal communities that may exist within their network of friends.
- The system is able to produce a visual representation in a form of a cluster graph of their friends' network to uncover any parallel betweeness and community detection

FIGURES

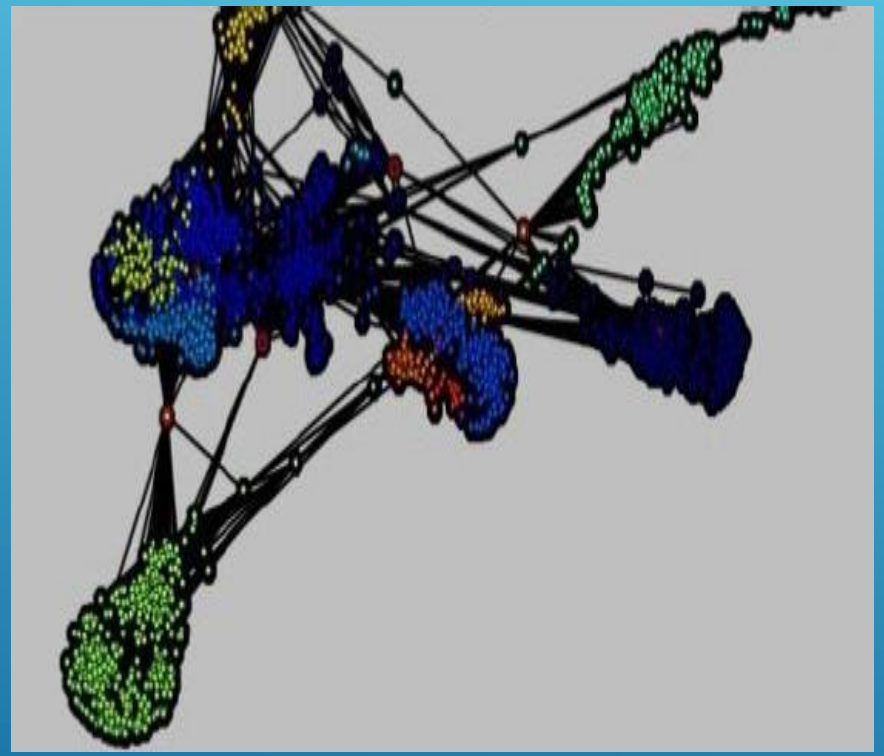


(a) Clustering

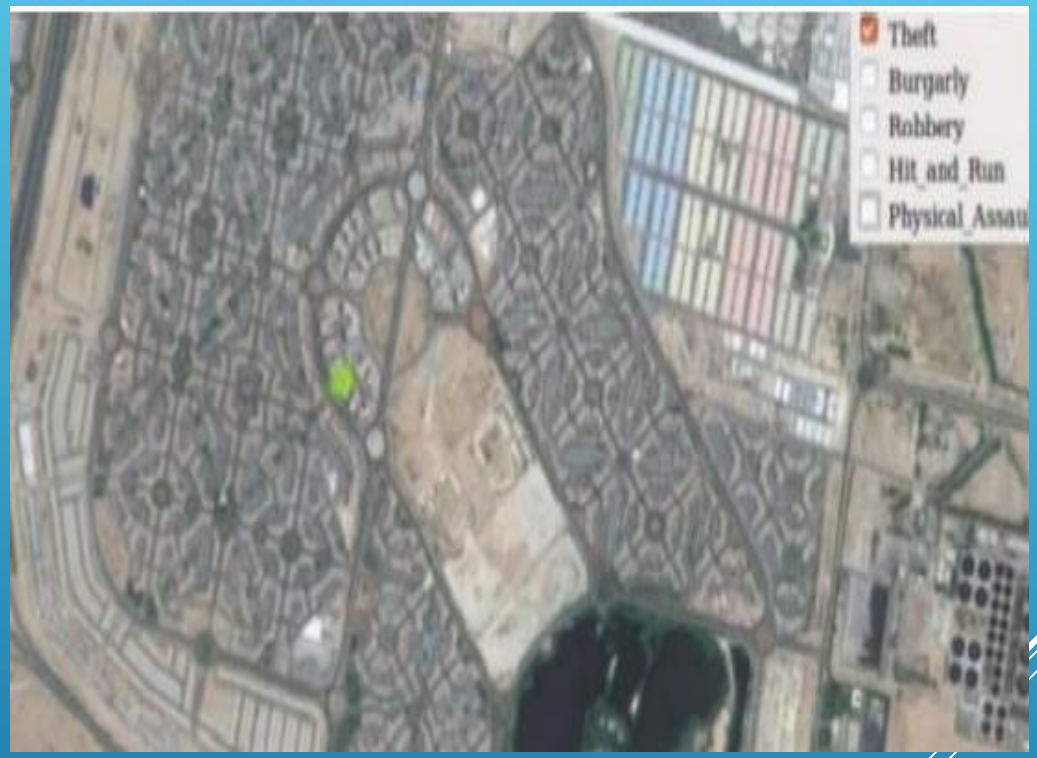


(b) CTS Mobile App

FIGURES (CONT...)

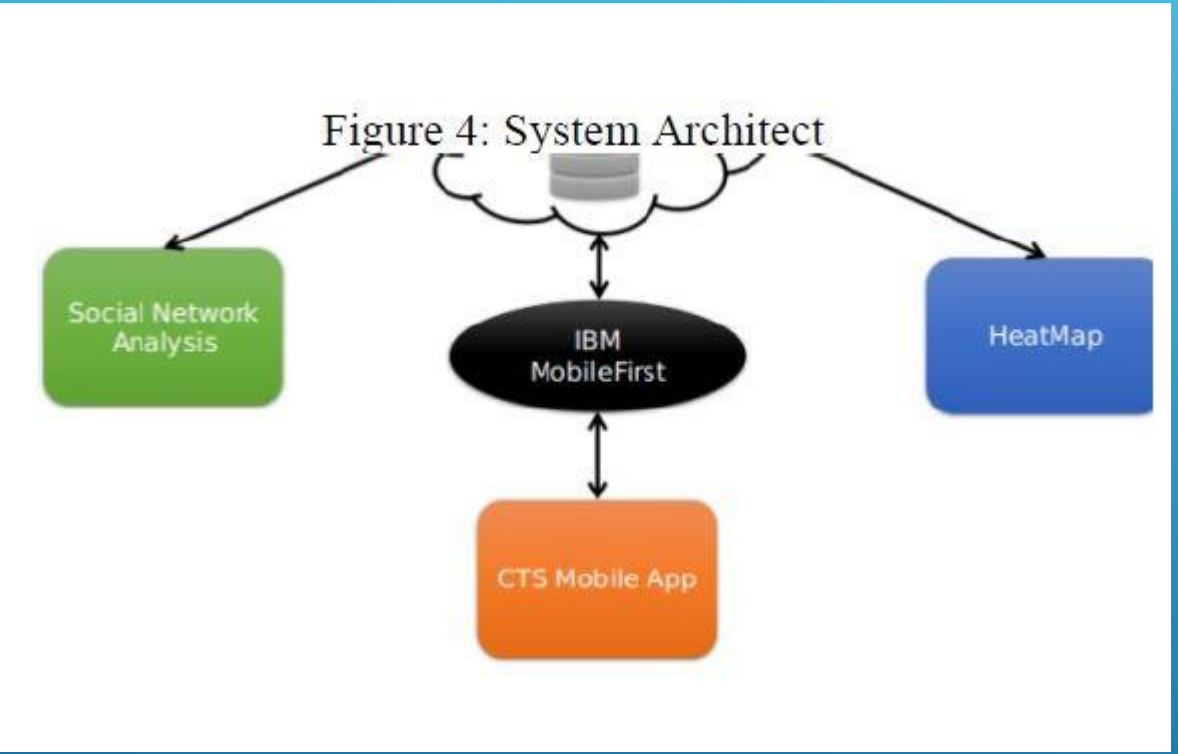


(c) Community Detection



(d) HeatMap Crime “Hotspot”

ARCHITECTURAL BLOCK DIAGRAM



FUTURE SCOPE

- The Idea of data science for Crime Investigation is been implemented in many countries such as US,Canada,UK,Colombo etc..
- Data Science for Crime Investigation can be extended for Predicting Future Crime Spots, Pretrial Release and Parole, who all likely to commit a crime etc...
- In India, many metro cities like Bangalore ,Hyderabad,Mumbai,Pune etc… are trying to implement the same for their easiness as well for fast Crime Solving.
- Either the idea has been still under testing or is implemented by many states with their Cyber Cell and Developer teams.

CONCLUSION

- The CTS mobile application is only designed for Blue Collar crimes. Crime detail entries were made to fit these type of crimes. White Collar crimes naturally needed more parameters for analysis.
- The Social Network Analysis System of CTS is limited to analyzing public Facebook accounts only. Gathering information from private Facebook accounts could be limited.
- The reach of the cluster graph provided by the Social Network Analysis of CTS could be massively narrowed. The HeatMap System is limited to analyze longitude and latitude only.
- Data science could be used to aid criminal investigation process. With technology such as the Social Network Analysis system, criminal or terrorist organizations could be crippled by targeting the leaders or prominent members.
- Therefore, improving crime-fighting efforts. Also, a HeatMap system has a high potential for subduing concentration of crime occurrence in particular crime infested areas.
- Serial Crime Detection system, the crime investigation process could now be automated to become more efficient and effective.
- Hence paper aims to create a safer modern society by equipping law enforcement agencies such as the Police with the technology and systems that could improve their overall policing performance.

REFERENCE

- [1] D. J. Icove, Automated crime profiling, FBI L.Enforcement Bill. 55 (1986) 27.
- [2] D. K. Rossmo, I. Laverty, B. Moore, Geographic profiling for serial crime investigation, in: Geographic information systems and crime analysis, IGI Global, 2005,pp. 102–117.
- [3] R. Li, K. H. Lei, R. Khadiwala, K. C.-C. Chang,Tedas: A twitter-based event detection and analysis system, in: Data engineering (icde), 2012 ieee 28th international conference on, IEEE, 2012, pp. 1273–1276.
- [4] H. Chen, W. Chung, Y. Qin, M. Chau, J. J. Xu, G.Wang, R. Zheng, H. Atabakhsh, Crime data mining: an overview and case studies, in: Proceedings of the 2003 annual national conference on Digital government research,Digital Government Society of North America, 2003, pp. 1-5.
- [5] J. Xu, H. Chen, Criminal network analysis and visualization, Communications of the ACM 48 (6) (2005) 100–107.
- [6] J. Saranya, J. Selvakumar, Implementation of children tracking system on android mobile terminals, in:Communications and Signal Processing (ICCSP), 2013International Conference on, IEEE, 2013, pp. 961–965.