

## MARKET BASKET INSIGHTS

PHASE 3:

Q: TENSORFLOW AND KERAS-ANN,  
CONVOLUTIONAL NEURAL NETWORKS  
AND OPEN CV

Submitted by

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# TENSORFLOW AND KERAS-ANN:

## ABSTRACT:

TensorFlow and are popular tools for building artificial neural networks (ANNs), including those used in market basket analysis. Market basket analysis is a data mining technique used to discover Kera's patterns in consumer purchase behaviour, often applied in retail and e-commerce industries to understand which products are frequently bought together. ANNs can be used to improve the accuracy and efficiency of market basket analysis.

Here's how TensorFlow and Kera's can be utilized in market basket insight:

### **1.Data Preparation:**

You need to gather transaction data, where each row represents a customer's purchase history. TensorFlow and Kera's don't directly handle data preprocessing, so you might use libraries like Pandas and NumPy for data manipulation.

### **2.One-Hot Encoding:**

Transform categorical data like product IDs into one-hot encoded vectors. This ensures that the neural network can work with the data effectively.

### **3.Model Architecture:**

Define your neural network using Kera's, which is now integrated into TensorFlow 2.x. The architecture of the ANN can vary, but a common approach is to use a feedforward neural network.

### **4.Training:**

Split your data into training and testing sets. Train your ANN using TensorFlow/Kera's by adjusting the weights and biases to minimize the loss function. You can use various optimizers like Adam, RMSprop, or SGD.

### **5.Validation:**

Evaluate your model's performance on a validation dataset. You can use metrics like accuracy, precision, recall, or F1-score to assess how well your ANN is identifying market basket patterns.

### **6.Prediction:**

Once your model is trained, you can use it to make predictions on new data. For market basket analysis, this might involve recommending additional products to customers based on their current cart.

### **7.Association Rule Mining:**

Another common technique in market basket analysis is association rule mining, often used in tandem with ANNs. Libraries like Apriorism or FP-Growth can help discover associations between products.

## **8. Visualization and Interpretation:**

You can use libraries like Matplotlib or Seaborn to visualize your findings. Visualizations can help stakeholders understand market basket insights.

## **9. Deployment:**

If your model performs well, you can deploy it in a production environment to provide real-time product recommendations or analyse transaction data as it comes in.

## **10. Continuous Improvement:**

Market basket analysis is an ongoing process. You can continually refine your model as you collect more data and adapt to changing customer behaviour.

Remember that market basket analysis isn't solely reliant on ANNs. Traditional methods like Apriorism, FP-Growth, or association rule mining are also widely used. ANNs can complement these techniques by offering a more data-driven and potentially more accurate approach, especially when dealing with large and complex datasets.

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## **CONVOLUTIONAL NEURAL NETWORKS:**

Convolutional Neural Networks (CNNs) are a type of deep learning model that is primarily used for image processing and computer vision tasks. Market basket analysis, on the other hand, is a data mining technique used in retail and e-commerce to uncover patterns and relationships in customer purchasing behaviour. While

CNNs are not typically used directly for market basket analysis, there are certain applications where deep learning and CNNs can be used in conjunction with market basket analysis to gain insights from retail data.

Here are some ways CNNs can be used in market basket analysis:

### **1.Image-Based Product Recognition:**

retailers have started using CNNs to recognize from products images. For example, if a customer takes a picture of a product, the CNN can identify the product Some and suggest related items. This information can be used to make product recommendations or optimize product placements in physical stores.

### **2.Shelf and Store Layout Analysis:**

CNNs can be used to analyse store layouts and shelf placements to understand how the physical arrangement of products influences customer purchasing behaviour. Retailers can use this information to optimize store layouts for better sales.

### **3.Customer Behaviour Analysis:**

CNNs can analyse security camera footage in stores to track customer movements and behaviour. This data can be be used in conjunction with transaction data to understand how customers move through the store and which products they interact with, providing insights into customer behaviour and preferences.

#### **4.Visual Data for Product Recommendations:**

Retailers can leverage CNNs to analyse images shared by customers on social media or reviews. This visual data can provide additional context for market basket analysis and help identify which products are often bought together or are popular among customers.

While CNNs are not the primary tool for market basket analysis, they can be a valuable addition when dealing with visual data or when trying to understand customer behaviour based on images and video footage. In most cases, traditional market basket analysis techniques like Apriorism or association rule mining are still the go-to methods for finding associations between products in a shopping basket, as they are designed for this specific purpose and work well with transaction data.

#### **OPEN CV:**

It seems like you're asking about OpenCV (Open Source Computer Vision Library) in the context of market basket analysis or insights. OpenCV is primarily used for computer vision tasks, such as image and video processing. It's not directly related to market basket analysis, which is a technique used in retail and e-commerce to discover patterns and relationships between products that customers buy together.

However, you might be interested in using OpenCV in conjunction with other tools and libraries to analyse data for market basket insights, especially if your analysis involves image or video data. For example, you could use OpenCV to process images or videos related to shopping behaviour, and then use the extracted data as part of your market basket analysis.

To perform market basket analysis, you typically need to use data mining and machine learning techniques on transaction data to identify associations between products that are frequently purchased together. Popular libraries for performing market basket analysis in Python include:

**1.Apriorism Algorithm:** The Apriorism algorithm is a classic method for market basket analysis and can be implemented using Python libraries such as MLX tend.

**2.Growth Algorithm:** Another frequent itemset mining algorithm for market basket analysis, which is more efficient than Apriorism for large datasets.

**3.Scikit-learn:** Scikit-learn can be used for clustering and association rule mining, which can be applied to market basket analysis.

**4.Pandas:** Pandas is useful for data manipulation and preprocessing before applying market basket analysis algorithms.

**5.Matplotlib and Seaborn:** For data visualization, if you want to create meaningful insights from your analysis results.

To combine OpenCV with market basket analysis, you would typically use OpenCV to handle any image or video data, extract relevant information, and then use one of the aforementioned libraries to perform the actual market basket analysis on the transaction data.

For example, you might use OpenCV to analyse surveillance footage in a retail store, identify which products customers are interacting with, and then use the transaction data from the store's point-of-sale system for market basket analysis.

If you have a more specific question about how to integrate OpenCV with market basket analysis or if there's a particular use case you'd like to discuss, please provide more details, and I'd be happy to provide further guidance.



## Loading the Dataset

Let's start by loading the dataset into a DataFrame using pandas.

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```
import pandas as pd
```

```
# Load the dataset
```

```
dataset_path = '/kaggle/input/market-basket-analysis/Assignment-1_Data.xlsx'
```

```
df = pd.read_excel(dataset_path)
```

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## Initial Exploration

We'll perform an initial exploration of the dataset to understand its structure and characteristics.

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```
# Display basic information about the dataset
```

```
print("Number of rows and columns:", df.shape)
```

```
print("\nData Types and Missing Values:")
```

```
print(df.info())
```

```
print("\nFirst few rows of the dataset:")
```

```
print(df.head())
```

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## Preprocessing

We'll preprocess the data to ensure it's ready for analysis.

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```
#Check Missing Values
```

```
print("Missing Values:")
```

```
print(df.isnull().sum())
```

```
#Drop Rows with Missing Values
```

```
df.dropna(inplace=True)
```

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```
# Convert dataframe into transaction data  
transaction_data = df.groupby(['BillNo', 'Date'])['Itemname'].apply(lambda x: '  
' + x.join(',')).reset_index()
```

```
# Drop Unnecessary Columns  
columns_to_drop = ['BillNo', 'Date']  
transaction_data.drop(columns=columns_to_drop, inplace=True)
```

```
# Save the transaction data to a CSV file  
transaction_data_path = '/kaggle/working/transaction_data.csv'  
transaction_data.to_csv(transaction_data_path, index=False)  
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```

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```
# Display the first few rows of the transaction data  
print("\nTransaction Data for Association Rule Mining:")  
print(transaction_data.head())  
transaction_data.shape
```