
# Personalized Fashion Recommendation System

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# Contents

# Recommendation System

Recommender systems are the systems that are designed to recommend things to the user based on many different factors. These systems predict the most likely product that the users are likely to purchase and are interested to.

Companies like Netflix, Amazon, etc. use recommender systems to help their users to identify the correct product, movies, etc. for them.

[2]

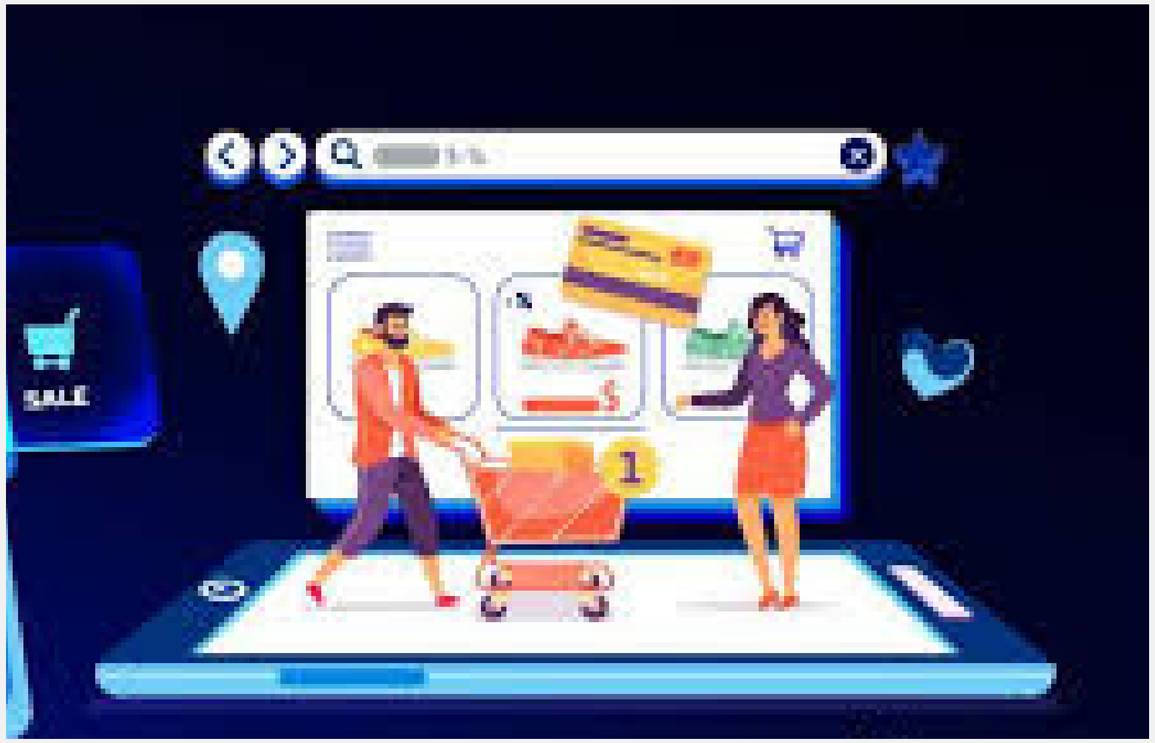



Fig 1 [1]

# Fashion Recommendation System

In an eCommerce firm, we have the requirement to create a system that should be able to scan across all the product images and automatically generate a group of recommended products that are customized to based on user actions like viewed/bought. The group of recommended products should be generated quickly to meet “real-time” experience.The system should be able to adapt to new products and new users.

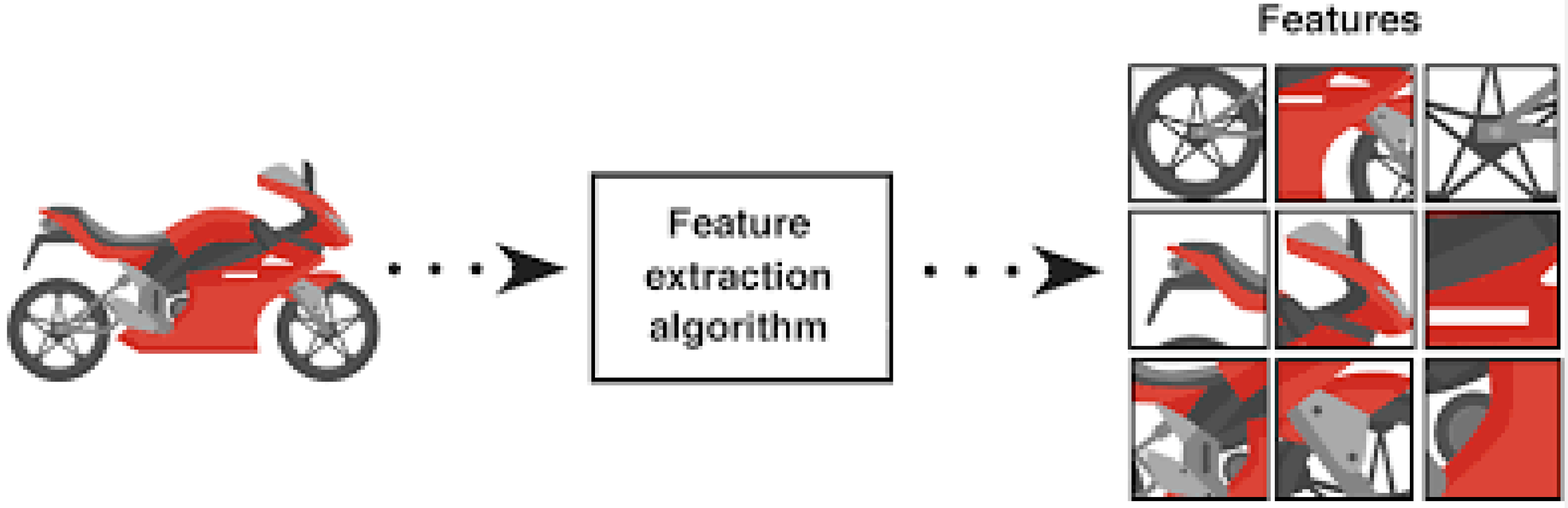
# Proposed Plan

- We will use a pre-trained model(ResNet50 trained on ImageNet) to extract features from fashion dataset.
- Later we use a classifier K-Nearest Neighbour algorithm and cosine similarity to build our fashion recommender system. We will be building a User Interface using Python Flask framework and Jinja UI templates

# Feature Extraction

Feature extraction is a type of dimensionality reduction where a large number of pixels of the image are efficiently represented in such a way that interesting parts of the image are captured effectively.[3]

# Why Feature Extraction




[4]

# ResNet

- ResNets are made up from Residual Blocks.
- There is a direct connection which skips some layers in between. Direct connections are called 'skip connection' and is the core of residual blocks.
- It solve the problem of vanishing gradient by allowing this alternate shortcut path for the gradient to flow through.
- Skip connection helps by allowing the model to learn the identity functions which ensures that the higher layer will perform at least as good as the lower layer, and not worse.

[5]

# ResNet - continued

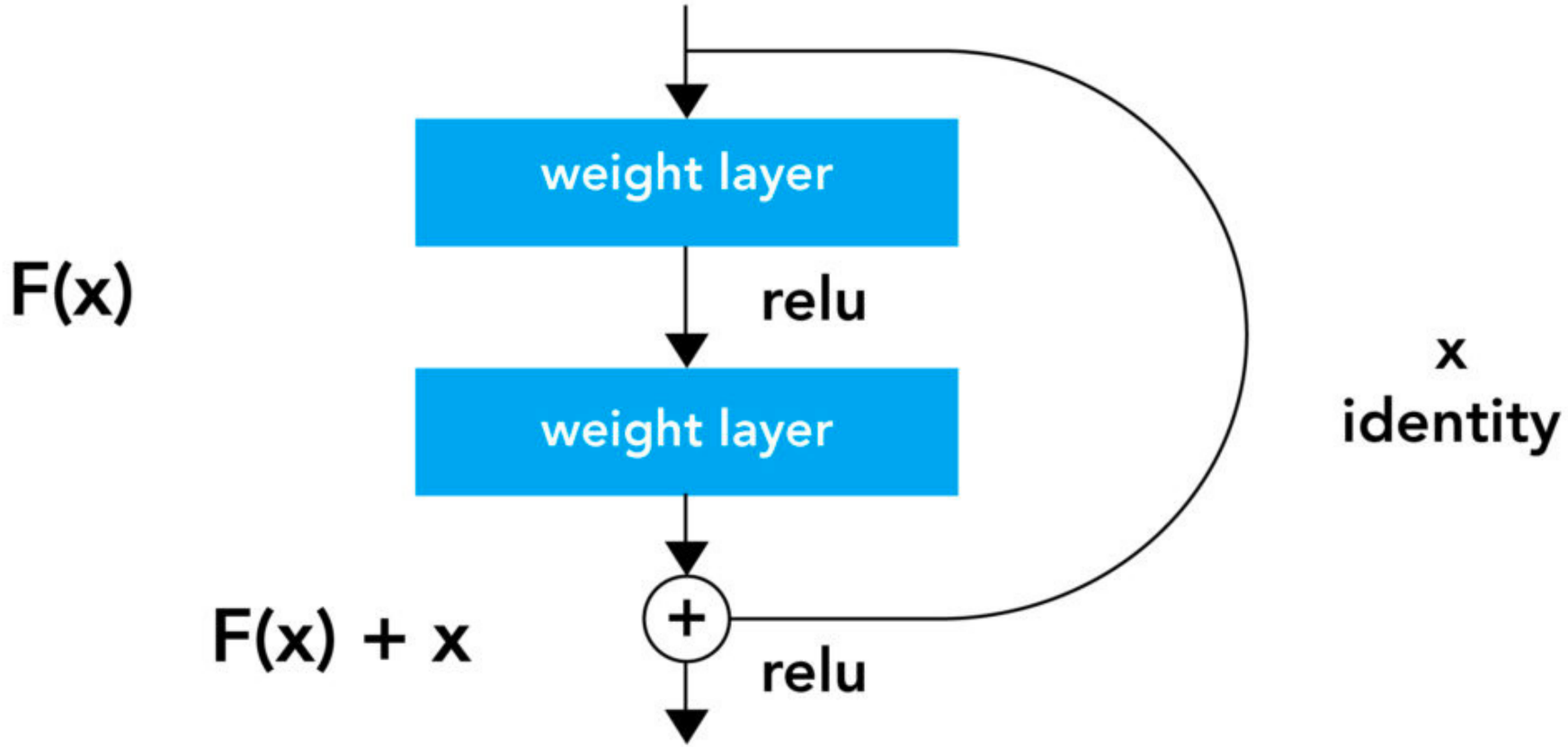


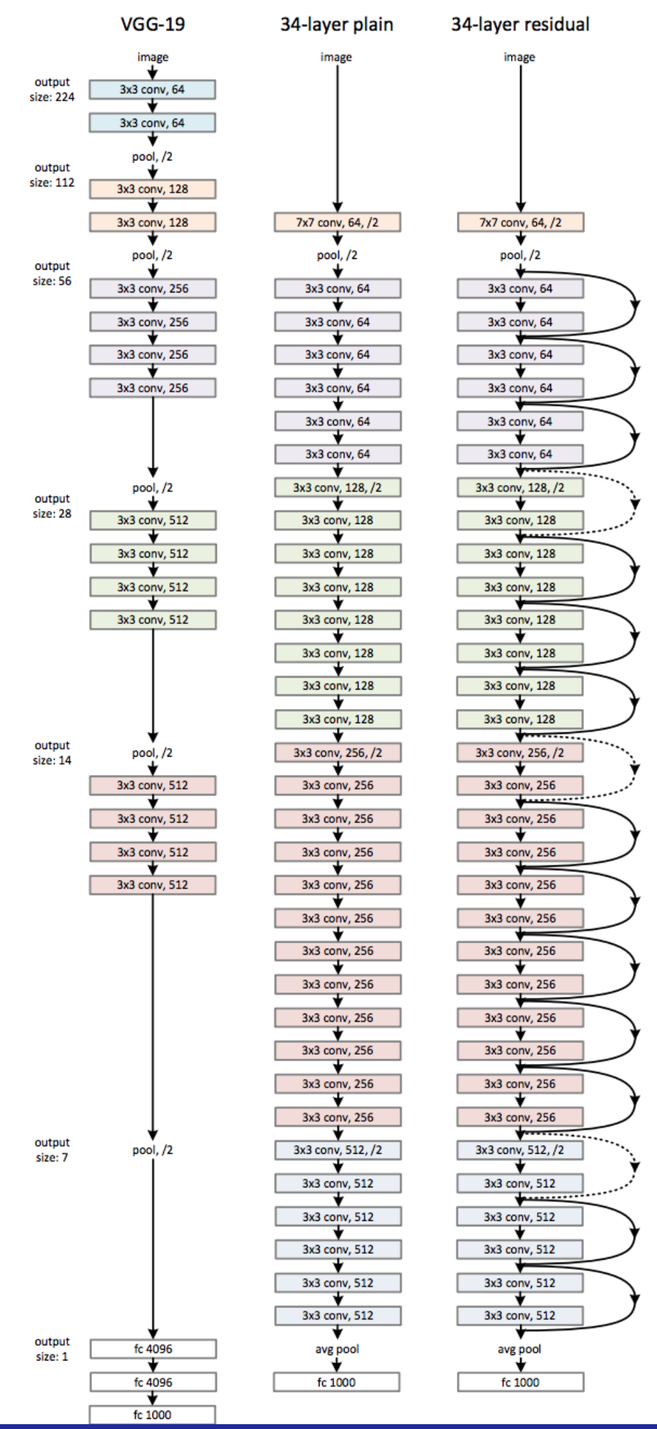

Figure 2. Residual learning: a building block.

[6]

# ResNet50 Architecture

ResNet50 is a variant of ResNet model which has 48 Convolution layers along with 1 MaxPool and 1 Average Pool layer.

[7]




[7]

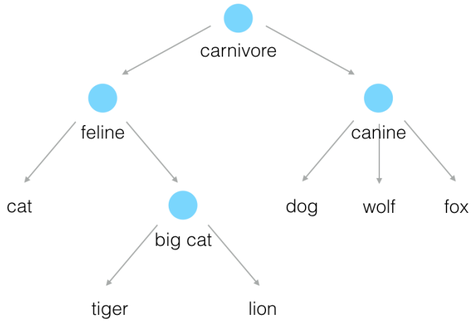
# Pre-trained Model & Transfer Learning

- Instead of building a model from scratch to solve a similar problem, we can use the model trained on other problem as a starting point.
- RestNet50 pre-trained models has been previously trained on large datasets(ImageNet), thus we can directly use the weights and architecture obtained and apply the learning on our problem statement. This is known as transfer learning. We “transfer the learning” of the pre-trained model to our specific problem statement.

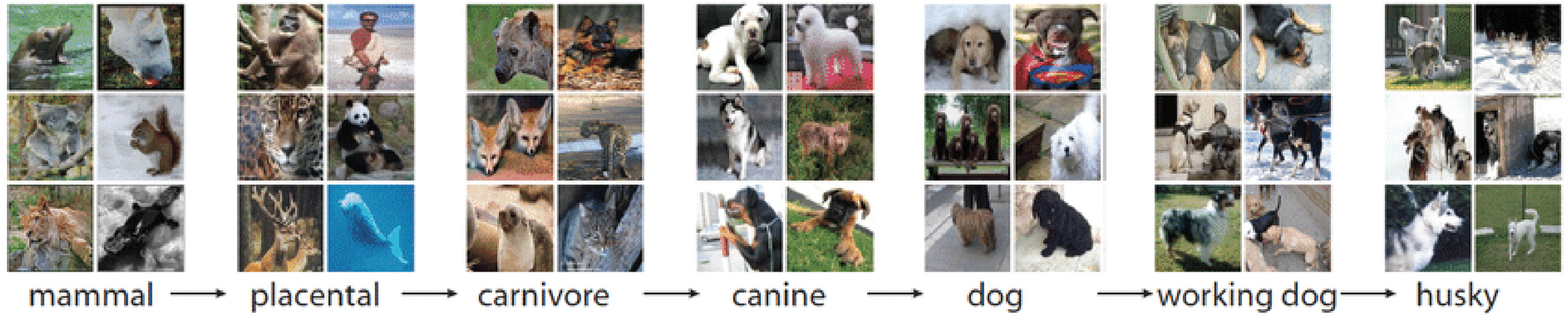

[9]

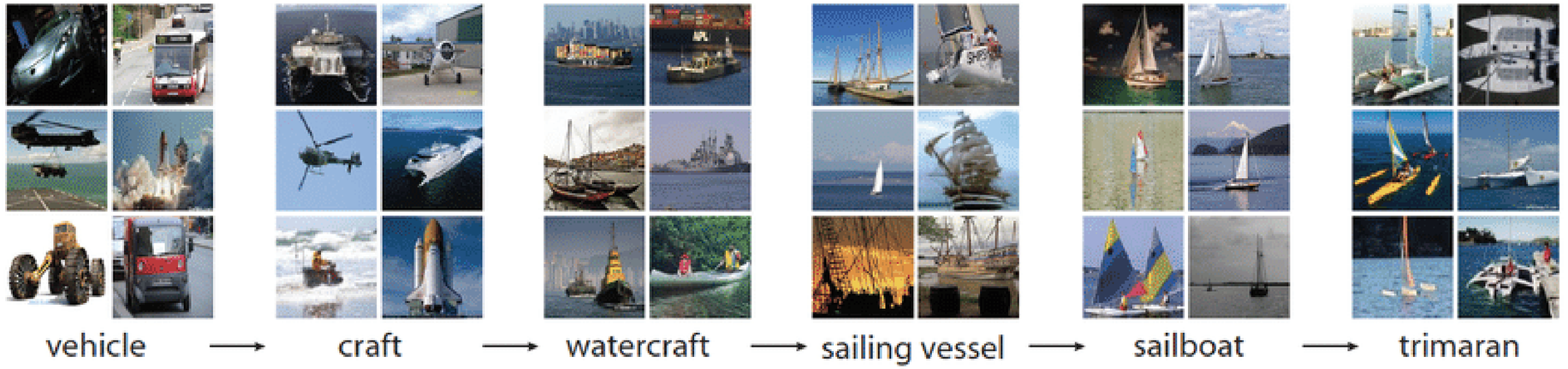
ImageNet is a large database or dataset of over 14 million images. It was designed by academics intended for computer vision research. It was the first of its kind in terms of scale. Images are organized and labelled in a hierarchy as mentioned in wordnet.

[10]




[11]




[10]

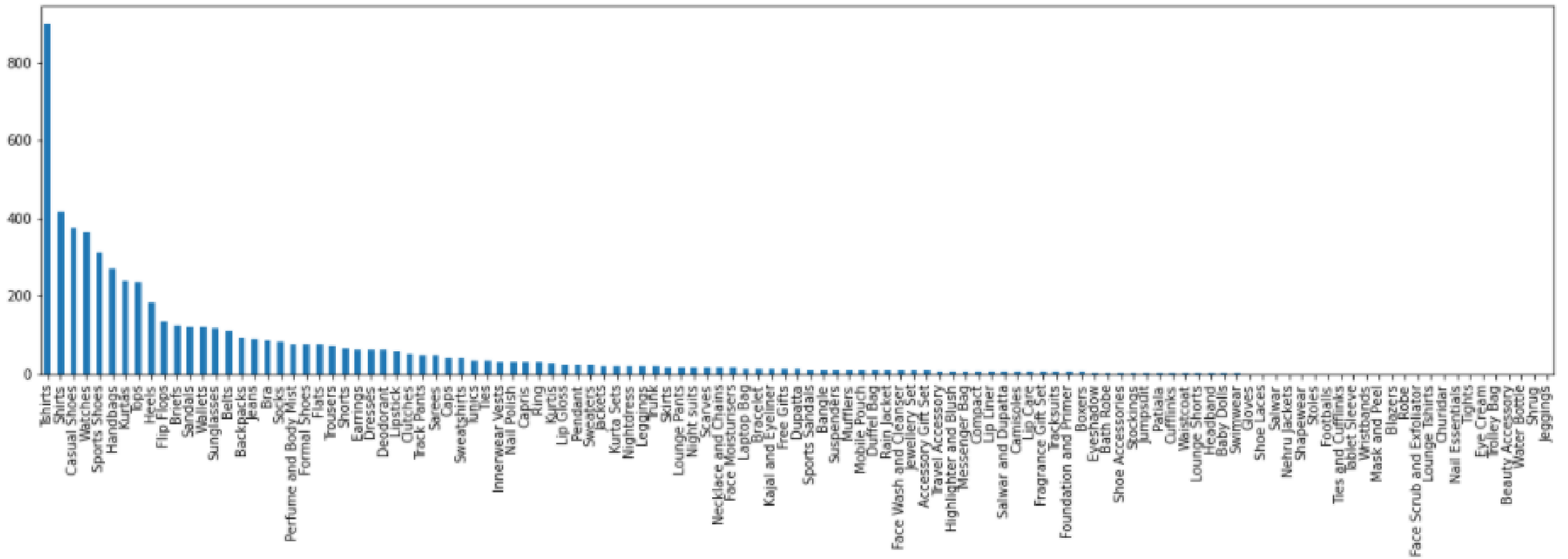
# Fashion Dataset

includes 44K images

```
['Shirts', 'Jeans', 'Watches', 'Track Pants', 'Tshirts', 'Socks', 'Casual Shoes', 'Belts', 'Flip Flops',
'Handbags', 'Tops', 'Bra', 'Sandals', 'Shoe Accessories', 'Sweatshirts', 'Deodorant', 'Formal Shoes', 'Bra
celet', 'Lipstick', 'Flats', 'Kurtas', 'Waistcoat', 'Sports Shoes', 'Shorts', 'Briefs', 'Sarees', 'Perfume
and Body Mist', 'Heels', 'Sunglasses', 'Innerwear Vests', 'Pendant', 'Nail Polish', 'Laptop Bag', 'Scarve
s', 'Rain Jacket', 'Dresses', 'Night suits', 'Skirts', 'Wallets', 'Blazers', 'Ring', 'Kurta Sets', 'Clutch
es', 'Shrug', 'Backpacks', 'Caps', 'Trousers', 'Earrings', 'Camisoles', 'Boxers', 'Jewellery Set', 'Dupatt
a', 'Capris', 'Lip Gloss', 'Bath Robe', 'Mufflers', 'Tunics', 'Jackets', 'Trunk', 'Lounge Pants', 'Face Wa
sh and Cleanser', 'Necklace and Chains', 'Duffel Bag', 'Sports Sandals', 'Foundation and Primer', 'Sweater
s', 'Free Gifts', 'Trolley Bag', 'Tracksuits', 'Swimwear', 'Shoe Laces', 'Fragrance Gift Set', 'Bangle',
'Nightdress', 'Ties', 'Baby Dolls', 'Leggings', 'Highlighter and Blush', 'Travel Accessory', 'Kurtis', 'Mo
bile Pouch', 'Messenger Bag', 'Lip Care', 'Face Moisturisers', 'Compact', 'Eye Cream', 'Accessory Gift Se
t', 'Beauty Accessory', 'Jumpsuit', 'Kajal and Eyeliner', 'Water Bottle', 'Suspenders', 'Lip Liner', 'Rob
e', 'Salwar and Dupatta', 'Patiala', 'Stockings', 'Eyeshadow', 'Headband', 'Tights', 'Nail Essentials', 'C
huridar', 'Lounge Tshirts', 'Face Scrub and Exfoliator', 'Lounge Shorts', 'Gloves', 'Mask and Peel', 'Wris
tbands', 'Tablet Sleeve', 'Ties and Cufflinks', 'Footballs', 'Stoles', 'Shapewear', 'Nehru Jackets', 'Salw
ar', 'Cufflinks', 'Jeggings']
```

117 Unique Categories

# Distribution of Product Types in Dataset




[12]

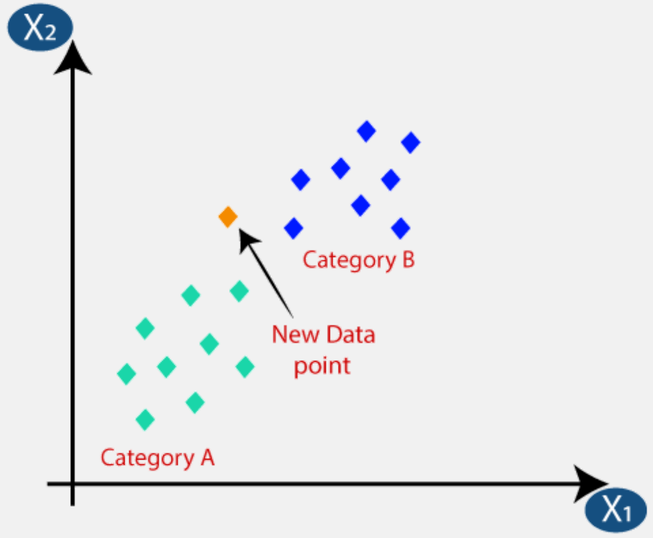
# K-Nearest Neighbour

- K-Nearest Neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique.
- K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K- NN algorithm.

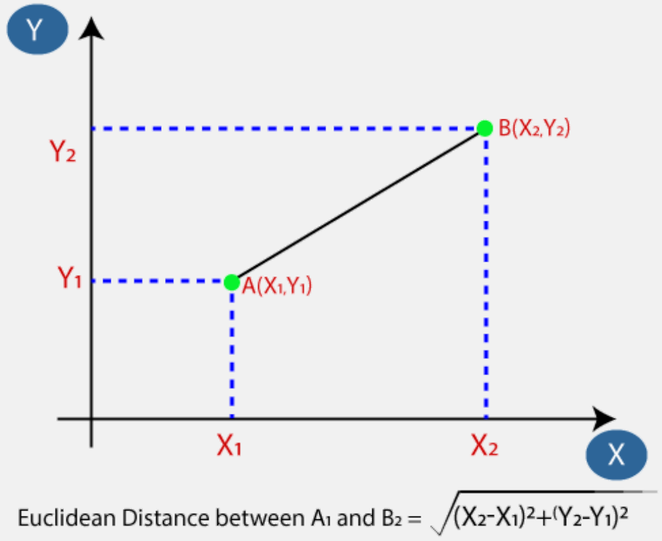
[13]

# How KNN works

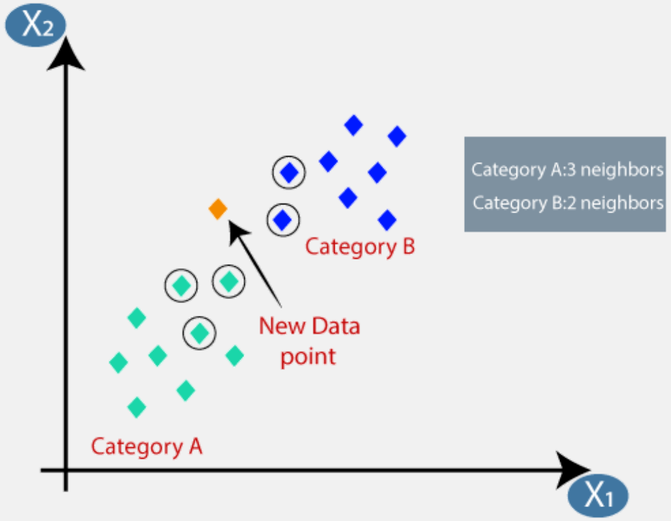
- Select the number K of the neighbors
- Calculate the Euclidean distance of K number of neighbors
- Run this distance calculation for all the data, and we get the final result with the K number of neighbours.




[14]

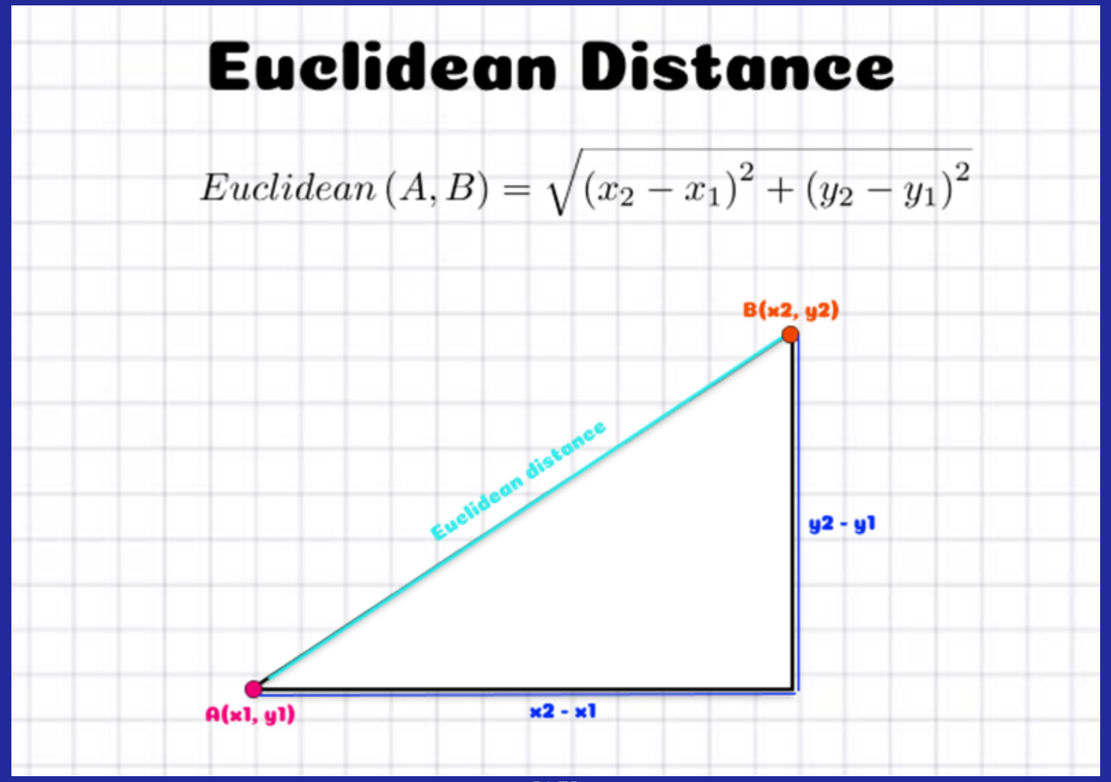



[14]

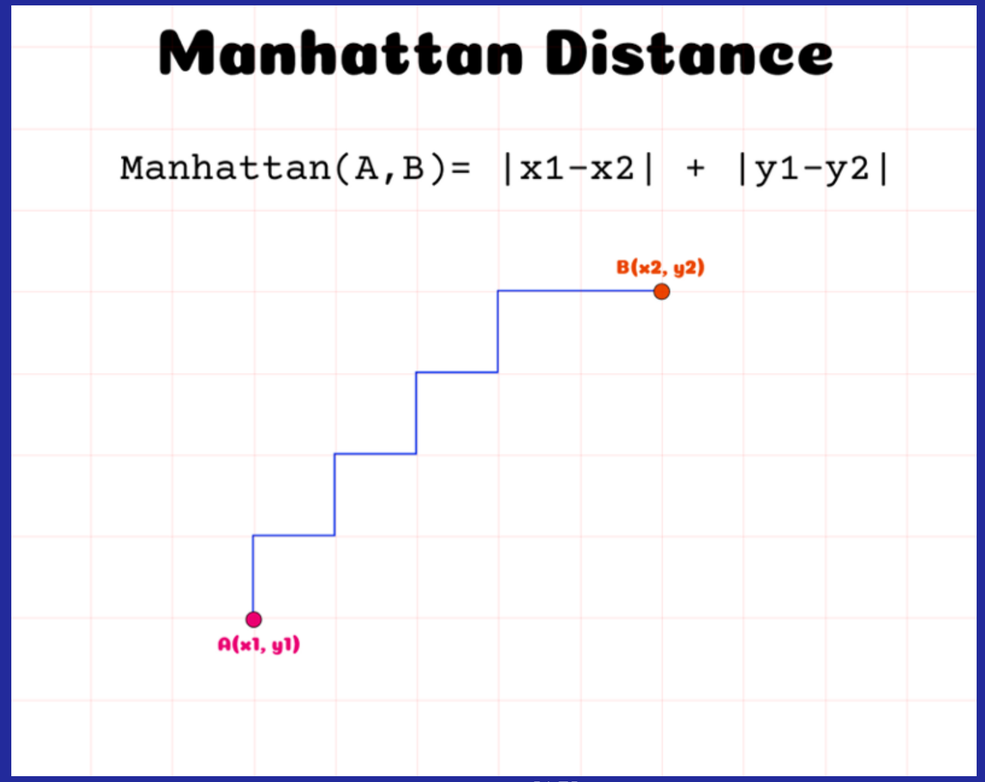



[14]

# KNN - Euclidean & Manhattan distance




[15]



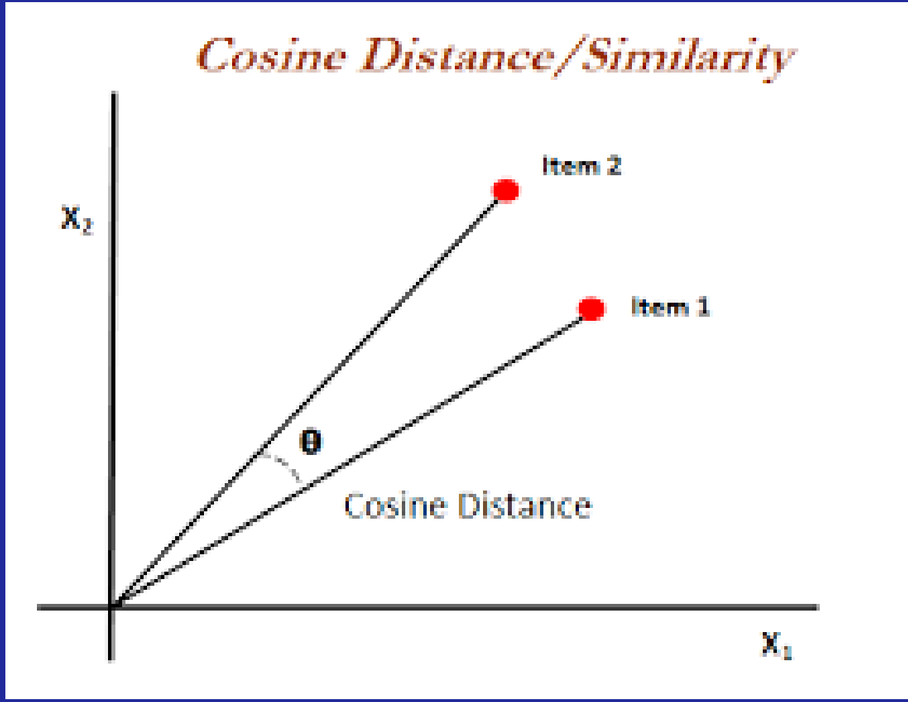

[15]

# Cosine Similarity

Similarity measure refers to distance with dimensions representing features of the data object, in a dataset. If this distance is less, there will be a high degree of similarity, but when the distance is large, there will be a low degree of similarity

Here we applied pairwise cosine similarity between the feature vectors of each image and find the top N number best results similar.

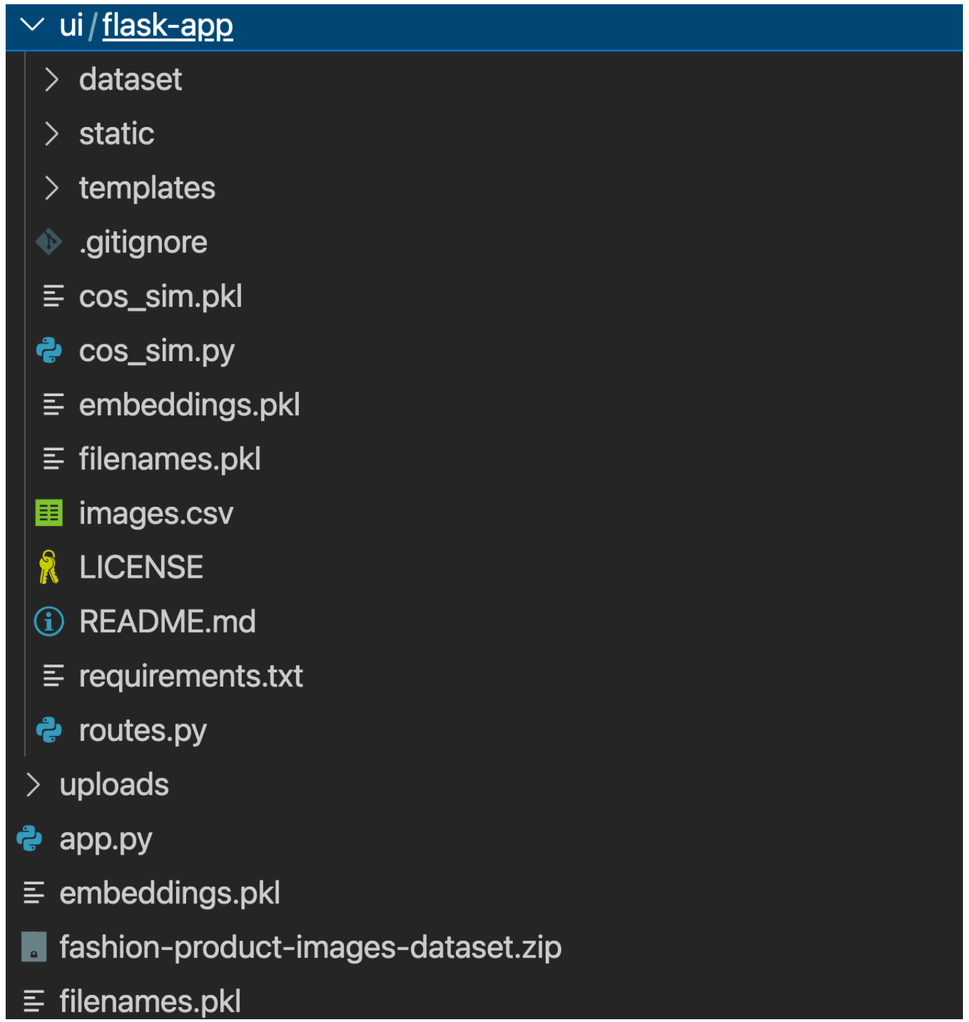
# Cosine Similarity - continued




$$\cos(\theta) = \frac{\mathbf{A} \cdot \mathbf{B}}{\|\mathbf{A}\|\|\mathbf{B}\|} = \frac{\sum_{i=1}^{n} A_i B_i}{\sqrt{\sum_{i=1}^{n} A_i^2} \sqrt{\sum_{i=1}^{n} B_i^2}}$$

| | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 0 | 1.00 | 0.57 | 0.51 | 0.26 | 0.31 | 0.33 |
| 1 | 0.57 | 1.00 | 0.54 | 0.25 | 0.31 | 0.43 |
| 2 | 0.51 | 0.54 | 1.00 | 0.19 | 0.25 | 0.36 |
| 3 | 0.26 | 0.25 | 0.19 | 1.00 | 0.50 | 0.38 |
| 4 | 0.31 | 0.31 | 0.25 | 0.50 | 1.00 | 0.56 |
| 5 | 0.33 | 0.43 | 0.36 | 0.38 | 0.56 | 1.00 |

# Project Repo




GitHub

Github link - git@github.com:avay/fashion_recommender_system.git

kaggle

https://www.kaggle.com/shivangigarg160997/fashinrecomendationsysytem

# Demo

# Conclusion

We developed a personalized fashion recommendation system using RestNet50 pre-trained model and classified using K-Nearest Neighbour algorithm and cosine similarity.

# Future Work

Image quality has always been a critical issue for recommendation systems because images are taken in random environment.We will work on image parsing i.e processing the images and learning them

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# Q/A

# THANK YOU