MIS2502: Final Exam Study Guide (Spring 2018)

Instructor: Jing Gong

The exam will be a combination of multiple-choice and short-answer questions. It is a closed-book, closed-notes exam.

**You should bring (i) a No. 2 pencil, and (ii) a calculator. You will not be able to use a computer or your smartphone’s calculator during 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?
* Explain how advanced data analytics differ from OLAP analysis

**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. R syntax, most likely, will be tested as multiple choice questions.*

* Explain the difference between R and RStudio
* Understand the role of packages in R
* Explain basic syntax for R, for example:
	+ Variable assignment (using = or <-)
	+ Identify functions versus variables.
		- Functions accept parameters (in parentheses) and return a value
		- Variables are named containers for data
	+ Understand the basic data types: numeric, character, and logical (Boolean)
	+ Understand advanced data types: vector, list, and data frame
		- Identify how to access a variable (column) from a dataset (data frame) (E.g., dataset$Salary)
	+ Understand the purpose of the following R functions (you do not required to memorize the complete syntax of these functions):
		- read.csv(), summary(), describe(), describeBy(), t.test(), rpart(), kmeans(), apriori()

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

* Be able to read and interpret a histogram
* 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
* Understand the role 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 how it can alter the decision tree
* Understand the pros and cons of having a more complex tree
	+ Understand the idea of overfitting
* 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?
* Be able to read the output from a cluster analysis
* 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?
* 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 analysis
* 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
* 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)