Abstract

- Explore the usability of Tradeoff Analytics in real-world decision-making problems.
- Help the users to make better airline selection between major cities in the U.S., from a variety of flight options available, considering multiple criteria while making the choice.
- Enable the users to make optimum choices when faced with multiple options and multiple conflicting goals.

Motivation

- Decision-making has always been a crucial part in any business enterprise or rather, in any area of life.
- A decision-maker is often faced with multiple objectives while making choices. These choices can be conflicting or similar in nature. For example, people often encounter multiple flight options while booking airlines for their travel plans.
- These options can often be overwhelming and a person with not much prior experience would not know what to choose and can end up selecting the wrong flight for their requirements, only to lead to dissatisfaction and wastage of money.
- It is therefore helpful to have certain tools and techniques to help with informed decision-making. The project pertains to studying the usefulness of the cognitive functionalities of IBM Watson’s Tradeoff Analytics in this regard.

About the Technology

- Tradeoff Analytics is an IBM Watson’s cognitive service that help in optimal and informed decision-making from multiple choices while considering multiple criteria which may also sometimes be conflicting to each other.
- The main parts of internal working of the service include:
  - Defining the optimal candidate options in a multi-objective problem, using the Pareto Optimality mathematical technique, that yields a ‘nondominated set of options’ also known as Pareto Frontiers. More than two selection-criteria can be considered for selecting options.
  - Enabling user-analysis and exploration through visual representation of the Pareto Frontiers.
  - Performing various analytical techniques and internal calculations so that user can carefully assess good possibilities from the already presented optimal options. This helps in going through even the minor details that a user might miss, especially when dealing with multi-dimensional data.

Approach

- A stand-alone application was developed using Watson Developer Cloud Software Development Kit to use the Tradeoff Analytics service.
- The user input is taken through a client application developed on Android platform, that provides an interface for user interactions for the entire process.
- This input is consumed on the back-end by a multi-threaded server created in Java using Networking APIs. The flow of the application is given in Figure 3.
- User specifies the selection criteria for a flight including price, comfort index, travel duration, etc. The selection is made from a range of choices pulled out from the dataset for the given source and destination.
- Objectives are set according to user preferences, for example, minimum price and maximum comfort.
- Users manipulates the number of options presented by determining the range of values of the objectives that they had customized.
- Final decision of the appropriate flight-choice is reached by weighing the options and their criteria.

Evaluation and Discussion

The developed stand-alone Tradeoff Analytics application suggests appropriate flights when the user enters the source, destination and personal preferences for flight selection. These preferences/criteria offered to the user to choose from are: Price, Number of Layovers, Travel Duration and Comfort Index. The application was tested on different combinations of user inputs with different cities and criteria. It was observed that the service adapts well to the varying user inputs. Overall, the service did well in terms of scalability and dealing with queries of varying complexities presented to it.

References

3. 3 www.ibm.com