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CS SD 2016 – Writing 3

**Business Proposal: Crime Analysis and Mapping Application**

**Project Overview**

We are building an application that will allow the George Washington University (GW) Police Department, and their parent organization, the GW Office of Safety and Security, to leverage their existing sources of criminal history information to provide analysis of what types of crimes are happening on campus, where they are happening, and how this data changes over time. This toolset will allow GW Police decision makers to inform both immediate and long-term planning in areas such as personnel and staffing, resource and budget allocation, and public awareness campaigns. Individual officers will also be able to use the system to tailor their individual patrol and investigation operations in response to changing trends on campus. It is our hope that once the system is operational with the GW Police dataset, we will be able to commercialize it and provide the application to other, similarly-sized law enforcement agencies across the country.

The core of the application is the mapping interface, which allows the user to interactively explore and filter both the raw criminal information dataset, as well as the output of the analysis methods used on the data. The mapping UI will be developed using open-source components from the OpenStreetMap project, which will reduce the application’s total cost of ownership by eliminating costly commercial-use fees associated with other data sources, most notably, Google Maps. The analysis methods and algorithms used to display data on the map will be tailored to the smaller datasets associated with smaller-sized law enforcement agencies. This application is not the first on the market that does this sort of visualization and analysis, nor is it the first to target law enforcement and public safety. However, as far as we can tell, this will be one of the first applications that targets smaller agencies on the scale of the GW Police. These agencies will benefit greatly from the application’s adaptations towards smaller datasets, both in terms of functionality and cost. After all, even if a smaller agency did have the millions of dollars and manpower required to implement a large-scale solution, it is highly unlikely that the components therein, which are designed for large multi-county or statewide agencies, would be of any use to that smaller department anyway.

The technical challenges we will face as we develop this project are primarily related to how we are going to import data into the system and how we will actually apply the analysis methods to that data and present the results to the end-user. One of the primary goals of the application is to eliminate the need to manually move data between systems, so building out sound integration strategies will be a critical part of the project. From a software engineering perspective, we want to ensure that we are building out the data management interfaces in as much of a platform-agnostic manner as possible, so that future developers or customer integrators can easily add additional interfaces to the system. The integration of the spatial autocorrelation algorithm itself also represents a significant technical challenge. While there are spatial analysis libraries for Python that we can integrate into the project, they are far from plug-and-play, and they do not provide a number of ancillary tasks that must be completed before data can be analyzed. Just as importantly, the third-party libraries provide no support for translating their output into something that can be displayed on a map, this will be something that we must implement as well. The extensibility found in the data import system will be applied to the analysis layer as well. By architecting the analysis layers in a component-oriented fashion, we can support additional analysis methods being added or modified later, without any modification to the base system.

**Business and Economic Potential**

The crime data analysis market is a relatively new industry, and, as mentioned previously, the market of smaller law enforcement agencies has thus far been more or less completely ignored. We believe that this project is ideally suited to fill this gap. Existing solutions are targeted at larger police and homeland security agencies, and the cost and barrier to implement these solutions, as well as the types of analysis and insights provided, are not suited to smaller agencies. By focusing on integration with existing data sources (thereby preventing manual processes of transferring data back and forth between applications), and providing an interface that will be familiar and intuitive to a variety of users, we are ensuring that the barrier to entry for using the application will be as minimal as possible.

Our partnership with the GW Police and the GW Office of Safety and Security is going to provide us with a unique edge when developing the application. Throughout the development lifecycle, we have met with key stakeholders from both groups, as well as with the University’s division of information technology. Our frequent consultations with these groups have allowed us to ensure that we are tailoring the application to the customers’ requirements at all times. We will be able to extrapolate the requirements we receive from GW to other university law enforcement agencies, as well as public law enforcement agencies of similar size, to ensure that our application is in line with the needs of these agencies.

Once we have developed the application to a state that we feel is production-ready, we will work to integrate the system into the GW Police department’s “ARMS” database of criminal history information. After ensuring that the connection between the application and the ARMS database is stable, we will begin verifying the output of the analysis methods with the GW stakeholders. After making any necessary changes to the import processes or data analyses, we will begin generalizing the application for sale on the overall commercial market. Specifically, we will remove all of the hard-coded references to the GW Police, including the maps of the Foggy Bottom campus, and any connection information related to ARMS or any other part of the GW network. Wherever possible, we will make these settings and properties configurable either during an initial setup process or via a configuration interface within the administration site of the application. We will also write an installation system to allow automatic configuration of the database and application server, empowering non-IT staff to complete the vast majority of the application’s configuration.

When the generalization process is complete, the application will be ready for commercial distribution. We will be licensing the application for use in the customer’s environment only, that is, we will not be providing hosting services. The primary motivator for this decision was the balance between cost and data security: the risks associated with data that is subject to FERPA, HIPAA, Clery Act, and other regulations makes the costs associated with storing and transferring this data extremely high. Therefore, we will be focusing on licensing the core application code and associated updates, as well as professional services for installation and custom integration development. We project that the integration services will be a particularly high-profit item because the while the application will come out of the box with a number of pre-built integrations, the customer will need to ensure that the application is properly integrated with their primary systems of record for the analyses to be meaningful.

Once the application is completely developed and commercialized, it is possible that one of the existing players in the market may adapt their offerings to the needs of smaller agencies and compete with our application. In preparation for such an outcome, we are going to heavily market the application as being designed from the ground up for smaller agencies. If competitors emerge in the form of existing products that have been slightly modified and repackaged for smaller agencies, it is highly likely that these products will do an inferior job of analyzing data because the smaller agencies are never going to be the primary focus vendors that are busy marketing to agencies on the scale of the New York City or Los Angeles police departments, or federal agencies such as the Department of Homeland Security. In addition to our algorithmic optimizations for smaller agencies, we will use our partnership with the GW Police as a major selling point. By involving stakeholders from across the University during all stages of the development process, we are able to ensure that we are meeting requirements and requests at all stages of the development process, which is certainly not the case with competitor applications. Larger-scale applications, which are developed over years by huge development teams, can be obsolete as soon as they are released if requirements are not managed correctly over time. Our lightweight development and testing process has allowed us to stay ahead of the curve both in terms of requirements fulfillment and use of the latest user-friendly technologies in the development process.

**Social Impact**

The application of analytical technologies to law-enforcement data has recently been the subject of intense public debate. We have seen such examples of NSA metadata collection programs, large-scale license plate analysis activities, and other systems and services that some believe are unfairly depriving innocent people of their civil rights. It is our goal to stay as far away from this debate as possible, and we will be able to respond to potential complaints or customer concerns by pointing out the myriad and fundamental differences between our product and those that have caused public concern. First, our application only deals with historical data and is not architected to support real-time processing of live data. Our application only reads data in from third-party sources, meaning that while a department would be able to, for example, connect it to an automatic license plate recognition (ALPR) system, the department would need to already have that system in place – our software provides no way for departments to collect data from the field that they don’t otherwise have.

The nature of our application inherently means that it will be interacting with confidential data that departments have no need or want to make public (to say nothing of regulations that bar agencies from releasing certain data). It is for this reason that, as mentioned previously, we will not be hosting any customer data ourselves; all implementations of the application will be behind the customer’s firewall. Because of this, we are divesting ourselves of any civil or criminal liability associated with the breach or loss of that data – the responsibility for securing it will remain with the customer’s existing internal information security service at all times. None of this is to say, of course, that we will not be making every effort to ensure that our application is as secure as possible, and we will react quickly to provide security patches and updates to our customers free of charge for the lifetime of the product.

We believe that our application will have a net positive impact on local communities and on the world. The goal of our development efforts on this application is to allow local law enforcement agencies access to the same tools and services that power the advanced analytical processes used by the nation’s foremost law enforcement agencies. By allowing local law enforcement agencies to harness the power of their existing data sources, we will be providing every component of law enforcement, from the top decision-makers to the beat cops on the street, with new and useful insights into the trends that are unfolding in their areas of responsibility every day. It is important to stress again that our application will not provide any new methods of capturing or acquiring law enforcement data, only offering new ways to explore data that an agency already collects. By doing so, we feel that we are balancing our duty to empower local law enforcement with our ethical responsibilities to everyday citizens.

We are excited to bring our criminal data analysis application through the development and user acceptance testing phases and eventually to the commercial marketplace. Serving the hugely untapped market of small, local and campus law enforcement agencies is our one and only priority, and this will be reflected in all stages of the design, development, and testing processes. As far as we are concerned, all of our development effort will have been worth it if our product can deter even one violent crime or even a non-violent offense. As one of our GW Police partners said in one of our development meetings, “if one person’s bike is stolen from outside a residence hall or academic building, that’s onaly one bike out of the thousands of bikes on campus, so that might not sound like a lot, but that’s still 100% of that person’s bikes that have been taken, and that’s what we are trying to prevent.” We are proud to have the opportunity to assist GW and other law enforcement agencies in this endeavor.