Master of Technology in Knowledge Engineering

Unit 7:

Developing Intelligent Systems for Performing Business Analytics

Forecasting Workshops

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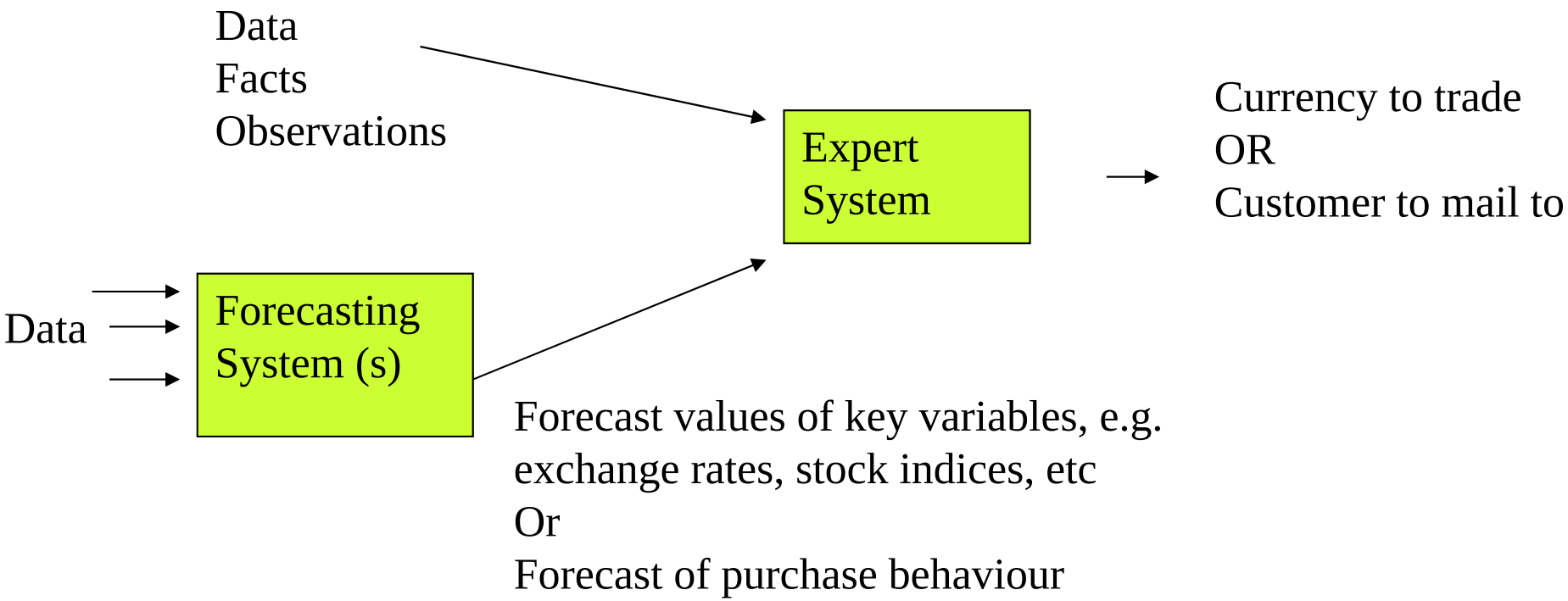
Forecasting Workshops

- **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 the two year period (Apr'96 to Apr'98) - given an initial amount of seed money
- Appropriate financial data is available for period Nov'86 to Apr'98




Workshop 2A: The Trading Expert System

- **Will recommend (on a weekly basis) which currencies to trade and the amount**
- **Simple currency trading rule**
  - » 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 is available for the period (Nov'86 to Apr'98)**
  - » **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**
  - » **Monthly inflation figures (Consumer Price Index) for each country**

Workshop 2A: Trading Instructions

- **You have 3 bank accounts containing S$10000, US$10000 and £10000**
  Use these accounts to trade over the period 3rd April 1996 to 1st April 1998
- **Record the amount of money in each of the 3 accounts at the end of the trading period and hence deduce the trading profit. Express profit in US$**
- **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
  - » A trained bank officer will visit each selected customer to try to sell them one or other product. To save costs, some staff are trained to sell product A and others product B.
- **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)**

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

** This is now a relative rather than absolute measure*

W/S 2B: Estimating Investment Potential

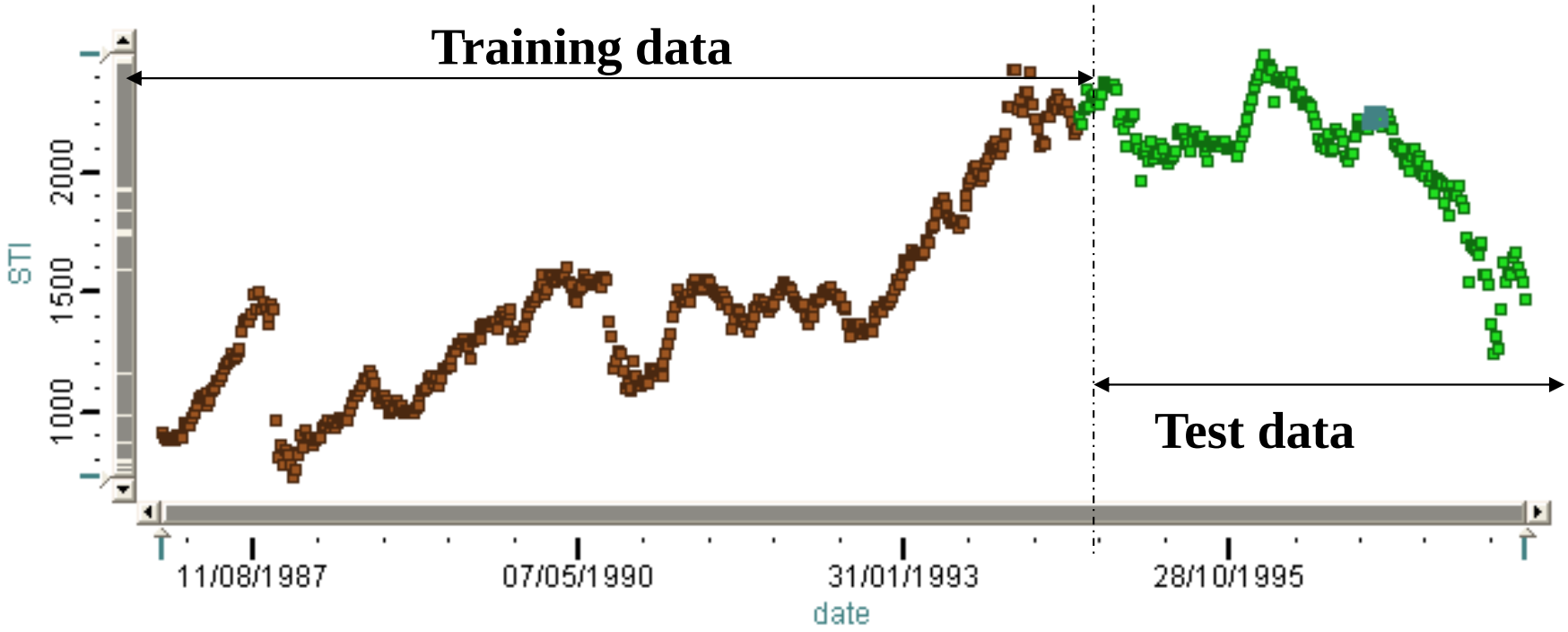
- **The bank uses the following guidelines to assign a score between 0 and 10**
  - » Investment potential is related to the customer's account activity as well as their personal attributes, account activity is considered more important than personal attributes.
  - » Account activity is measured by 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**
- **Improve your system further**

Time Series Forecasting Issues

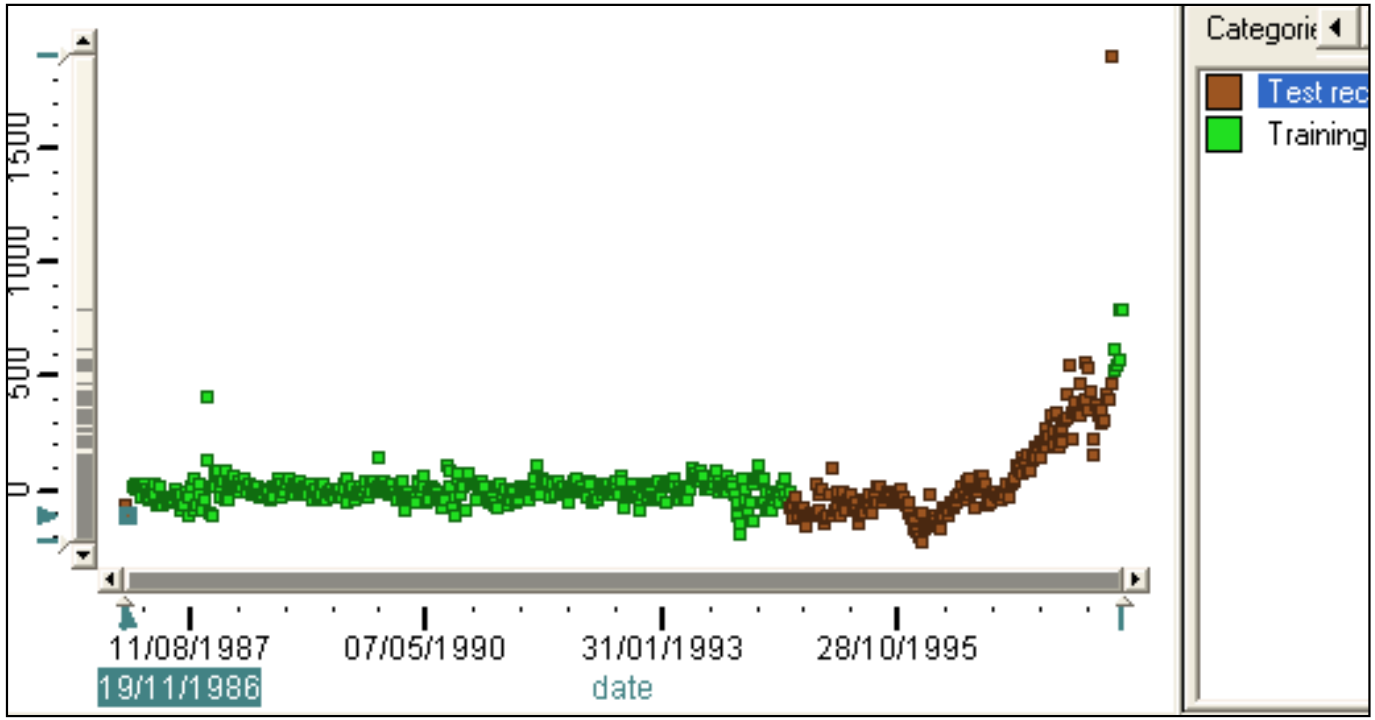
- Sequence of data is important – cannot select a simple random subset for training & testing
- Daily (snapshot) data is not sufficient for time series forecasting - need to derive extra variables to use as inputs: e.g. moving averages, momentum etc



Time Series Forecasting Issues

- Error gets bigger the longer the model is used…

Error



- Models go rusty over time… need to rebuild frequently!

CA Assessment Scheme

Continuous Assessment 1

- » **Workshop (1A & 1B)**
  - ♦ **Report** **10 marks**
- » **Workshop (2A or 2B)**
  - ♦ **Report** **20 marks**

- **3- 4 students per team**

- **CA1 Reports are due on 06/10/2017**

Please submit your report to IVLE KE5108 Files / Student Submission /CA1