FYP Project Proposal Form 2019/2020

CS·DIT
D U B L I N
Institute of Technology
Computer Science

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Programme Code: DT228

Project Title: An Investigation and Analysis of Criminal Data and Possible Causes using Data Visualization, Exploration and Predictive Models

Summary (approximately 200 words)

The goal of this project is to create a web application that visualizes criminal data and provides the user with tools to explore the data visually. The web application will also use machine learning to attempt to give a prediction on potential crimes in a given area.

The web application will be able to visualize data on a map or with graphs and each visualization will have a set of filter options to explore the data, for example, the user can search for a specific crime type and have that information displayed on a map. The filter options for the graphs will be the same for the map but the user will be able to compare two different filter queries e.g. compare house robberies at night with house robberies in the day. The filter options I plan to use in this project are time period, date, crime type, weather type (snow, rain, sunny, etc), deprivation index (1 -10) and location.

The web application will use machine learning to attempt to predict potential crimes in the next 24 hours. I plan to display all crimes in a pie chat with a percentage of the likelihood of the crime happening.

There will be an upload feature that allows the user to upload a criminal data set. The web application will then process the file and clean it up so it can be used in the machine learning algorithm.

The web application can be used to help law enforcement officers better use their resources more efficiently. It can be used by the public for multiple reasons like deciding if to buy a house in a certain area, which areas are the safest to go out to a bar at night or it could be used to find a safe location with a low percentage of car thefts to park your car for a few days.

Background (and References)

During my internship I worked for a company that specialized in data visualization. I helped develop a web application that visualized data and created filter options to allow the user to explore the data. I also developed a workflow to process and validate CSV files. All this knowledge I gained

has given me a good foundation for creating this web application.

During my research I have come across a few web applications that do parts of my idea but none that have it all incorporated into a single web application. The closest one I have found is crimemapping, this web application has filter options to explore crime and displays them in graphs. The graphs just show the percentage of crimes within the given filter options but there is no way to compare two different graphs which I think would be a very useful feature.

Crime-in-my-area is crime mapping web application for the UK. This website shows all crimes in a chosen area. There is not a lot of user interactivity available. You type in the area you want it to display crime in and it will display markers for the crime location and display the crime type. There is not a lot of information when you click on a marker it only displays the crime type there is no information for when the crime occurred. A really nice feature in crime-in-my-area app is how it displays crimes that are closely clustered together. It displays them as a circle/cluster and if you click on the cluster it will zoom in and display all crimes in that cluster, the more crimes are in a area the bigger the cluster.

J. Eppler, M. and Andreas Pfister, R. (2014) Did a study on how effective digital and physical knowledge is to a police/military forces. From their findings they discovered that crime data visualization is a very useful strategy for police and military forces. This is what my project is going to be centered around visualization criminal data.

Keyvanpour, M.R., Javideh, M. and Ebrahimi, M.R. (2011) Talked about how using data visualization and exploration can be used identify crime characteristics and how the knowledge gained from data exploration can be very useful to law enforcement officers. The data exploration aspect of my project could potentially be very useful if done correctly.

References
crimemapping. 2019. crimemapping. [ONLINE] Available at: https://www.crimemapping.com/. [Accessed 1 October 2019].

adt. 2019. crime-in-my-area. [ONLINE] Available at: https://www.adt.co.uk/crime-in-my-area. [Accessed 2 October 2019].

J. Eppler, M. and Andreas Pfister, R. (2014), "Best of both worlds: hybrid knowledge visualization in police crime fighting and military operations", *Journal of Knowledge Management*, Vol. 18 No. 4, pp. 824-840.

https://doi.org/10.1108/JKM-11-2013-0462.Keyvanpour, M.R., Javideh, M. and Ebrahimi, M.R., 2011. Detecting and investigating crime by means of data mining: a general crime matching framework. *Procedia Computer Science*, *3*, pp.872-880.

Proposed Approach

The main parts of this project is going to be the visualizations, machine learning predictions and data exploration.

The first feature I am going to implement is going to be the map visualizations. I will be using leaflet.js for the mapping visualizations. Originally I was going to use ArcGisJs but the learning curve was a bit steep and it included a lot of features that I wouldn't be using. I chose leaflet because it is much simpler to use and has decent documentation. The first stage will be setting up a django project and the database then creating the user interface which I have already drawn out. I will then populate the map with temperory data as a prototype.

Once I have the prototype web application setup. I will work on the data exploration aspect of the app. I will create the filter options and test them on the prototype web application using the map visualizations.

The next phase will be creating the graph visualizations and adding functionality to compare two different graphs. I plan to use chart.js to create the graph since it is a simple javascript library and has a lot of good documentation.

I plan to have this all done by the first semester.

The final and most difficult stage will be the machine learning predictions. I am going to create an upload link to upload files and validate them so they can be used in the machine learning algorithm. I might need to update my database scheme depending on what features I decide to add or remove from the machine learning algorithm.

Once I have the file validation workflow set up I will make sure that the relevant data gets displayed on the map and works with the filter options and graph visualizations.

The final step will be implementing the machine learning algorithm and trying to make it as accurate as possible.

Once I have everything done I will have the application evaluated by students and attempt to get it evaluated by the company I worked in that specialized in data visualization. With the knowledge from students and professionals in the industry I will be able to make the necessary changes to the web application.

Deliverables

Web application with data visualizations and exploration tools
File validation workflow
Machine learning algorithm

Technical Requirements

Laptop
Database (postgres)
Web framework (django)

Project Reviews – Please include reviews of two of LAST 2 years projects from either DT228, DT282 or DT211C.

Project 1
Title: Crime Explorer

Student: Deividas Savickas

Description (brief):

Crime explorer is a web application that visualizes criminal data in the United Kingdom. It can filter crimes by yearly quarter. All crimes are displayed on a map with a marker. The markers can be clicked on to display more information about the selected crime. There is also a section that compares crimes using graphs. A really nice feature in crime explorer is crime markers are clustered together if they are positioned too close to one another. If you hover over the cluster is displays all crimes in that cluster.

Project 2
Title: CrimAnalytics

Student: Sean Jennings

Description (brief):
CrimAnalytics is a project aimed to make predictions on crime rates using predictive analytics. The objective of this project was to create a predictive model on the backend of the web application and provide the user with a frontend to easily visualize the model. CrimAnalytics allows users to drag and drop a marker onto a specific location on the map of Ireland. The predictive model will then make a prediction on crime rates based on the location the user selected.

Proposal Sign off:

Student Signature:	**Date:**
Lecturer Signature:	**Date:**