Progress Report

Integrated Warfighter Biodefense Program (IWBP)

Submitted By: Quantum Leap Innovations, Inc.

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EXECUTIVE SUMMARY:

This report outlines Quantum Leap Innovations, Inc. (QLI) accomplishments during the three months of performance between September 30, 2011 and December 31, 2011 on ONR Contract N00014-10-C-0363 for the Integrated Warfighter Biodefense Program (IWBP). The report summarizes activities focused on continued development of the Quantum Leap Innovations Pattern Based Analytics (PBA) Platform.

SUMMARY OF ACCOMPLISHMENTS:

Continued Development of Quantum Leap Innovations Pattern Based Discovery:

- In the previous reporting period, we had summarized our initial implementation of the search engine work flow for Pattern Based Discovery. During the current reporting period, there were three major focus areas for continued development of Discovery:

  1. Addition of a report generation capability by implementing the Jasper Report Generator.
  2. Addition of a spreadsheet capability within Discovery to facilitate some additional analysis capability within the product. This capability was implemented using JComponentPack v3.3.4.
  3. Further refinements and improvements to the user interface.

- In addition, further work was done on developing Pattern Based Prediction by implementing a predictive analytics methodology based on stochastic decision trees.

- During the current reporting period, there were several discussions with third parties around customer engagements using our PBA platform.

EXTENSIONS TO PATTERN BASED DISCOVERY

The Quantum Leap Pattern Based Discovery ("Discovery") product automatically discovers informative patterns against a user specified query using a search based paradigm. A ranked list of informative patterns that link to associated data subsets is generated from the search and displayed. This allows the user to easily perform targeted exploration, visualization and analysis of informative data subsets rather than all the data.

During the current reporting period, several enhancements were made to the Discovery product described in the previous quarterly report:

Addition of the Jasper report generation capability:

In order to allow the user to record observations of interest during the data exploration process, the Jasper Report Generator provided by JasperSoft was integrated into the Discovery product. This capability allows the user to select patterns of interest and add them to a customizable report that can be published as a pdf file at the end of the Discovery session. The workflow to realize this capability is reminiscent of adding items to a shopping cart in a consumer website that ultimately results in making a purchase.

We use the same Healthcare Fraud example from our previous quarterly report summarized below:

Healthcare Fraud Example:

It has been estimated that healthcare fraud and abuse can constitute between 3 -15% of annual healthcare expenditures in the United States. From a cost standpoint, this translates to $100-$170 billion in annual costs! Analysis of healthcare data to discover patterns that associate with different fraud types can potentially provide a proactive means for health care providers to detect fraud early on. In this example, we use a simulated data set of ~1 million patients based on an existing fraud model ("Healthcare Fraud and Abuse", Rudman et al). Six fraud types are modeled based on statistical occurrence within the nation. An additional challenge with this data set is the prevalence of MISSING data that is characteristic of healthcare data.

Figure 1 below shows the addition of a new action at the far right of the pattern summary that enables the creation of a new report.

Figure 1. Addition of new action item for report creation

When the user selects "Create New Report", an edit box to create the report appears as shown in Figure 2.
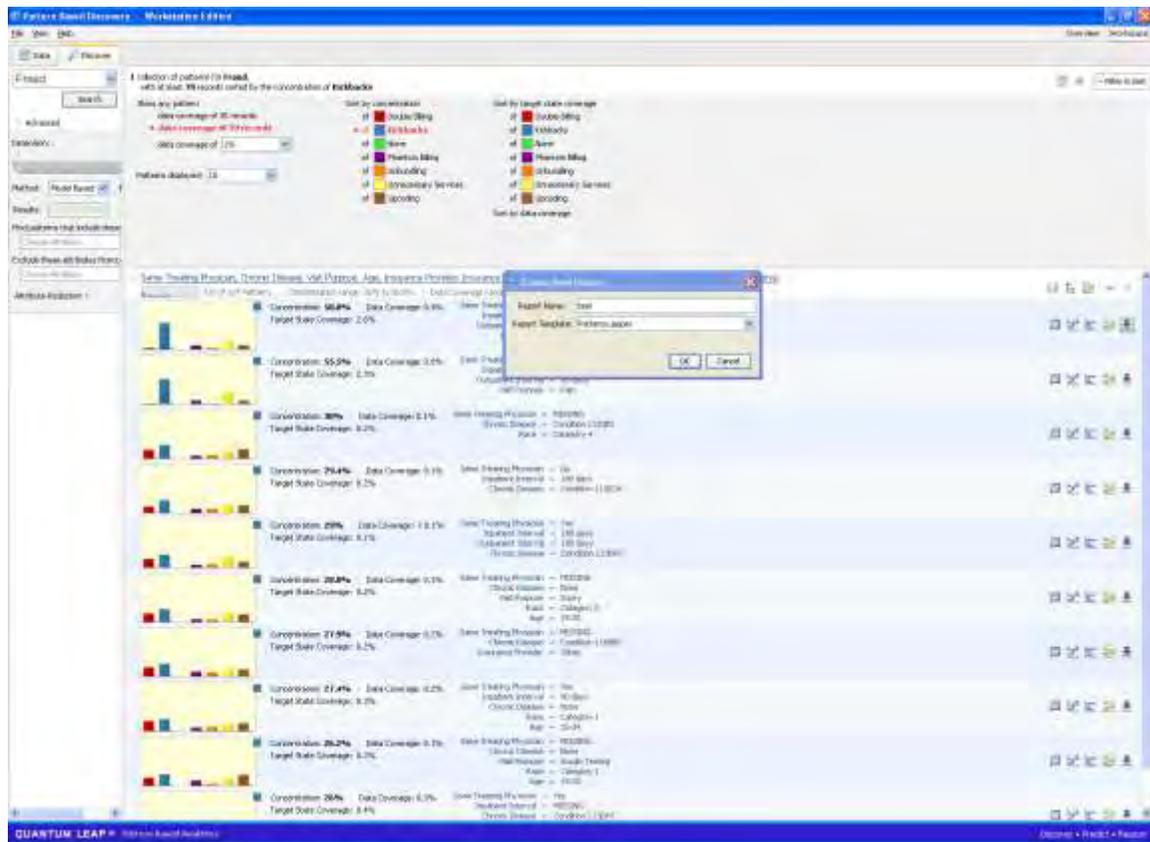
Figure 2. Creation of a new report

After the new report has been created, a pattern can be added to the report as shown in Figure 3. The highlighted icon at the top right of Figure 3, when clicked, will display the pattern report shown in Figure 4.
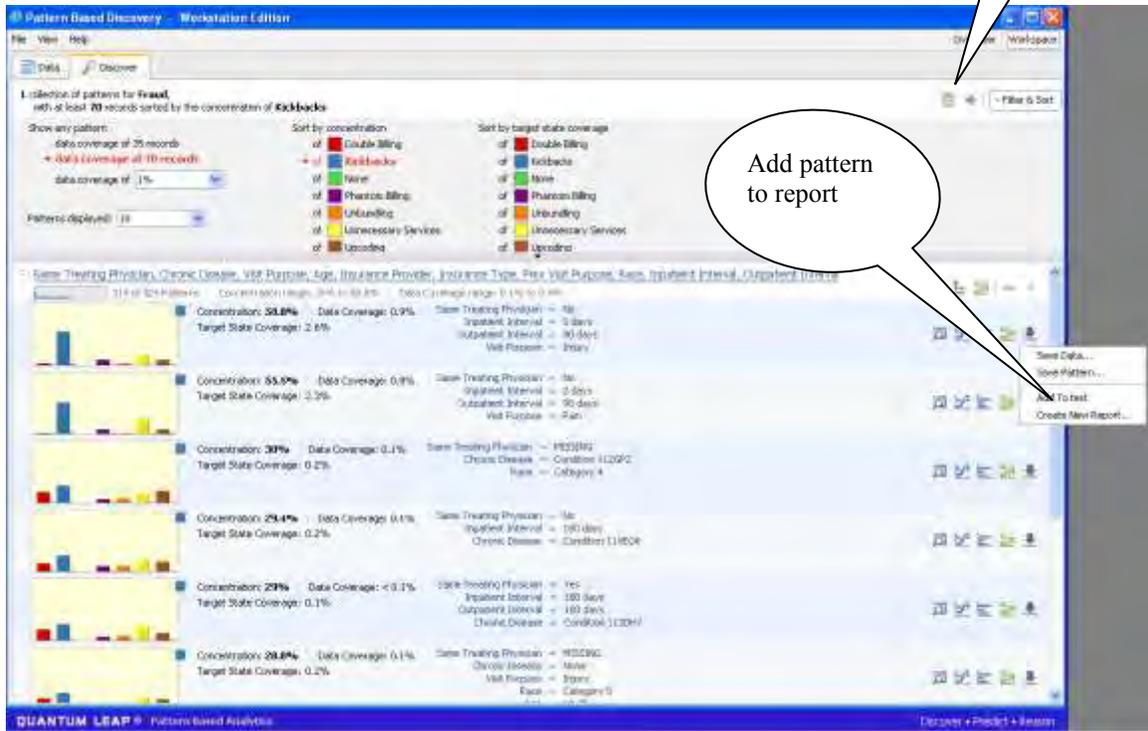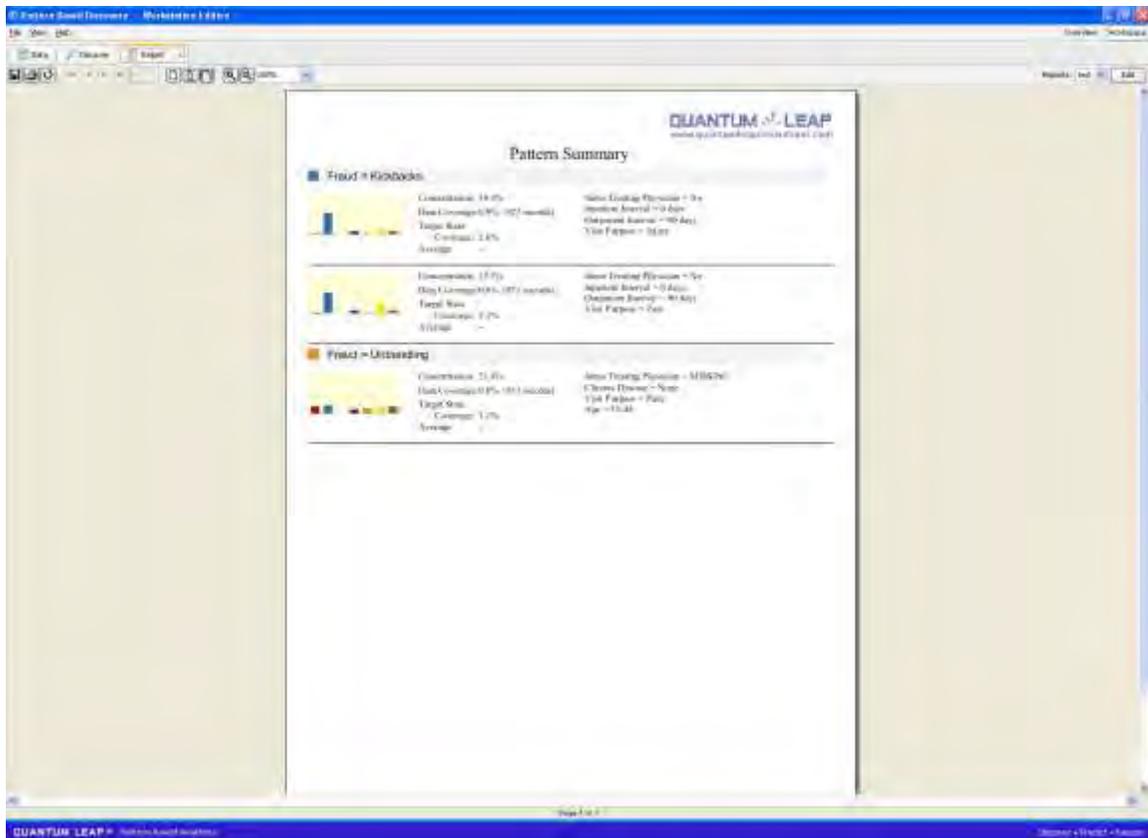
Figure 3. Adding a pattern to a report

Figure 4. Example of a generated report

Addition of Spreadsheet capability:

In order to facilitate analysis of a data subset associated with a pattern, the data contained within a pattern can be automatically copied to a spreadsheet. This capability was implemented using JComponentPack v3.3.4. In Figure 5, the scratchpad icon on the top right of the pattern data table copies the data table into a spread sheet as shown in Figure 6.
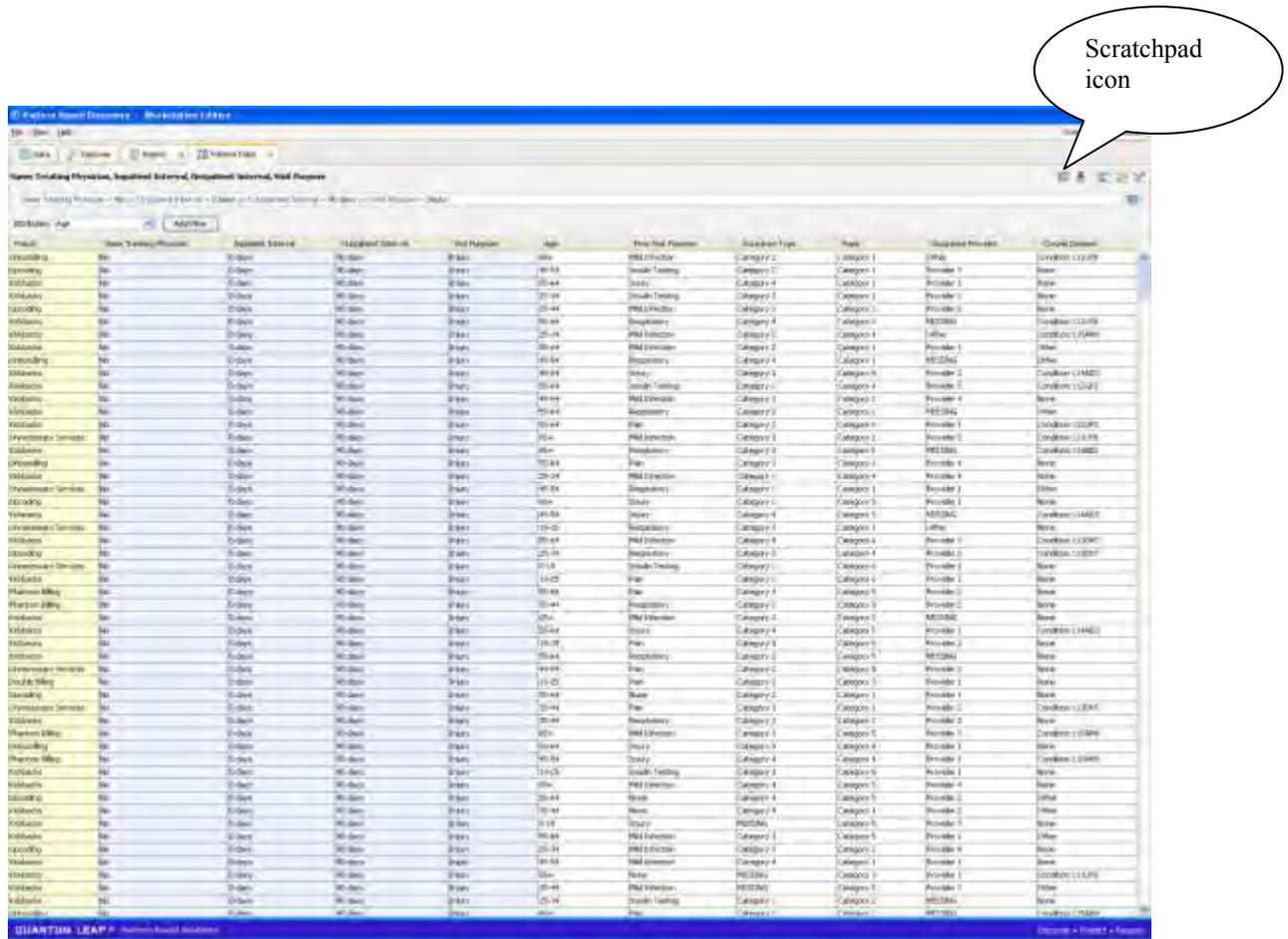

Figure 5. Scratchpad icon on top right of Pattern Data Table

Figure 6. Spreadsheet copy of Pattern Data Table

The spreadsheet implemented within Discovery allows the user to enter formulae, insert columns and perform several of the most commonly used functions within Excel.

Further refinements to the User Interface

During the current reporting period, several aesthetic and functional refinements were made to the User Interface based on feedback from users.

Implementation of stochastic decision trees for Pattern Based Prediction

During the current reporting period, initial work was begun on the implementation of ensembles of stochastic decision trees as a basis for Pattern Based Prediction. The primary motivation is to use the same modeling paradigm used in Discovery for implementing Pattern Based Prediction. This will allow a seamless integration of a Business Intelligence capability defined by Discovery with a Business Analytics capability defined by Prediction so that users can easily go back and forth between BI and BA. A more complete description of Pattern Based Prediction will be provided in the next report.

Customer Engagements:

During the current reporting period, significant effort has been spent on exposing the Quantum Leap Pattern Based Analytics Platform to the broader Analytics community.

There have been several ongoing discussions with enterprise customers on engagements based on the PBA platform. They include health care, financial services and retail customers for a variety of applications where the ability of patterns to filter, organize and fuse disparate data sources are of particular interest.

NEXT STEPS:

During the next reporting period, we will report on our engagement efforts with prospective enterprise customers. In addition, work will begin on fully integrating Pattern Based Prediction (to enable Predictive Analytics) with Pattern Based Discovery.

FINANCIAL SUMMARY:

Contract Activity

QLI Contract N00014-10-C-0363 Award date: 07/01/2010	$2,987,891
ACTUAL: Expenditures Invoiced to the Government through December 31, 2011	$2,330,234

78% of Contract Value has been spent as of December 31, 2011