Crime-Mapping Design Handout

CS 410

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CS 410

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Key Terms

SafetyScore™ - A measure of risk at a point on the map that is calculated based on the severity of nearby crimes, the times of those crimes, their distance from the point, length of time since the crime was committed, and the time of day and day of week that the crime was committed.

Heat map: a two-dimensional representation of data in which values are represented by colors. A simple heat map provides an immediate visual summary of information. More elaborate heat maps allow the viewer to understand complex data sets. [5]

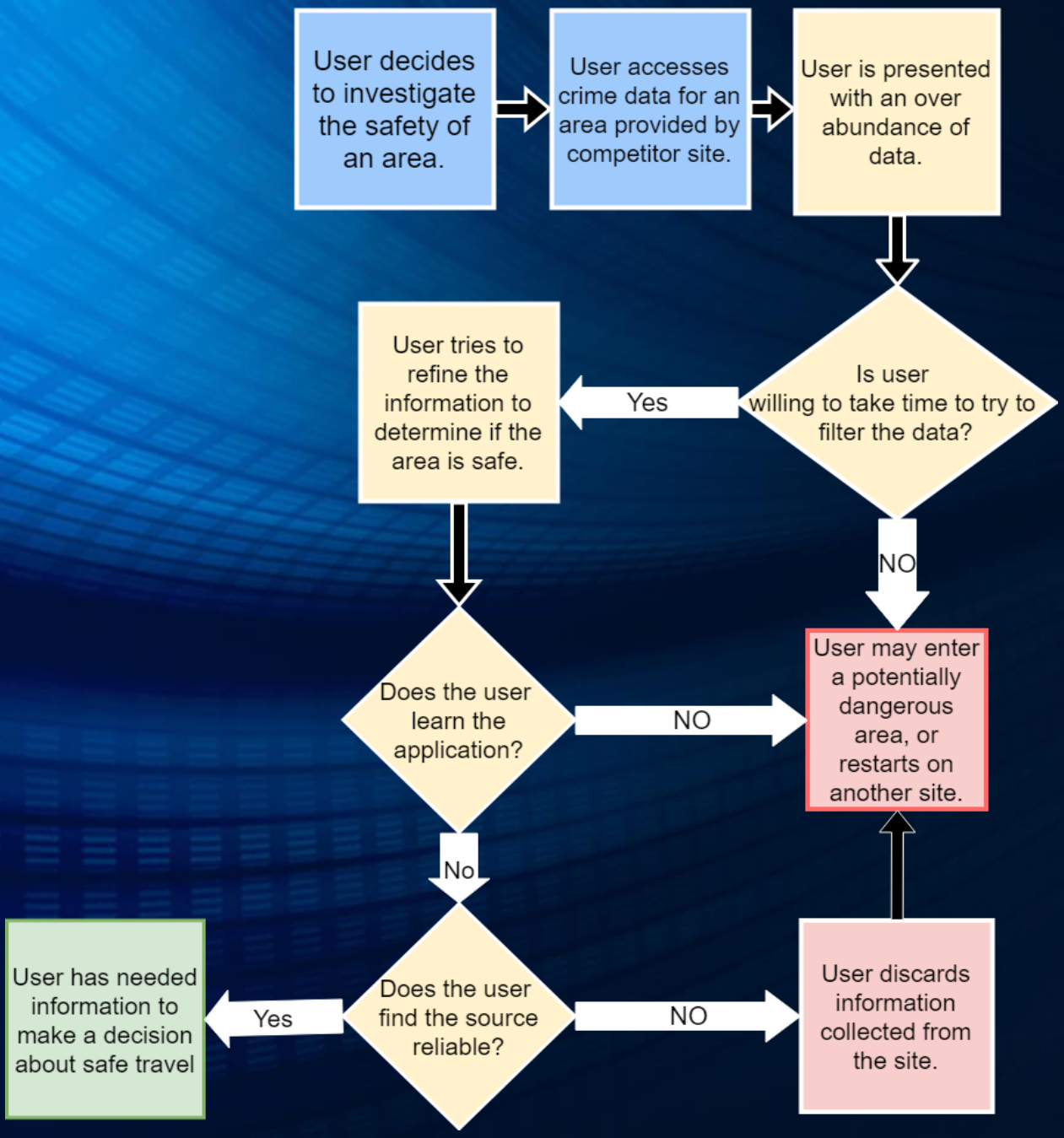
Risk: the likelihood of being the victim of a crime. Areas are considered higher risk based on the severity of the crimes, the likelihood of their recurrence, and user-adjusted weights.

User-friendly: Someone with basic computer/internet skills should be able to navigate the application with minimal instruction

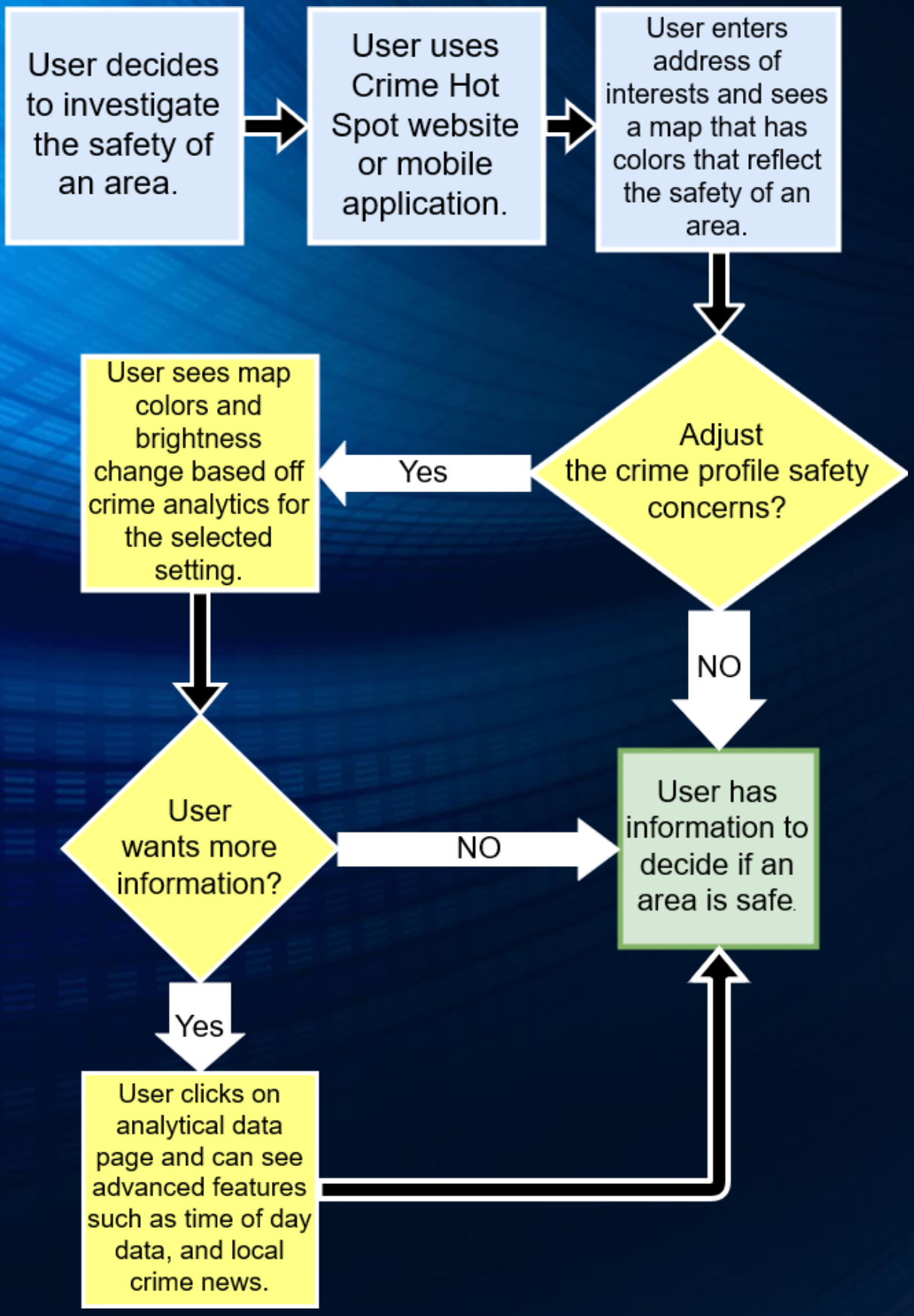
Problem Statement

Current crime-maps do not display data in a way that allows users to make effective and informed decisions regarding their safety in both a timely and efficient manner.

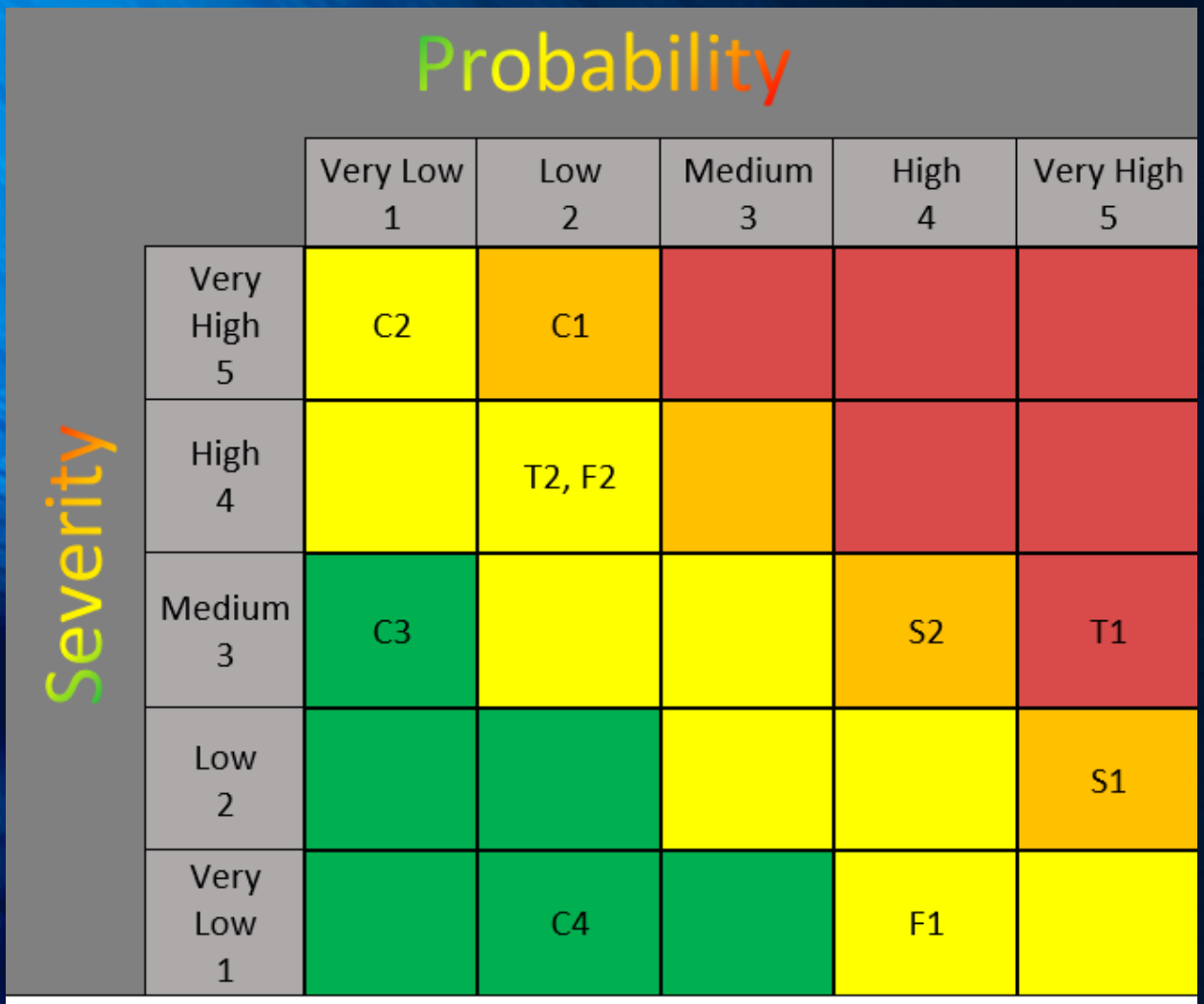
Current Process Flow



Solution Process Flow



Risk Matrix



Key:

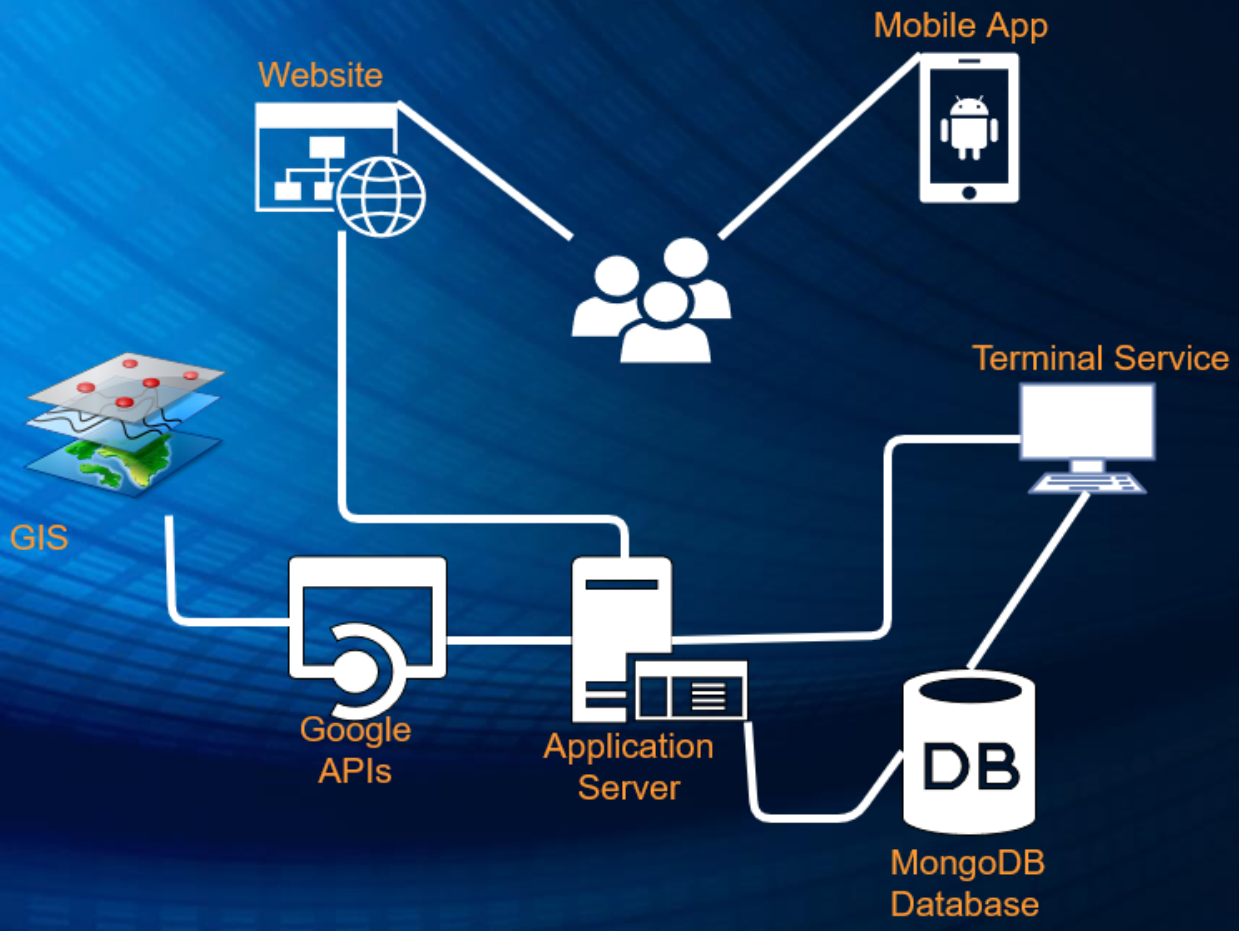
Acceptable: The risk is acceptable and no further resolution is needed.

Permissible: The risk is at a level that any controls that could be put in place without causing undue hardship should be used.

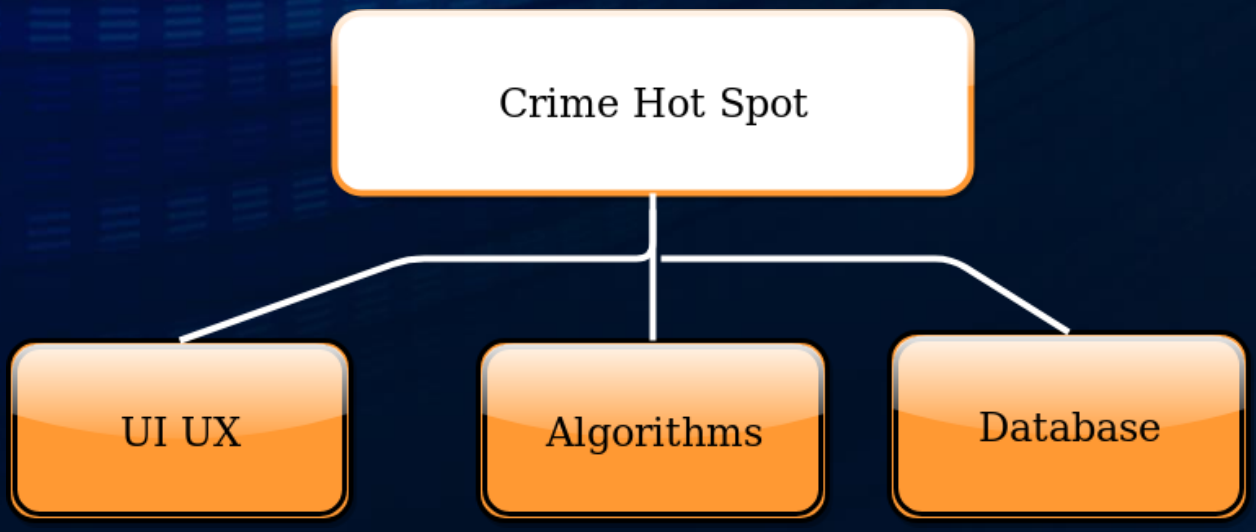
Considerable: The risk must be considered and contingencies prepared.

Catastrophic: The project cannot proceed until a resolution is identified to mitigate the challenge.

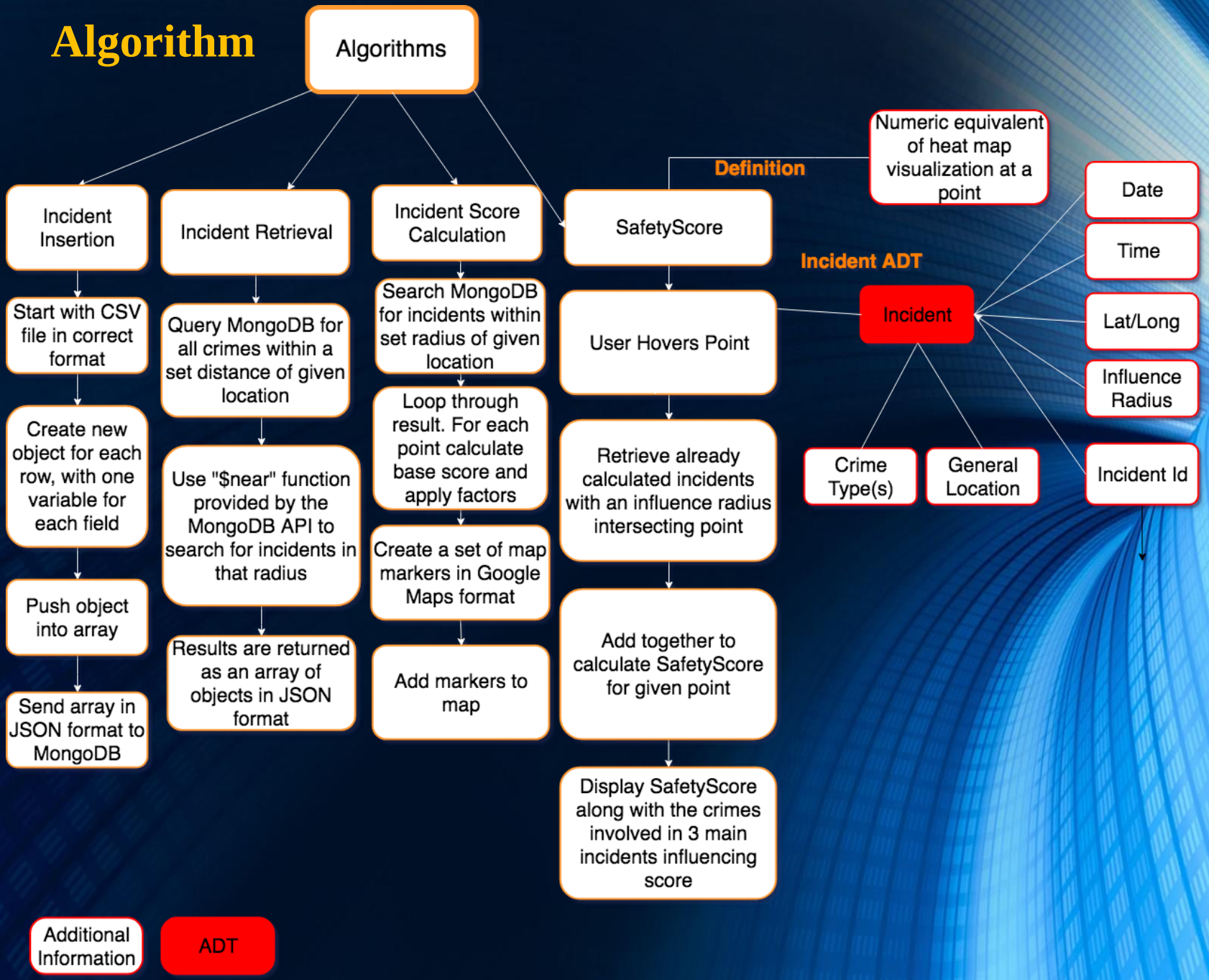
Major Component Diagram



Work Breakdown Structure (WBS)



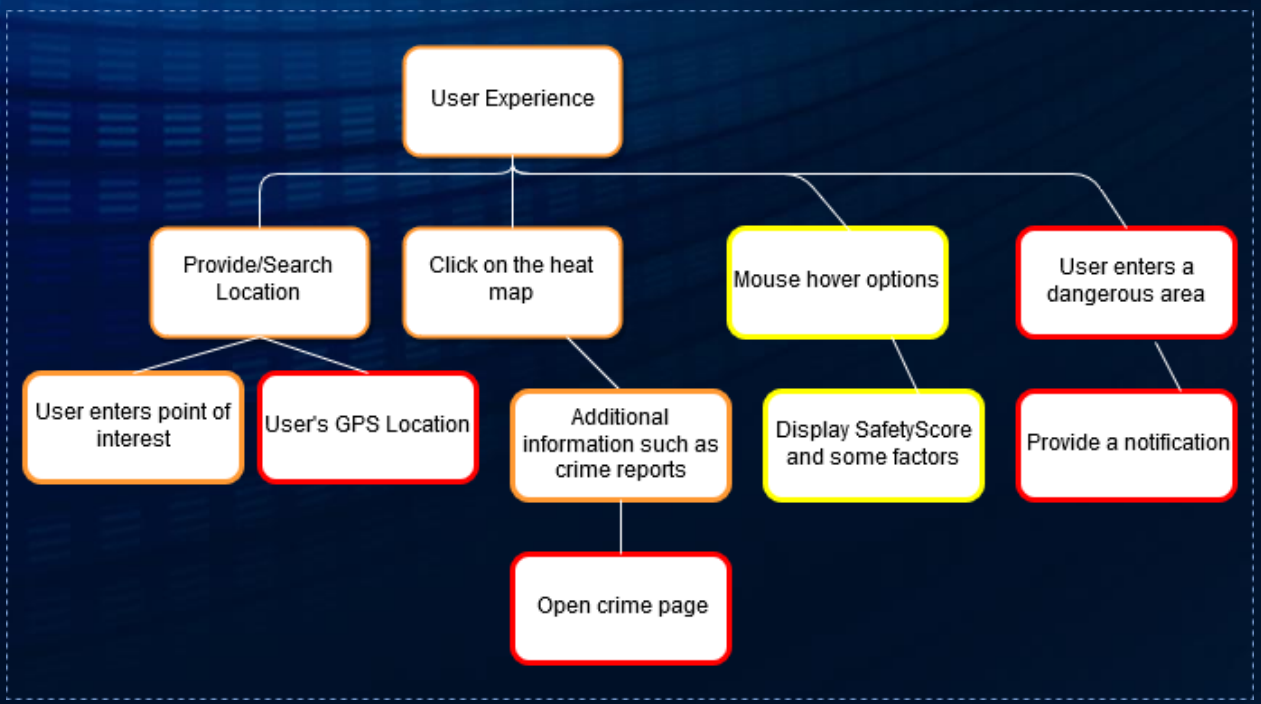
Algorithm


Algorithms
Incident Insertion
Incident Retrieval
Incident Score Calculation
SafetyScore
Start with CSV file in correct format
Create new object for each row, with one variable for each field
Push object into array
Send array in JSON format to MongoDB
Query MongoDB for all crimes within a set distance of given location
Use "$near" function provided by the MongoDB API to search for incidents in that radius
Results are returned as an array of objects in JSON format
Search MongoDB for incidents within set radius of given location
Loop through result. For each point calculate base score and apply factors
Create a set of map markers in Google Maps format
Add markers to map
User Hovers Point
Retrieve already calculated incidents with an influence radius intersecting point
Add together to calculate SafetyScore for given point
Display SafetyScore along with the crimes involved in 3 main incidents influencing score
Definition
Numeric equivalent of heat map visualization at a point
Incident ADT
Incident
Crime Type(s)
General Location
Date
Time
Lat/Long
Influence Radius
Incident Id
Additional Information
ADT

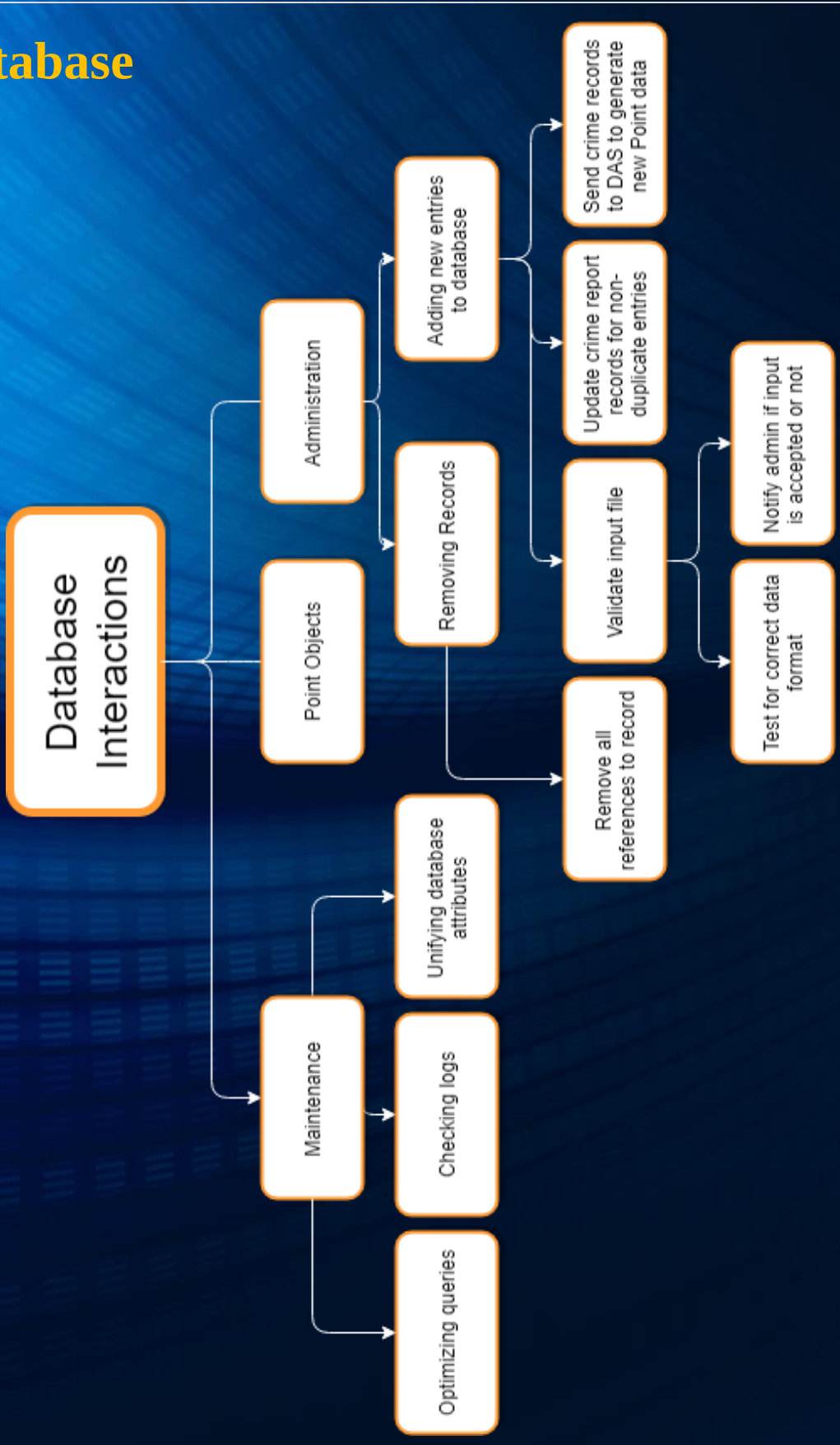
UI


User Interface
Crime Reports
Filters
Crime Analytics
Crime
Time of Day
Date

UX


User Experience
Provide/Search Location
Click on the heat map
Mouse hover options
User enters a dangerous area
User enters point of interest
User's GPS Location
Additional information such as crime reports
Display SafetyScore and some factors
Provide a notification
Open crime page

Database


Database Interactions
Administration
Point Objects
Maintenance
Adding new entries to database
Removing Records
Unifying database attributes
Checking logs
Optimizing queries
Send crime records to DAS to generate new Point data
Update crime report records for non-duplicate entries
Validate input file
Remove all references to record
Notify admin if input is accepted or not
Test for correct data format

Safety Score Algorithm

Justification

Crime Statistics

Crime stats alone provide bare bones information for a collection of crimes in a given jurisdiction. They are typically intended for use by researchers, crime analysts, and other savvy users to aid in traditional police work and improve overall public safety. Without training, practiced skill, and knowledge, crime statistics provide little context or useful information.

Individual Bias

Humans are generally poor judges of risk, a fact that most of the city of Las Vegas was built on. This poor judgement particularly applies to assessments of risk to personal safety. In general, we tend to over apply the impact that extreme events have on average situations, especially if the extreme event has an emotional component. While this may not always be a significant issue, this could cause someone to judge an area as safe simply because it has not recently experienced a high profile crime event, which can be extremely problematic.

Premise

Safety Score

The goal of the SafetyScore is to balance the objective and subjective factors used in assessing the risk for a specific location. It will use a base score determined by applying a constant value to particular crime categories, as well as a series of factors to modulate the relative risk of an individual incident:

- A dynamic factoring score which will decrease the weighting factor as distance and time from the original occurrence increases.
- A customer preference factor
- A population density factor which will decrease the weight of an individual incident
  as population density increases

Heat Map

While the individual SafetyScore ratings provide a good amount of information about individual incidents, the true information will be in the aggregate score for individual geographic locations. By giving specific intensities to the individual incidents, we can establish their weight and geographical reach. As these incidents overlap, the map will indicate how the combined risks of the individual crimes will affect the overall risk for that area.