**Prescriptive analysis suggests optimal actions using data-driven insights, considering constraints and objectives to guide decision-making and achieve desired outcomes.**

**From business analytics perspective:**

**Why is prediction important across diverse fields, and how does it influence decision-making processes?**

First, the usage of predictive analytics will provide a firm with a competitive edge through greater preparedness for future challenges and opportunities. This leads to improved strategic planning and increased adaptability to the evolving market conditions. Netflix is a company that uses predictive algorithms which recommend video content based on user’s preferences and viewing history. This personalised service provides Netflix with a competitive edge in the market.

With predictive analytics, future trends can be predicted and addressed. For the finance industry, predictive analytics can be used to foresee market trends, assisting investors in making better informed decisions. Furthermore, in the healthcare industry, predictive analytics can be utilised to identify disease outbreaks or patient risks, improving patient care and resource allocation.

A graph of cancer

Description automatically generated with medium confidence

*Figure 1. An analysis based on an Australian Cancer dataset done by myself using the ARIMA model in RStudio to predict the cancer incidence rate for the next 20 years.*

Second, operation processes can be optimised, for example, in supply chain management, prediction models are able to forecast demand, eventually helping companies to optimise their inventory levels, reduce waste levels, and improve efficiency. For example, Walmart uses predictive analytics to forecast the demand for products. Through the analysis of market trends and sales, inventory levels are optimised, consequently reducing excess stock and minimising stock outs.

Finally, the overall insights obtained from predictive analytics can be used to enhance decision-making. For example, for the retail industry, there are e-commerce companies that utilise prediction models to anticipate customer churn. Through analysing past purchase behaviour and customer engagement metrics, identification of customers who are likely to leave becomes possible, and targeted retention strategies can be implemented.

However, one should note that prediction analytics is only one aspect of decision-making. Two other elements that are important in decision making include data, and judgment, representing the complements to prediction. The data used should be of a high quality, without systematic bias, and judgment determines the kinds of patterns and outcomes that are meaningful in different contexts (Avi Goldfarb, Jon R. Lindsay, 2022).

**What methods are commonly used to evaluate the effectiveness of prediction models?**

To measure accuracy:  
1) Mean Absolute Error (MAE)/ Mean Squared Error (MSE)/ Root Mean Squared Error (RMSE): Quantifies how close the predictions are to the actual outcomes. A higher RRMSE indicates that the model is making larger prediction errors.

2) Precision and Recall: Precision measures the proportion of true positive predictions out of all positive predictions, while recall measures the proportion of true positives out of all actual positives. A higher precision indicates better performance in avoiding false positives in classification models, while a higher recall indicates better performance in correctly identifying positive instances and minimising false negatives in classification models.

3) Cross-Validation: Assesses generalisability of prediction model by splitting data into training and validation sets multiple times, ensuring that the model performs well on unseen data.

4) Confusion Matrix: Table which provides information on true positives, false positives, true negatives, false negatives, aiding in understanding model performance.

5) F1 Score: Combines precision and recall to provide a balanced metric.

6) Sensitivity: Measures proportion of actual positive cases correctly identified by the model. High sensitivity indicates that model is good at identifying positive cases correctly.  
7) Specificity: Measures proportion of actual negative cases correctly identified by the model. High specificity indicates that the model is effective at identifying negative cases correctly.

**What role do emerging technologies like artificial intelligence and deep learning play in advancing prediction capabilities and applications?**

Artificial intelligence (AI) and deep learning algorithms are capable of analysing large amounts of data and identifying complex patterns that may be missed by traditional methods. For example, deep learning models are particularly effective in image recognition, time-series forecasting, and natural language processing. AI and deep learning models can also handle unstructured data, such as text, images, and videos, resulting in new prediction possibilities.

AI systems are also able to utilise reinforcement learning, resulting in continuous improvement of its predictive capabilities by learning from new data. For example, autonomous vehicles utilise reinforcement learning to enhance driving strategies based on real-time data. Furthermore, such adaptability is definitely useful in dynamic environments such as finance and healthcare.

AI can also be used to improve decision support systems through providing more accurate risk assessments, which are crucial for sectors such as insurance and banking. As such, AI models can be used to predict economic indicators not limited to GDP growth and inflation, eventually supporting greater policy-making and investment decisions.

With the rapid advances in technology, including statistical prediction, the accuracy, efficiency, and scalability of predictive models are improved.

Week 2 Render Link:  
<https://week-2-assignment-11-0.onrender.com>

References:

*Avi Goldfarb, Jon R. Lindsay, 2022, Prediction and Judgment: Why Artificial Intelligence Increases the Importance of Humans in War*

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