How do you know it‘s a Shirt?

Implementation and comparison of K-nearest neighbors (KNN) and convolutional neural network (CNN) for clothes recognition

Topic 01
Group 04

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Overview

1. Material
   - Dataset

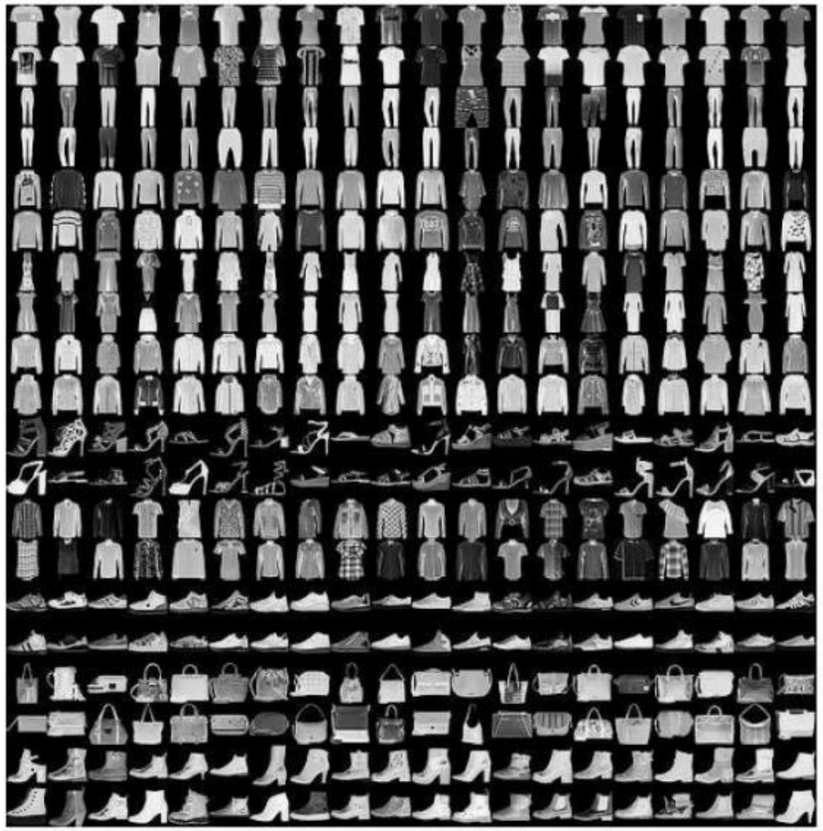
2. Methods
   - Data preparation
   - KNN
   - CNN
   - Evaluation

3. Results

4. TEIL:

Zusammenfassung

Fashion-MNIST Dataset

Label	Description	Examples
0	T-Shirt/Top	
1	Trouser	
2	Pullover	
3	Dress	
4	Coat	
5	Sandals	
6	Shirt	
7	Sneaker	
8	Bag	
9	Ankle boots	

- Training set 60.000 images
- Test set 10.000 images
- 28 x 28 pixels grayscale
- CSV files (Comma-separated values)
- One Row = one image
- Intensity values: 0 - 255

Fashion-MNIST Dataset Images with Labels and Description II. LITERATURE... | Download Scientific Diagram (researchgate.net)

Data preparation

1. Z-transformation

$$Z = \frac{x - \bar{x}}{\sigma_x}$$

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2. Principal Component Analysis (PCA)

$$Xv = \lambda v$$

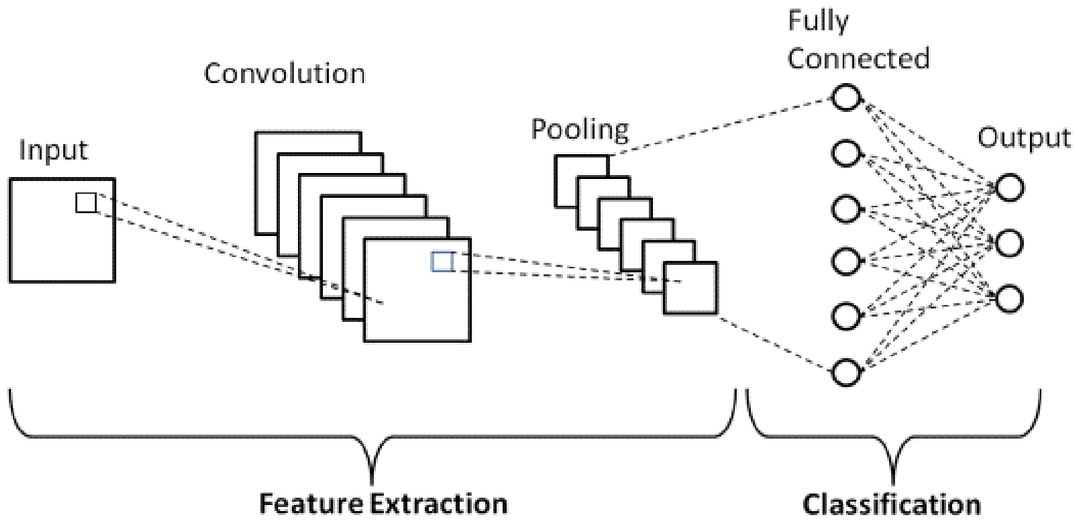
K-nearest neighbors (KNN)

- nonparametric, supervised learning algorithm
- For classification problems
- Predictions based on similarity to training data points
- Majority vote

$$d(x, y) = \sqrt{\sum_{i=1}^{n} (y_i - x_i)^2}$$

Convolutional Neural Network (CNN)

- deep learning model
- for analysis of visual data
- detects patterns in a hierarchical structure
- different types of layers

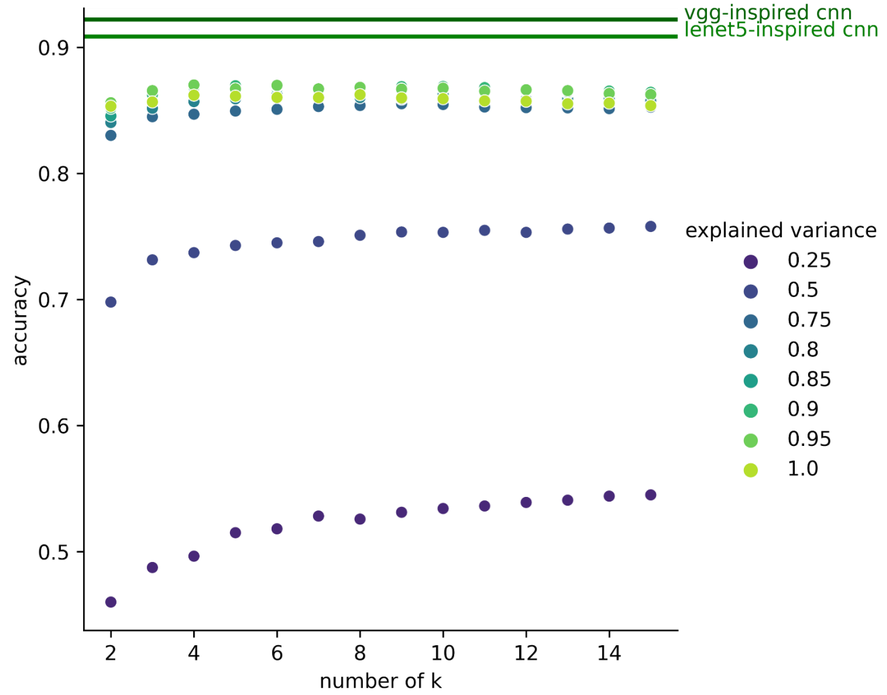


Basic CNN Architecture: Explaining 5 Layers of Convolutional Neural Network | upGrad blog

PCA

- 784 Eigenvectors

Optimal number of k and PCs



- Optimal k = 4
- Variance 95%
- 256 Eigenvectors

RESULTS

KNN

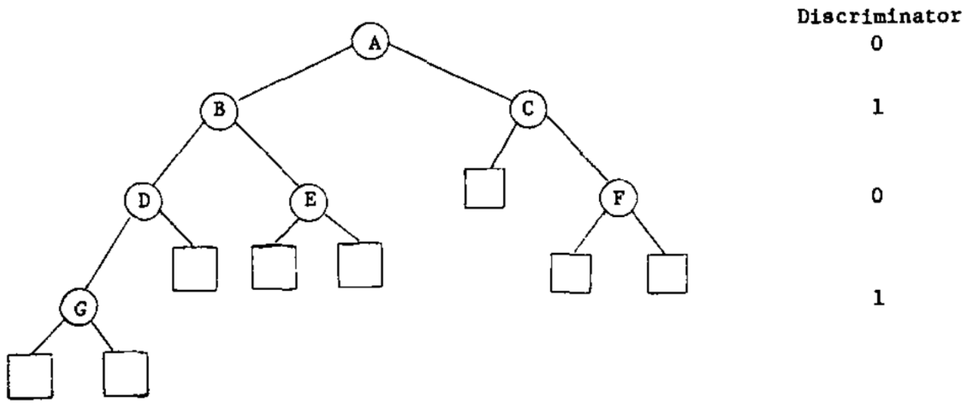
- Run time 40 images: 26.4 seconds

KNN with KD-Tree

- Run time 10,000 images: 26.9 seconds
- Leaf size 10

Accuracy: 86.3%

What‘s a KD-Tree?



RESULTS

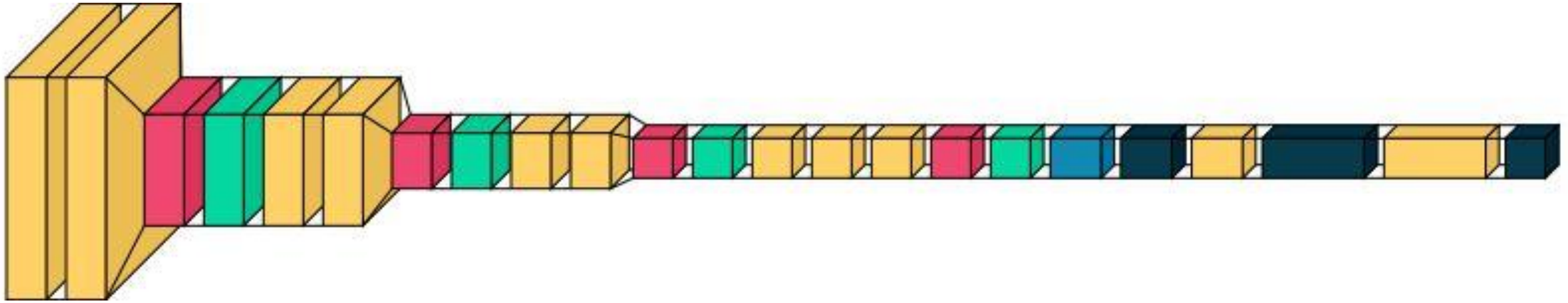
CNN

Training: 30 – 60 minutes
run time: 2 seconds

Accuracy: 92.9%

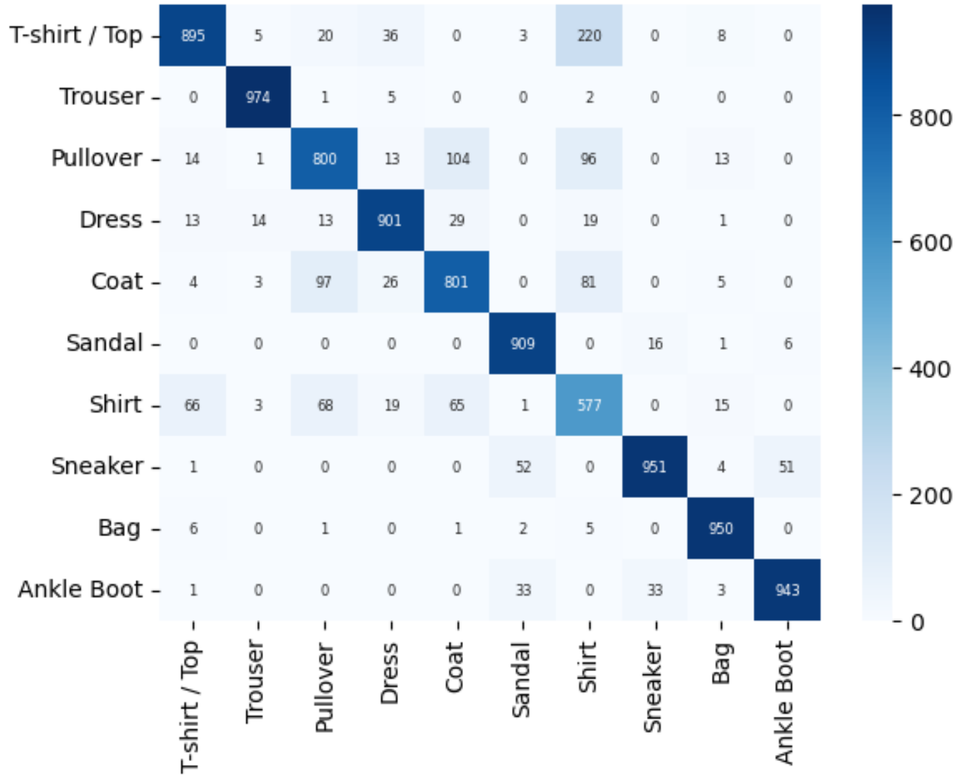
KNN

Accuracy: 86.3%

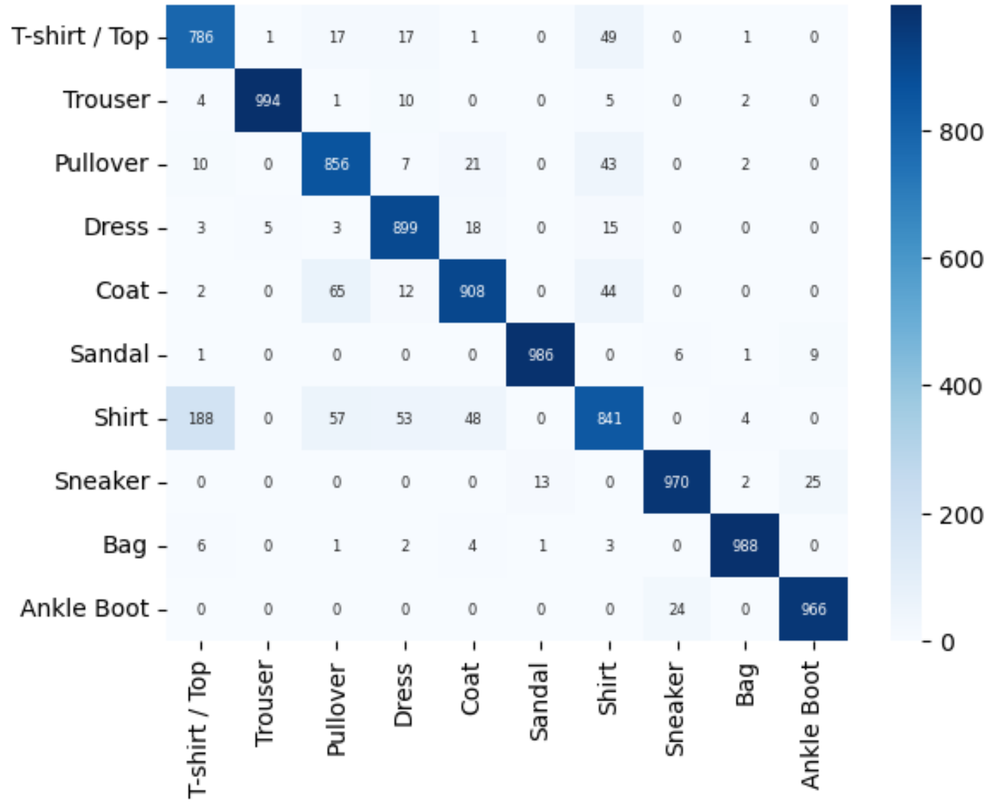


Confusion matrices

KNN



CNN

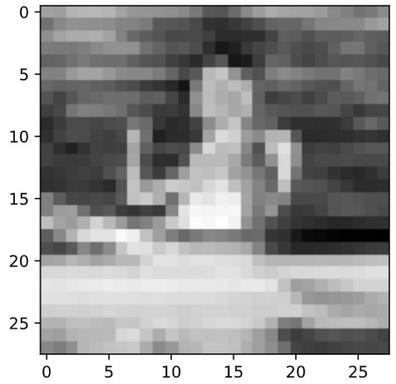


T-Shirt/Top vs. Shirt problem

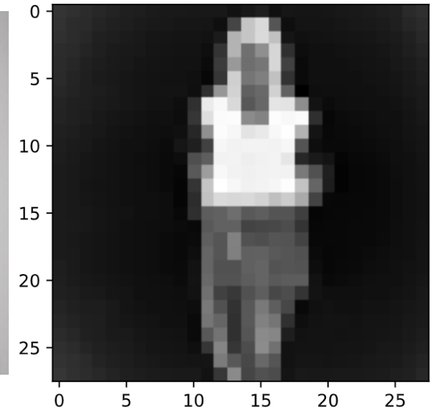
Our Team

CNN quickly reaches its limit when dealing with pictures of people wearing clothes

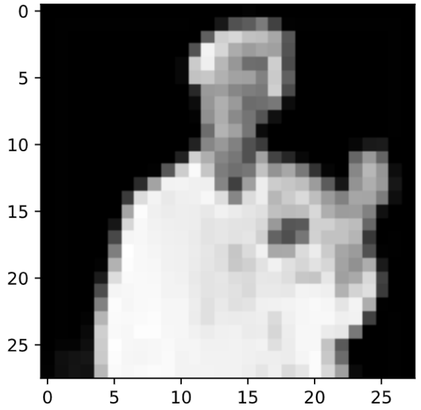
Ole Decker Shirt



Heinrike Gilles Trouser



Bastian Mucha Sandal



Anastasia Warken Ankle Boot