Lab 2 - Crime HotSpot Prototype Product Specification

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CS411W

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3. Specific Requirements

3.1. Functional Requirements

3.1.1. Home page

3.1.1.1. The webpage shall load displaying a weighted heatmap depicting the criminal activity statistics provide by police departments. (O: Loftin, M: Mendoza)

3.1.1.2. When the user visits the site for the first time the application will prompt the user for their desired location. (O: Sandor)

3.1.1.3. The website shall use the Crime HotSpot logo as a drawer menu positioned at the top, left corner of the page. (O: Mendoza)

3.1.1.4. The drawer menu shall open to the right. (O: Mendoza)

3.1.1.5. The drawer menu shall provide options to navigate between other pages of the website. (O: Mendoza)

3.1.1.6. The drawer menu shall be transparent when not in focus. (O: Mendoza)

3.1.1.7. The drawer menu shall be opaque when in focus. (O: Mendoza)

3.1.1.8. The drawer menu shall provide a link to the "Team Website URL" (O: Loftin, M: Mendoza)

3.1.1.9. The website shall have a sidebar navigation menu positioned at the left of the screen. (O: Mendoza)

3.1.1.10. The sidebar shall slide right when the mouse hovers over it. (O: Mendoza)

3.1.1.11. The sidebar shall slide left when the mouse is not hovering over it. (O: Mendoza)

3.1.1.12. The sidebar shall stay in place once a profile is selected on it until it is closed/minimized. (O: G-Man)

3.1.1.13. The sidebar shall provide four preset crime profiles for the following categories (O: Mendoza):

- A preset for crimes against the public.
- A preset for crimes against property.
- A preset for crimes against the person.
- A preset for severe crimes against the person.

3.1.1.14. The sidebar shall be click based in regards to all crime categories. (O: G-Man)

3.1.1.15. The sidebar shall allow for multiple preset crime profiles to be selected. (O: G-Man)

3.1.1.16. The sidebar shall refresh the map with each selection, and de-selection, of any and all crime profiles. (O: G-Man)

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3.1.2. Heatmap

3.1.2.1. Upon applying a filter, the application changes the heat map. (O: Sandor)
3.1.2.2. The heatmap will display data provided by ODU Campus police. (O: Loftin)
3.1.2.3. The heatmap shall overlay the base map (O: Hall)
3.1.2.4. The heatmap shall load when the base map loads (O: Hall)
3.1.2.5. The heatmap shall be drawn using the Google Maps Visualization Library (O: Hall)
3.1.2.6. The heatmap shall represent the magnitude of the SafetyScore for a given area (O: Hall)
3.1.2.7. The heatmap color shall follow a gradient from violet to red representing low to high SafetyScore (O: Hall)
3.1.2.8. The heatmap shall update and reload in response to changes in the user's selected search filters. (O: Hall, M: Zeil)
3.1.2.9. The heatmap color shall update and reload in response to a change in location selected by the user (O: Hall, M: Mendoza)
3.1.2.10. The heatmap shall update and reload in response to selected crime profiles from the sidebar. (O: G-Man)

3.1.3. SafetyScore

3.1.3.1. The SafetyScore shall start as a base score retrieved from MongoDB (O: Hall)
3.1.3.2. The SafetyScore shall be scaled by a factor based on the distance of the date of the crime's occurrence from the end date (e) of the period of observation. (O: Loftin, M1: Hall)

- Crimes occurring on (e) shall have a multiple of 1.
- Crimes occurring prior the start date (s) or after e shall have a multiple of 0.
- Crimes occurring at some date (d) such that ($s \leq d \leq e$) will have a multiple of $1 - \frac{|e-d|}{|e-s|}$ where $|e - d|$ is the number of days elapsed from d to e.

3.1.3.3. The SafetyScore shall be scaled by a factor based on the physical distance from the location of interest to the location at which the crime occurred (O: Hall)
3.1.3.4. The SafetyScore shall be scalable by user-adjusted weights corresponding to each crime type. (O: Zeil)

3.1.4. Analytics Page

3.1.4.1. The application shall allow an analytics page view to be toggled from the home web page. (O: Sandor, M: Zeil)
3.1.4.2. The analytics page shall display a chart comparing crime categories across the dataset. (O: Watson)
3.1.4.3. The analytics page shall display a chart comparing time of day of occurrence across the dataset. (O: Watson)
3.1.4.4. The analytics page shall display a chart comparing top crimes across each crime category of the dataset. (O: Watson)

3.1.4.5. The analytics page shall display a chart comparing number of incidents across the currently chosen timespan. (O: Watson)
3.1.4.6. The analytics page shall allow users to select and combine data attributes so that custom charts can be created. (O: Watson)
3.1.4.7. The analytics page shall display the numbers of crimes that occurred in a month for an area of interest. (O: Mendoza)
3.1.4.8. The analytics page shall provide a graph showing the distribution of crime for each category. (O: Mendoza)
3.1.4.9. The analytics page shall provide fields at the bottom of the page that will allow the user to select the date and time from the dataset. (O: Sandor)
3.1.4.10. When the user clicks date field the user can either type the date in mm:dd:yyyy or select from a calendar popup (O: Sandor)
3.1.4.11. When the user selects the hour field the user needs to provide a range based on a 24hour clock e.g., 600-1300 for 6:00 A.M. to 1:00 P.M. (O: Sandor)
3.1.4.12. When the user has entered in a invalid date, the application will create an alert message box informing the user of an invalid date.

3.1.5. Score Detail Tooltip

3.1.5.1. Clicking on the heatmap shall trigger a score detail tooltip. (O: Loftin, M1: Kenneth, M2: Stephanie)
3.1.5.2. The score detail tooltip window shall contain the following information (O: Kenneth, M: Stephanie)

- A localized SafetyScore of the immediate area surrounding the cursor
- A count of the crime incidents, grouped by category, that factored into the SafetyScore

3.1.5.3. When the user clicks on a section of the map outside of the dataset, the application shall alert the user that there is no available data. (O: Sandor)

3.1.6. Mobile Application

3.1.6.1. When the user's GPS location changes, the mobile app should notify the user of the SafetyScore for the new location. (O: Sandor)
3.1.6.2. The mobile app shall notify the user when the user’s GPS location moves outside the radius of the current dataset. (O: Watson)
3.1.6.3. The mobile app shall notify the user when a new crime has been added to the dataset (O: Watson)
3.1.6.4. The mobile application be able to let user see the current danger levels for a given location (O: Sandor)
3.1.6.5. The user will be prompted for GPS services when the application is loaded and the GPS on the device is currently turned off.

3.1.6.6. The mobile application shall allow users to search the crime map by (O: Zeil M: Sandor)

1. Street address
2. Street intersection
3. Zip code

3.1.7. User Preferences

3.1.7.1. The application shall allow users to search the crime map by (O: Zeil)

1. Street address
2. Street intersection
3. Zip code

3.1.7.2. The application shall provide different color scheme options for the heatmap to accommodate users with color blindness. (O: Watson)

3.1.7.3. The application shall allow users to filter searches by (O: Zeil)

1. Crime type
2. Date range
3. Time range

3.1.7.4. When the user selects a date outside of the available data range, the application shall alert the user of no available data. (O: Sandor)

3.1.7.5. The web page shall provide sliders as a means of adjusting the base score of a given crime type. This allows the user to customize the application to display crime data according to individual views of crime severity. (O: Loftin, M: Mendoza)

3.1.7.6. The user shall be able to specify selected locations for Safety Score information by: map click, address or intersection entry. (O: Loftin)

3.1.7.7. The webpage shall provide sliders to adjust the severity scale of each of the 4 crime categories. (O: Loftin)

3.1.7.8. The webpage shall set the default user preferences for each category to 1. (O: Loftin)

3.1.8. Web Application Service

3.1.8.1. The service shall listen on port 3000 for service requests. (O: Loftin)

3.1.8.2. The service shall establish connection to the crimes database. (O: Loftin)

3.1.8.3. The service shall query the crimes database for activity within a provided radius of a provided location. (O: Loftin)

3.1.8.4. The service shall scale the severity of the crime according to user preference (p) by category such that $0.0 \leq p \leq 2.0$. (O: Loftin)

3.1.8.5. All scaled crime scores shall have a final score (f) such that $0.00 \leq f \leq 10.00$ Any $f >$ 10.00 shall equal 10.00. (O: Loftin)

3.1.8.6. The service shall provide to the webpage a weighted heatmap containing all crime points such that for each crime $f > 0.00$. (O: Loftin)

3.1.8.7. The radius of influence (i) of any crime shall be set to 150 meters. (O: Loftin)

3.1.8.8. The service shall provide, according to a provided location, the count by category of crimes points (c) such that $c \in i$ and has a scaled severity $f > 0.00$. (O: Loftin)

3.1.8.9. The service shall provide, according to a provided location, the average of all c such that $c \in i$ and has a scaled severity $f > 0.00$. (O: Loftin)

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3.2. Performance Requirements

3.2.1. Page Load Time

3.2.1.1. The home page shall load in under 5 seconds. (O: Mendoza)

3.3. Assumptions and Constraints

3.3.1.1. Location services must be enabled on device (O: Sandor)
3.3.1.2. The user must allow the app to monitor location (O: Sandor)

3.4. Non-Functional Requirements

3.4.1. Web Page

3.4.1.1. The application shall notify the user if JavaScript has been turned off. (O: Sandor)
3.4.1.2. The website shall incorporate functions of Angular.js. (O: Loftin)
3.4.1.3. The web application service shall utilize the Google Maps JavaScript API of GIS functions. (O: Loftin)
3.4.1.4. The web application shall inform the user that the information provided is not guarantee of safety. The user should use the information provided only as an aid to improve the user's individual safety. (O: Loftin)
3.4.1.5. The android mobile application requires Android Ice Cream Sandwich or newer; Android operating system ≥ 4.0.3. (O: Sandor)

3.4.2. Database

3.4.2.1. The crimes database shall be built on the MongoDB Atlas platform. (O: Loftin)

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4. Appendices

4.1. Appendix A: Glossary

Application Programming Interface (API) - a set of functions and procedures allowing the creation of applications that access the features or data of an operating system, application, or other service.

Crime Map - A map that has crime statistical data overlaid on it to provide information on the criminal activity of an area.

Comma-Separated Values (CSV) file - a delimited text file that uses a comma to separate values.

Geographic Information System (GIS) - a framework for gathering, managing and analyzing data in respect to spatial location.

Heatmap - a representation of data in the form of a map or diagram in which data values are represented as colors.

JavaScript MEAN Stack - MEAN is a free and open-source JavaScript software stack for building dynamic websites and web applications. The MEAN stack is MongoDB, Express.js, AngularJS (or Angular), and Node.js.

JavaScript Object Notation (JSON) - a lightweight data-interchange format that is easy for humans to read and write as well as easy for machines to parse and generate. It is based on a subset of the JavaScript Programming Language

SafetyScore - A number, proprietary to Crime HotSpot, that represents the relative safety of an area.

Soft Target - a person or property which presents as having poor defenses against crime.

Comma-Separated Values (CSV) File - a delimited text file that uses a comma to separate values.

Geographic Information System (GIS) - a framework for gathering, managing and analyzing data in respect to spatial location.

RGB - Red, Green, Blue colors.

Base Map - the first layer of the map created by google without any modifications or filters.

4.2. Appendix B: Analysis Models

Not Applicable