Shiny Investigative Tool into GASTech Personnel Disappearance

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ABSTRACT

A fictitious scenario was created as part of VAST Challenge 2021. A group of staff members from GASTech, an oil and gas company situated on an island known as Abila on Kronos, had gone missing mysteriously. A group known as Protectors of Kronos (POK) was the prime suspect into the disappearance. A series of unprocessed data were made available to the law enforcement agencies to investigate on. The data were split across three mini challenges, which our team had undertaken Mini Challenge 1 and 2.

Mini Challenge 1 consists of email correspondences, employee records and resumes, historical documents and news articles. The ojective of this mini challenge is to identify the complex relationships among the people and organisations, and possibly infer the disappearance of GASTech to any individuals/group who might be involved. Mini Challenge 2 consists of gps tracking, transaction and loyalty card records, together with car assignment records - linked to the gps tracking data. The objective of this mini challenge is to discover anomalies and suspicious activites that may require additional investigating.

The objective of this research paper is to share on the methods and models used to develop an online investigative tool where a law enforcement at Kronos and Tethys could use, to piece the raw data into useable information and evidences.

1. INTRODUCTION

A fictitious scenario was created as part of VAST Challenge 2021. A group of staff members from GASTech, an oil and gas company situated on an island known as Abila on Kronos, had gone missing mysteriously. A group known as Protectors of Kronos (POK) was the prime suspect into the disappearance. While Mini Challenge 1 and 2 provided a set of raw data that allow investigators to establish and identify complex relationships among the people and organisations, discover anomalies and suspicious activities, such investigative work may require humongous man hours and effort, without data analytics and visualisation.

We would be using Shiny R to develop an online investigative tool to aid in the analysis into the disappearance of GASTech Personnel, allowing investigators to explore information and inferential statistics derived from the unprocessed data available.

2. MOTIVATION

The motivation of this project is two-fold. First, the data presented to the investigators were raw and unprocessed, and to link and derive insights from these data would require tremendous man hours and effort. Second, while insights could be derived and useful information could be formed, there would be a need to present the information in a visually appealing format to facilitate information dissemination and to allow quick collective appreciation of events among the investigators.

To this end, we would be looking to develop an informative, intuitive and interactive R Shiny app. The data would undergo baseline cleaning to make them into suitable formats for subsequent processing to deliver information. The user-interface would be made intuitive so that the investigator would be able to use the application without much references to our user guide. The online investigative tool would be interactive, such that the investigator would be able to provide varied inputs in the formation towards the final visualisation report.

The R Shiny app would comprise of two main modules: (a) Exploratory Data Analysis allowing investigators to draw information such as transaction records, employee records, email correspondences and such; (b) Inferential Statistics allowing investigators to infer relationship linkages among user-selected employees, possible coded words within email correspondences within an identified group of personnel, their movements towards identified locations and possible anomalies at the locations and transaction analysis using both credit card and loyalty card data.

3. REVIEW AND CRITIC OF PAST WORKS

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4. DESIGN FRAME

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4.1 Module 1

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4.2 Module 2

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