



The University of Fiji

School of Science and Technology

Department of Computer Science/Information Technology

ITC355 Business Intelligence

Semester 2, 2013

FINAL EXAMINATION

QUESTION PAPER

Section	Question Type	Marks Allocation
A	32 Open-Ended questions (q1-32)	85 marks
B	1 Practical Application	10 marks
C	1 Case Study	5 marks

Time Allowed: 3 Hours (+10 Minutes for Reading the Paper)

Weighting: 50%

Total Marks: 100 marks.

Instructions

- Answer All Questions in the ANSWER BOOKLET provided.
- Show your answers clearly in each question to gain maximum marks.
- You may ask for extra sheets from the supervisors if the need arises.
- Do not forget to write your name and ID number on all the extra sheet(s) attached.

Section A - Short Answers/Descriptive (85 marks)

Decision Support and Business Intelligence

1. Compare and contrast between the *decision support system* (DSS) architecture and four major components of *business intelligence* (BI). [3 marks]

Computerized Decision Support

2. What are some of the measures of effectiveness in a toy manufacturing plant? [1.5 mark]
3. You are about to sell your car. What principles of choice are you most likely to use in deciding whether to offer or reject offers? Why? [1 mark]
4. Your company is opening a branch in Labasa. Use Simon's 4-phase model to list typical activities in each phase of the decision whether to open or not. [4 marks]

Computerized Decision Support

5. List and describe the four types of DSS intermediaries. [4 marks]

Modeling & Analysis

6. Explain why a manager might perform what-if analysis. [1 marks]
7. Identify three classes of models. [1.5 marks]

Data Warehousing

8. Compare the Kimball and Inmon approaches toward data warehouse development. Identify when each one is most effective. [2 marks]
9. Describe the data warehousing process in five steps. [5 marks]

Data Mining for Business Intelligence

10. State three recent factors have increased the popularity of data mining? [3 marks]
11. Explain the four main steps (tasks and relevant techniques) used in data preprocessing? [4 marks]
12. What are some of the criteria for comparing and selecting the best classification technique?
(State at least two) [2 marks]

Understanding Data Mining Structures

13. Discuss the use of *Dependency Network* in *mining model viewer*. [2 marks]
14. "Brick-and-mortar retailers, as well as online- retailers who implemented data mining as part of their BI solution are impressed with the power of Association Mining Model." What information does this association algorithm provide each retailer respectively. [2 marks]

Implementing Data Mining Structures

15. What are the following data mining algorithms used for? [2 marks]
- a. Microsoft Clustering algorithm
 - b. Microsoft Time Series algorithm
16. List the phases of the CRISP-DM process model, the standard life cycle model for data mining. [3 marks]

Artificial Neural Networks for Data Mining

17. List the nine steps in conducting a neural network project. [4.5 marks]
18. Differentiate between *supervised learning* and *unsupervised learning* in ANN. [2 marks]
19. Explain at least three advantages of Artificial Neural Networks? [1.5 marks]

Text and Web Mining

20. Briefly discuss the 3-step text mining process. [3 marks]
21. Explain the three different branches of web mining. [3 marks]

Business Performance Management

22. Discuss the 4-step closed-loop process to optimize business performance. [4 marks]
23. Differentiate between performance dashboards and performance cards. [2 marks]

Collaborative Computer-Supported Technologies and Group Support Systems

24. Describe the various types of electronic teleconferencing, including Web-based conferencing. [4 marks]
25. List the seven steps of organizing a GDSS session. [3.5 marks]

Knowledge Management

26. Define *tacit knowledge* and *explicit knowledge*. [2 marks]
27. How can employees be motivated to contribute to and use KMS? [2 marks]
28. Explain at least three reasons why firms adopt knowledge management initiatives. [3 marks]

Artificial Intelligence and Expert Systems

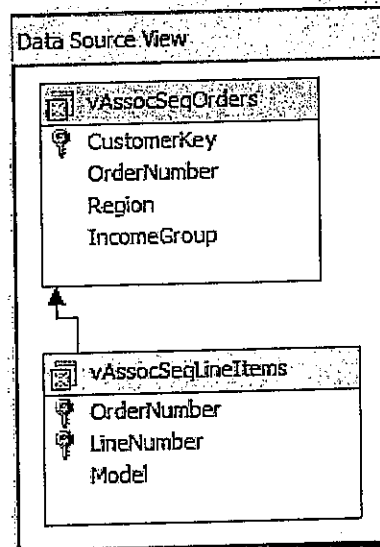
29. State at least five major capabilities of artificial intelligence? [2.5 marks]
30. List three most popular methods to deal with uncertainty in Expert Systems. [3 marks]

MSS-Emerging Trends

31. State at least two advantages and two disadvantages of providing decision support through virtual worlds? [2 marks]
32. List at least four legal issues of MSS. [2 marks]

Section B – Practical Applications (10 marks)

33. Study the pictorial given below of a mining model for *AdventureWorks DW* and answer questions that follow.



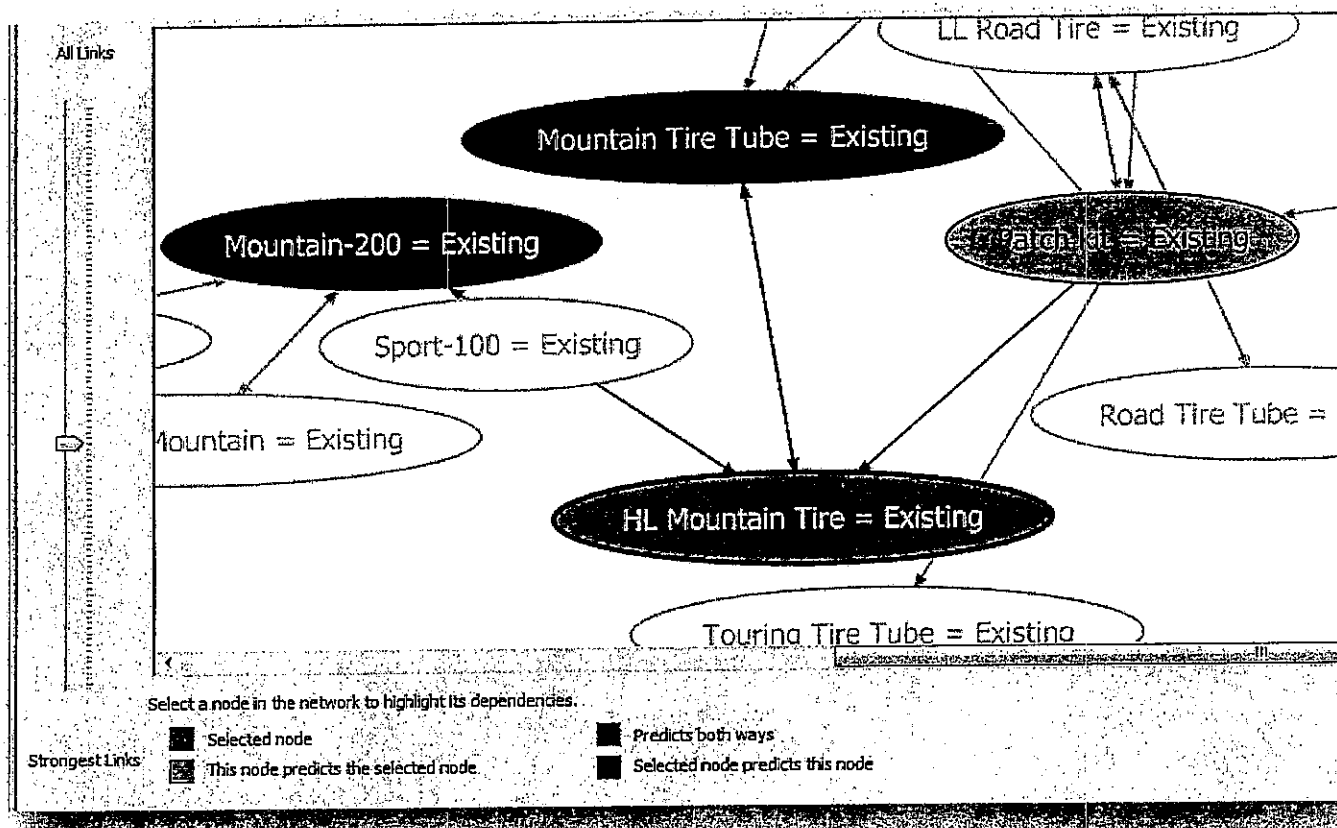
- What *mining structure* does the above *Data Source View* show? [1 mark]
- Which fieldnames (columns) will be *predictable* columns in the above *mining models* tab. [1 mark]
- State the parameters that you will need to set a Value? What values will you set? Why? [2 marks]

Parameter	Value	Default	Range
MAXIMUM_ITEMSET_COUNT		200000	[1,...)
MAXIMUM_ITEMSET_SIZE		3	[0,500]
MAXIMUM_SUPPORT		1.0	(0.0,...)
MINIMUM_IMPORTANCE		-999999999	(...,...)
MINIMUM_ITEMSET_SIZE		1	[1,500]
MINIMUM_PROBABILITY		0.4	[0.0,1.0]
MINIMUM_SUPPORT		0.0	[0.0,...)

d. Interpret the information from the pictorial below. [1 mark]

Probability	Importance	Rule
0.851		Mountain Bottle Cage = Existing, Sport-100 = Existing -> Water Bottle = Existing

Study the *dependency network* below answer questions that follows



e. How do you use this mining model viewer? [2 marks]

f. Interpret the information displayed in the above mining model viewer. [1 mark]

g. What BI decision can be made from the interpretation in part c. above. [2 marks]

Section C – Case Study (5 marks)

Read the Case and answer questions that follow.

Coors Improves Beer Flavors with Neural Networks

Coors Brewers Ltd, based in Burton-upon-Trent, Britain's Brewing Capital, is proud of having the United Kingdom's top beer brands, a 20-percent share of the market, years of experience, and some of the best people in the business. Popular brands include Carling (the country's bestselling lager), Grolsch, Coors Fine Light Beer, Sol, and Korenwolf.

Problem(s)

Today's customer has a wide variety of options regarding what he or she drinks. A drinker's choice depends on various factors, including mood, venue, and occasion. Coor's goal is to ensure that the customer chooses a Coors brand no matter what the circumstances are.

According to Coors, creativity is the key to long-term success. To be the customer's choice brand, Coors needs to be creative and anticipate the customer's ever so rapidly changing moods. An important issue with beers is the flavor; each beer has a distinctive flavor. These flavors are mostly determined through panel tests. However, such tests take time. If Coors could understand the beer flavor based solely on its chemical composition, it would

open up new avenues to create beer that would suit customer expectations.

The relationship between chemical analysis and beer flavor is not clearly understood yet. Substantial data exist on the chemical composition of a beer and sensory analysis. Coors needed a mechanism to link those two together. Neural networks were applied to create the link between chemical composition and sensory analysis.

Solution

Over the years, Coors Brewers Ltd, has accumulated a significant amount of data to the final product analysis, which has been supplemented by sensory data provided by the trained in-house testing panel. Some of the analytical inputs and sensory outputs are shown in the following table:

Analytical Data: Inputs	Sensory Data: Outputs
Alcohol	Alcohol
Color	Estery
Calculated bitterness	Malty
Ethyl acetate	Grainy
Isobutyl acetate	Burnt
Ethyl butyrate	Hoppy
Isoamyl acetate	Toffee
Ethyl hexanoate	Sweet

A single neural network, restricted to a single quality and flavor, was first used to model the relationship between the analytical and sensory data. The neural network was based on a package solution supplied by NeuroDimension, Inc. (nd.com). The neural network consisted of an MLP architecture with two hidden layers. Data were normalized within the network, thereby enabling comparison between the results for the various sensory outputs. The neural network was trained (to learn the relationship between the inputs and outputs) through the presentation of many combinations of relevant input/output combinations. When there was no observed improvement in the network error in the last 100 epochs, training was automatically terminated. Training was carried out 50 times to ensure that a considerable purposes. Prior to each training run, a different training and cross-validation dataset records, thereby removing any bias.

This technique produced poor results, due to two major factors. First, concentrating on a single product's quality meant that the variation in the data was pretty low. The neural network could not extract useful relationships from the data. Second, it was probable that only one subset of the provided inputs would have an impact on the selected beer flavor. Performance of the neural network was affected by "noise" created by inputs that had no impact on flavor.

A more diverse product range was included in the training range to address the first factor. It was more challenging to identify the most important analytical inputs. This challenge was addressed by using a

software switch that enabled the neural network to be trained on all possible combinations of inputs. The switch was not used to disable a significant input; if the significance input were disabled, we could expect the network error to increase. If the disabled input was insignificant, then the network error would either remain unchanged or be reduced due to the removal of noise. This approach is called an *exhaustive search* because all possible combinations are evaluated. The technique, although conceptually simple, was computationally impractical with the numerous inputs; the number of possible combinations was 16.7 million per flavor.

A more efficient method of searching for the relevant inputs was required. A genetic algorithm was the solution to the problem. A genetic algorithm was able to manipulate the different input switches in response to the error term from the neural network. The objective of the genetic algorithm was to minimize the network error term. When this minimum was reached, the switch settings would identify the analytical inputs that were most likely to predict the flavor.

Results

After determining what inputs were relevant, it was possible to identify which flavors could be predicted more skillfully. The network was trained using the relevant inputs previously identified multiple times. Before each training run, the network data were randomized to ensure that a different training and cross-validation dataset was used. Network error was recorded after each training run. The testing set used for

assessing the performance of the trained network contained approximately 80 records out of the sample data. The neural network accurately predicted a few flavors by using the chemical inputs. For example, "burnt" flavor was predicted with a correlation coefficient of 0.87.

Today, a limited number of flavors are being predicted by using the analytical data. Sensory response is extremely complex, with many potential interactions and hugely variable sensitivity thresholds. Standard instrument analysis tends to be of gross parameters, and for practical and

economic reasons, many flavor-active compounds are simply not measured. The relationship of flavor and analysis can be effectively modeled only if a large number of flavor-contributory analysts are considered. What is more, in addition to the obvious flavor-active materials, mouth feel and physical contributors should also be considered in the overall sensory profile. With further development of the input parameters, the accuracy of the neural network models will improve

(Source: C.I. Wilson and L. Theapleton, "Application of Artificial Intelligence for Predicting Beer Flavours From Chemical Analysis, "Proceedings of the 29th European Brewery Congress, Dublin, Ireland, May 17-22, 2003, neurosolutions.com/resources/apps/beer.html)

CASE STUDY QUESTIONS

1. Why is beer flavor important to Coor's profitability? (1m)
2. What is the objective of the neural network used at Coors? (1m)
3. Why were the results of Coor's neural network initially poor, and what was done to improve the results? (1m)
4. What benefits might Coors derive if this project is successful? (1m)
5. What modification would you make to improve the results of beer flavor prediction? (1m)

THE END