Machine Learning and AI Concepts Objective Notes

**Machine Learning Introduction**

Machine learning is a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention.

**What's required to create good machine learning systems?**

* Data preparation capabilities.
* Algorithms – basic and advanced.
* Automation and iterative processes.
* Scalability.
* Ensemble modelling.

**Time Series Forecasting**

Businesses use forecasting extensively to make predictions such as demand, capacity, budgets and revenue. One type of forecasting that routinely comes up in all of these scenarios is time series forecasting. Time series data is any data set that collects information regularly over a period of time. There are specific techniques for picking apart this type of data. Time series modelling has a range of modelling options which can work on different types of techniques. They include:

* Linear vs. non-linear,
* Parametric vs. non-parameteric,
* And univariate vs. multivariate techniques.

**Why is Time Series Forecasting Important?**

Time series forecasting brings with it a unique set of concerns and challenges. Modelling is driven by studying to understand what it is that is driving changes in the data. With time series data, this can stem from long term trends, seasonal effects, or irregular fluctuations. It is the regular patterns of trends and seasonality which are specific to time series forecasting and aren’t always seen in other types of data. These patterns have to be addressed in order to develop a solid forecast for data over time.

**Forecasting**

The predictability of an event or a quantity depends on several factors including:

1. How well we understand the factors that contribute to it
2. How much data is available
3. How similar the future is to the past
4. Whether the forecasts can affect the thing we are trying to forecast

Helps to inform decisions about the scheduling of production, transportation and personnel, and provides a guide to long-term strategic planning.

Forecasting is about predicting the future as accurately as possible, given all of the information available.

Goals are what you would like to have happen.

Planning is a response to forecasts and goals.

Steps:

1. Problem definition
2. Gathering information
3. Preliminary (exploratory) analysis
4. Choosing and fitting models
5. Using and evaluating a forecasting model

Passive demand forecasting – use data from the past to predict the future

Active demand forecasting – use external factors to forecast next events.

Short-term projections – next 3 to 12 months. Allow you to adjust based on real-time.

Long-term projections – one to four years into the future. Aspirational – use as a roadmap.

External macro forecasting – how trends will affect your goals.

Internal business forecasting – review your operations.

Methods:

* Trend projection
* Market research
* Sales force composite (feedback)
* Delphi method (experts)
* Econometric (numbers)

**Sales Forecasting**

Sales forecasting is the process of estimating future revenue by predicting the amount of product or services a sales unit will sell in the next week, month, quarter, or year.

Sales forecast must be shared across an organisation e.g. finance, production, sales ops, sales strategy.

Benefits:

* Improved decision-making about the future
* Reduction of sales pipeline and forecast risks
* Alignment of sales quotas and revenue expectations
* Reduction of time spent planning territory coverage and setting quota assignments
* Benchmarks that can be used to assess trends in the future
* Ability to focus a sales team on high-revenue, high-profit sales pipeline opportunities, resulting in improved win rates

Steps:

1. Assess historical trends
2. Incorporate changes
3. Anticipate market trends
4. Monitor competitors
5. Include business plans

Forecasting Measures

*Accuracy of the dataset*

* Training and Test Data
  + *Would be splitting the data this way and using the test data to validate the model.*
* Forecasting Error
  + *Quantify accuracy of the model – want to look at the error between the forecast and actual data.*
* e.g. Mean Absolute Percentage Error (MAPE)
  + *One method is MAPE. Most common forecasting metric in demand planning – since it expresses the forecast error in relation to sales volume. Basically, it tells you by how many percentage points your forecasts are off, on average.*
  + *However, a downside to this is that as all products are given the same weight, it can give very high error values when the sample contains many slow-movers.*
  + *MSE could also be used.*

Keys to success in sales forecasting

* Collaborative.
* Data-driven.
* Produced in real time.
* Single-sourced, with multiple views.
* Improved over time.

What are some key sales forecasting challenges?

* Accuracy and Mistrust.
* Poor adoption of CRM across the company, and employees not entering data in a timely manner.
* Inconsistent data across teams or salespeople not inputting complete data
* Stakeholders across the company using different methodologies to produce their forecasts.
* Subjectivity.
* Usability.
* Inefficiency.