

# Master of Technology in Knowledge Engineering

## Unit 7:

### Developing Intelligent Systems for Performing Business Analytics

Choose one of 2 workshops.

# Forecasting Workshops

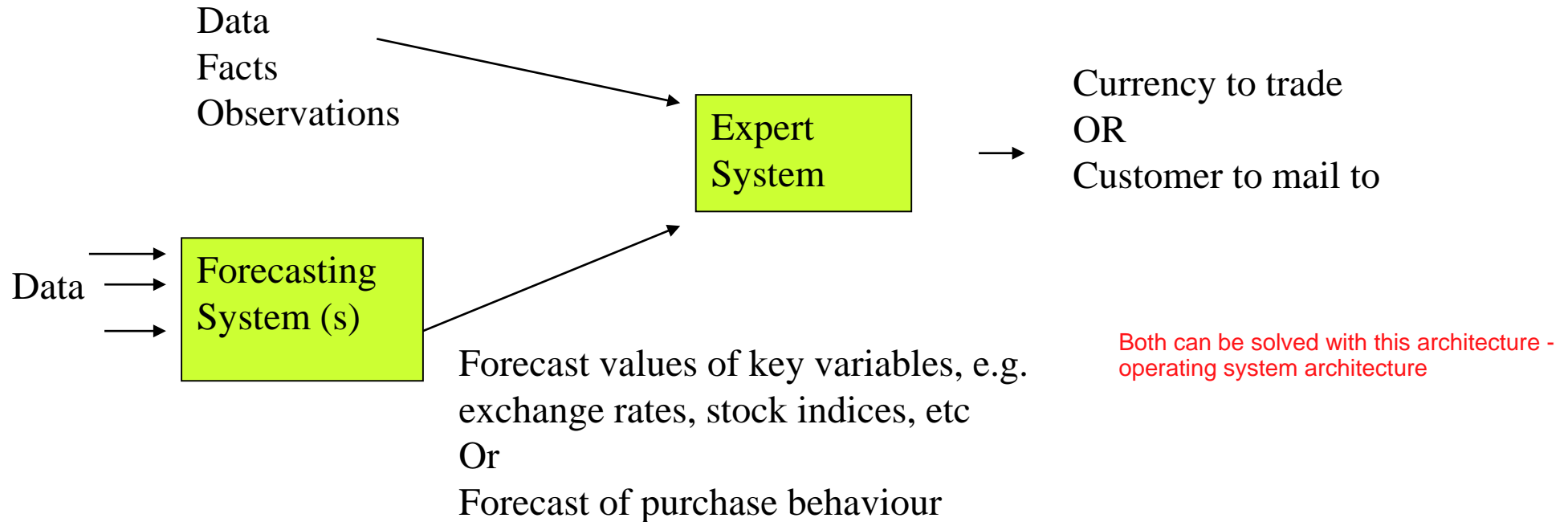
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# Forecasting Workshops

- You can choose one of two workshops
- Both workshops involve building an expert system (crisp or fuzzy) and a forecasting system (generated from data)
- Workshop 2A
  - » Foreign currency trading
- Workshop 2B
  - » Direct mailing campaign for a bank

# System Overview



# Workshop 2A: Problem Scenario

- Build a hybrid system to perform foreign currency trading between US, Singapore and UK currencies in order to achieve a profit
- Your system should be evaluated by trading over a two-year period - given an initial amount of seed money



# Workshop 2A: The Trading Expert System

- **Will recommend (on a weekly basis) which currencies to trade and the amount**
- **Simple currency trading rule**      Forecast exchange rate between S\$ and USD
  - » convert money from currency X to Y if Y is forecasted to rise in value against X
  - » convert money from Y to X if the forecast suggests Y will fall against X
- **More advanced heuristics can take into account the reliability of the forecast**
  - » E.g. if there has been a steady rise in Y against X for many months, then a forecast of a further rise in Y is more reliable than forecasts made during a period of fluctuations.
  - » E.g. Other heuristics may take into account how risk averse the user is
- **Invent your own trading heuristics & rules**

# Workshop 2A: The Forecasting System

- **Will forecast future exchange rate movements and possibly future values of stock indices, bank rates etc (if your trading Expert System requires these)**
- **Historical data:** Data available in IVLE
  - » **Weekly currency exchange rates between US\$, Sing\$ and UK\$**
  - » **Weekly stock exchange indices and trading volumes (NYSE, FTSE & STI )**
  - » **Weekly prime bank rates for each country** Reference by bank rate - divide the value by 52 since annual rate is given
  - » **Monthly inflation figures (Consumer Price Index) for each country**

# Workshop 2A: Trading Instructions

- **You have 3 bank accounts containing S\$10000, US\$10000 and £10000.**  
**Use these accounts to trade over a two-year period**
- **Record the amount of money in each of the 3 accounts at the end of the trading period and hence deduce the trading profit. Express profit in US\$**
- **To make a trade**
  - » Convert the money you wish to trade (\$X) into the new currency (\$Y) using the exchange rate at the start of the trade
  - » Subtract \$X from the source account, also subtract the trading cost ( $\$X * 1\%$ )
  - » Add \$Y to the destination account
- **Take into account benefits of not trading**
  - » Assume the 3 accounts gain interest payments
  - » Update the amount in each account at end of each week by using the appropriate bank prime rate to add interest based on the account balance

# Workshop 2B: Problem Scenario

- **Sentosa Bank has two new investment products – A & B**
- **They conduct a trial mailing - 1000 customers are selected randomly and offered both products**
- **They plan a second mailing campaign in which:**
  - » The trial promotion results are used to help select 400 customers likely to buy one of the new products
- **GOAL = Build a hybrid system to select 400 customers that maximize the expected campaign profit**





# Workshop 2B: Estimating Expected Profit

- Estimate the expected profit from the campaign by summing the expected profit from each individual customer

$$\text{Expected profit for campaign} = \sum_{\text{customers}} \text{Expected profit for customer}_i$$

- The profit for a customer depends on the product bought (A or B) and the expected amount of money they will invest, but there is no formula to estimate the amount of money a customer will invest. There are guidelines developed by experienced staff to calculate an investment potential score for each customer (a number between 0 and 10)

Product they will buy - a, b and none

$$\begin{aligned} \text{Expected profit* for customer}_i &= \text{customer investment score} * 0.6 && \text{if product purchased} = A \\ &= \text{customer investment score} && \text{if product purchased} = B \\ &= 0 && \text{if no product purchased} \end{aligned}$$

B is more profitable

Score can be obtained from the customer profile

\* This is now a relative rather than absolute measure

# W/S 2B: Estimating Investment Potential

- **The bank uses the following guidelines to assign a score between 0 and 10**
  - » Investment potential is related to the customer's account activity as well as their personal attributes, account activity is considered more important than personal attributes.
  - » Account activity is measured by examining the customers average monthly transactions and average monthly balance. A customer with high values for both has more investment potential.
  - » Personal factors relating to investment potential
    - ◆ **Gender - males have more potential than females, this is less true for unmarried women**
    - ◆ **Income – higher is better**
    - ◆ **Age - investment potential peaks around middle-age**
    - ◆ **Occupation - retirees have low potential, professionals (doctors, lawyers etc) have the highest**
    - ◆ **Education – a higher level is better. Education is more important for middle-aged customers. For older customers income is more important than education-level..**

# Workshop 2B: Instructions

- Generate a *prospect list* of 400 customers drawn from the database of 4000 customers (excluding customers in the trial promotion already) that maximises the expected profit.
  - » the trial promotion results are in the file *trialPromoResults.csv*
  - » the database of 4000 customers is in the file *custdatabase.csv*
- Find out the true profit by using the file *Cust\_Actual.csv* – compare with your estimated profit Purchase ? score both present here
- Improve your system further
  - a. Buy or not buy
  - b. 3 output - which product?
  - c. Evaluate the customer to get the score - rule based system - to
  - d. Choose top 4 and get the actual profit

# CA1 Assessment Scheme

## Continuous Assessment 1 (20 marks)

- » Workshop (1A & 1B) 8 marks
- » Workshop (2A or 2B) 12 marks Choose 1
- Work in teams of 3 - 5 students
- Submission: (soft copy only)
  - » A report to describe your work on workshops
  - » Source code, model files, other supporting documents (if any)
- CA1 submission due date: 30/09/2018  
Please submit your report to IVLE KE5108 Files / Student Submission /CA1  
Please submit only one ZIP file from each team.