Assignment 1

AI and ML Technologies

**Learning Outcome Addressed**

* Explore the facets of neural networks and build a programme that learns from data

**Assignment Instructions**

In this module, you have learnt the principles of supervised and unsupervised learning, the differences between them and the facets of neural networks. In this assignment, specify for each scenario below which model you would use and the type of data you would need.

* Scenario #1: Detecting potential intrusion events from video stills captured periodically by CCTV cameras.
* Scenario #2: Determining market segments among customer population-based on sales and customer data.
* Scenario #3: Monitoring consumer opinions of a given product by processing the text in product reviews.

**Submission Instructions**

* Download this assignment to record your responses.
* After you complete your assignment, select the **Start Assignment** button at the top of the assignment page.
* Upload the document containing your response.
* Select the **Submit Assignment** button to submit your responses

**Suggested Time:** 120 minutes

*This is a required assignment and counts towards programme completion.*

**AIML Required Assignment 2.6: AI and ML Technologies**

| **Criteria** | **Ratings** | **Pts** |
| --- | --- | --- |
| Scenario #1: Detecting potential intrusion events from video stills captured periodically by CCTV cameras | |  |  |  | | --- | --- | --- | | **4 pts**  **Exceeds expectations**  Identified a logical model and the type of data required for detecting potential intrusion events | **2 pts**  **Meets Expectations**  Identified either a logical model, or the type of data required for detecting potential intrusion events | **0 pts**  **Did not meet expectations**  Did not identify a logical model and the type of data required for detecting potential intrusion events | | 4 pts |
| Scenario #2: Determining market segments among customer population based on sales and customer data | |  |  |  | | --- | --- | --- | | **3 pts**  **Exceeds expectations**  Identified a logical model and the type of data required for determining market segments among customer population | **2 pts**  **Meets Expectations**  Identified either a logical model, or the type of data required for determining market segments among customer population | **0 pts**  **Did not meet expectations**  Did not identify a logical model and type of data for determining market segments among customer population | | 3 pts |
| Scenario #3: Monitoring consumer opinions of a given product by processing the text in product reviews | |  |  |  | | --- | --- | --- | | **3 pts**  **Exceeds expectations**  Identified a logical model and type of data required for monitoring consumer opinions | **2 pts**  **Meets Expectations**  Identified either a logical model, or the type of data required for monitoring consumer opinions | **0 pts**  **Did not meet expectations**  Did not identify a logical model and type of data required for monitoring consumer opinions | | 3 pts |
| Total Points: 10 | | |

Required Assignment   
AI and ML Technologies

**<Your Name>**

|  |  |
| --- | --- |
| Clock | Suggested time: 120 minutes |

**Task:** In this module, you have learnt the principles of supervised and unsupervised learning, the differences between them and the facets of neural networks. In this assignment, specify for each scenario below which model you would use and the type of data you would need.

* Scenario #1: Detecting potential intrusion events from video stills captured periodically by CCTV cameras.
* Scenario #2: Determining market segments among customer population-based on sales and customer data.
* Scenario #3: Monitoring consumer opinions of a given product by processing the text in product reviews.

***Note:****This is a required assignment and counts towards programme completion.*

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| --- |
| Scenario #1: Detecting potential intrusion events from video stills captured periodically by CCTV cameras **Model:** Convolutional Neural Network (CNN)  **Data Required:**   1. **Training Data:** Labeled video stills indicating normal and intrusion events. 2. **Features:** Image data from CCTV stills, including pixel values and spatial information. 3. **Annotations:** Bounding boxes or masks identifying intruders in the training images for supervised learning.   **Explanation:** Convolutional Neural Networks (CNNs) are highly effective for image recognition tasks. They can learn to identify patterns and features within images, making them ideal for detecting intrusion events from video stills. The model will be trained on a dataset of labeled images, where each image is annotated to indicate whether it contains an intrusion event. This supervised learning approach allows the CNN to learn the distinguishing features of intrusions. Scenario #2: Determining market segments among customer population based on sales and customer data **Model:** K-means Clustering  **Data Required:**   1. **Customer Data:** Demographic information (age, gender, income, etc.), purchasing history, and behavioral data. 2. **Sales Data:** Transaction records, including product types, purchase frequency, and spending amounts. 3. **Features:** Variables derived from customer and sales data such as average transaction value, purchase frequency, and product preferences.   **Explanation:** K-means clustering is a popular unsupervised learning algorithm used for market segmentation. It groups customers into clusters based on their similarities across multiple features. By applying K-means clustering to the sales and customer data, we can identify distinct market segments, allowing businesses to tailor marketing strategies to each segment’s specific needs and preferences. Scenario #3: Monitoring consumer opinions of a given product by processing the text in product reviews **Model:** Sentiment Analysis using Recurrent Neural Network (RNN) or Transformer-based models (e.g., BERT)  **Data Required:**   1. **Training Data:** A large corpus of product reviews, labeled with sentiment scores (positive, negative, neutral). 2. **Features:** Text data from reviews, including words, phrases, and context. 3. **Pre-processing:** Tokenization, removal of stop words, stemming, and lemmatization of review text.   **Explanation:** For monitoring consumer opinions, sentiment analysis is an effective approach. Recurrent Neural Networks (RNNs) or Transformer-based models like BERT are well-suited for natural language processing tasks. These models can analyze the sentiment expressed in product reviews by learning from a labeled dataset of reviews. The model can then predict the sentiment of new reviews, providing insights into consumer opinions about the product. |