

Assignment 2

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T4Btech Comp B

- 1) Video Surveillance - Support Vector Machine
- Beyond anomaly detection, SVMs can also be used for object recognition in video. SVMs learn a hyperplane decision boundary in a high dimensional feature space extracted from image frames. This hyperplane effectively separates normal activities, patterns from anomalies. Kernel functions are used to map the original features. Potentially low-dimensional into a higher dimensional space where better separation between normal & anomalous activities is achieved.

When a new frame is captured, the SVM classifies object or tracks specifies items, thus enabling alert for unauthorized objects.

Challenges - Fine tuning the SVM kernel function for optimal performance and handling variations in lighting and camera angles can be complex.

Application - Traffic Surveillance
Crowd Management
Re Security Monitoring.

- b) Sentiment analysis: Naive Bayes.

It calculates the conditional probability of a text review belonging to a specific sentiment class (positive, negative or neutral) given the presence of individual words. Bayes theorem is used to combine these probabilities for

words in the review to find the most likely sentiment class.

This technique can be enhanced by incorporating features beyond just word presence techniques like n-group or sentiment (word list with associated sentiment scores) can improve accuracy.

Challenges.

Naive Bayes assumes independence of features which may not always hold true in language. Additionally handling sarcasms and complex emotions can be different.

Applications

Brand Reputation

Customer Support

Market Research.

c) Image Recognition - K-Nearest Neighbours (KNN)
KNN relies on the similarity of new images features to those of labelled images, in the training set. A distance metric like Euclidean distance is used to measure this similarity.

Common features extraction techniques for images including color histograms, edge detection, and texture analysis, which capture the visual properties of the image content.

KNN can be computationally expensive for large datasets and the choice of k significantly improves performance.

Applications:

Medical Imaging

FOR EDUCATIONAL USE

Autonomous Vehicles Quarterly Context

2) Recommendation Systems - Collaborative filtering

CF algorithms analyze users-items interaction data to classify patterns & relationships. Thus data is technically represented in a user-item matrix, where rows represent users & columns represent items. The matrix entries contain values & represent the level of interaction.

This technique is a popular model based CF approach. The model learns three factors from the user-item interactions data and uses them to predict user ratings for unseen items. This method can handle sparse data while users haven't interacted with many items.

Challenges:

Cold starts problems (recommending to new users or items) can be challenging additionally CF techniques are susceptible to biases present in the data.

Applications:

Movie Recommendation

E-commerce

Music Streaming

In conclusion, all these applications are considered as powerful application of ML despite their challenges they play vital role in security communication & personalization in various industries.