MIS2502: Final Exam Study Guide (Spring 2021)

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The exam will be a combination of multiple-choice and short-answer questions. It is a closed-book, closed-notes exam. We will use Canvas and Proctorio for the exam.

The following is a list of items that you should review in preparation for the exam. *Note that not every item on this list may be on the exam, and there may be items on the exam not on this list.*

**Advanced Data Analytics Techniques**

* Explain the three advanced data analytics techniques we covered in the course
  + Decision Trees, Clustering, and Association Rules
  + What kinds of problems can each solve? Provide a business-oriented example.
* Explain how data mining differs from analysis we did using SQL/NoSQL/ETL

**Using R and RStudio**

*You will not need to generate blocks of R code for this exam. However, you should be familiar with the basic syntax.*

* Explain the difference between R and RStudio
* The role of packages in R
* Generate and explain basic syntax for R, for example:
  + Variable assignment
  + Identify functions versus variables
  + Identify how to access a variable (column) from a dataset (table)

**Understanding Descriptive Statistics (Introduction to R)**

* Be able to read and interpret sample (descriptive) statistics
* Be able to read and interpret results from simple hypothesis testing (e.g., t-test)

**Decision Tree Analysis (Decision Trees in R)**

* Understand what classification is and when it is appropriate to use this technique
* Role and structure of input and predictor variables in a decision tree
* Understand the basic idea behind the decision tree algorithm
* Interpret a decision tree: determine the probability of an event happening based on predictor variable values
* Understand the meaning of the complexity factor (COMPLEXITYFACTOR) and minimum split (MINIMUMSPLIT), and how it can alter the decision tree
* Compute error rate and correct classification rate based on a confusion matrix

**Cluster Analysis (Cluster Analysis Using R)**

* Understand what cluster analysis is and when it is appropriate to use this technique
* Understand the basic idea behind K-means clustering algorithm
  + K: the number of clusters, which we have to specify in advance
  + What is a centroid?
* Interpret within-cluster sum of squares error and between-cluster sum of squares error
  + Within-cluster sum of squares error is also known as within-cluster SSE, or “withinss” in R
  + Between-cluster sum of squares error is also known as between-cluster SSE, or “betweenss” in R
  + Relate them to cohesion and separation
  + What does it mean when those values are larger (or smaller)?
  + What happens to those statistics as the number of clusters increases?
  + What is the advantage of fewer clusters?
    - Higher separation, and easier to interpret
* Interpret normalized cluster means (centroid) for each variable
  + Describe a particular cluster mean (centroid) in relation to the population average

**Association Rules (Association Rules Using R)**

* Understand what association rule analysis is and when it is appropriate to use this technique
* Understand the basic idea behind association rule algorithm
* Be able to read and interpret the output from an association rule analysis
  + Find the strongest (or weakest) rule from a set of output
* Understand and be able to explain the difference between support, confidence, and lift
  + Can you have high confidence and low lift?
* Given a set of baskets, compute and interpret support, confidence, and lift for an association rule
* Given a table of aggregate purchase numbers for two products, compute and interpret the lift for the rule based on those two products (i.e., the Netflix/Cable TV example from class)

**SQL Queries**

* Understand how to use
  + SELECT
  + FROM
  + DISTINCT
  + WHERE (and how to specify conditions)
  + AND/OR
  + COUNT, AVG, MIN, MAX, SUM
  + GROUP BY
  + ORDER BY (ASC/DESC)
  + LIMIT
* Given the schema of a database, be able to create the SQL statements that
  + Require a join of multiple tables

*Not* included: subselects