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NPTEL Week-2 Live Session

on Machine Learning and Deep Learning - Fundamentals and Applications (noc24_ee146)

A course offered by: Prof. Manas Kamal Bhuyan, IIT Guwahati

Week-1 practice questions: Bayes minimum error and risk classifier, discriminant function

By

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$\Sigma_i = \sigma^2 I$ = $\begin{bmatrix} \sigma^2 & & \\ & \sigma^2 & \\ & & \sigma^2 \end{bmatrix}$ = independence (statistical)

Σ_c

$\vec{a} \cdot \vec{b} = 0 \rightarrow$ orthogonal to each.

PCA

$\Sigma^{-1}(\mu_1 - \mu_2)$

$\vec{x}_1 \cdot \vec{x}_2 = 0$

$\arg(\hat{x}_1, \hat{x}_2) = 90$

w_1 w_2 90° μ_1 μ_2

$\vec{x}_2 \in w_2$ $\vec{x}_1 \in w_1$

Vector projection

$\hat{i} \cdot \hat{j} = 0$

30° $3\hat{i}$

$\vec{x}_1$ $\vec{x}_2$ ... $\vec{x}_n$

$\begin{matrix} \vec{x}_1 \\ \vec{x}_2 \\ \vdots \\ \vec{x}_n \end{matrix}$ $\begin{bmatrix} \sigma_{11} & \sigma_{12} & \cdots & \sigma_{1n} \\ & \ddots & & \\ & & & \sigma_{nn} \end{bmatrix}$

$3\hat{i} \cos 90 = 0\hat{i}$

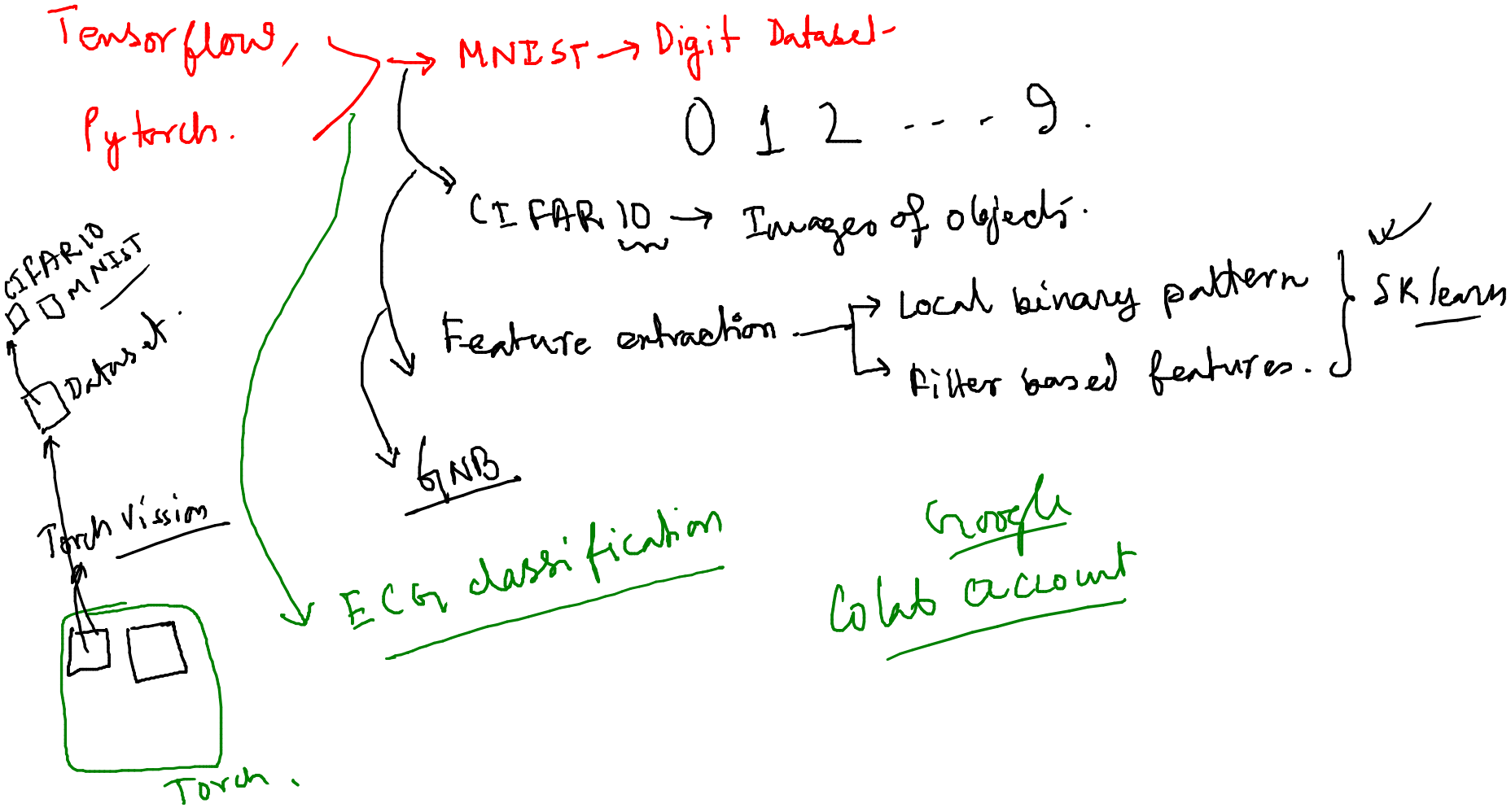
$\sigma_{11} = E\left((x-\mu)\cdot(x-\mu)\right) = E\left((x-\mu)^2\right) = \sigma_1^2$

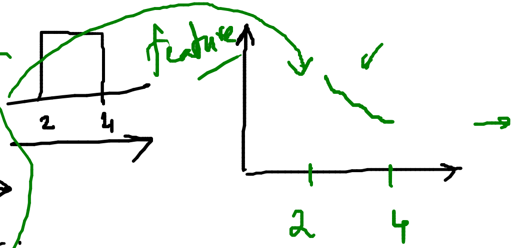
$\vec{a} \cdot \vec{b} = |\vec{a}| \cdot |\vec{b}| \cos\theta$

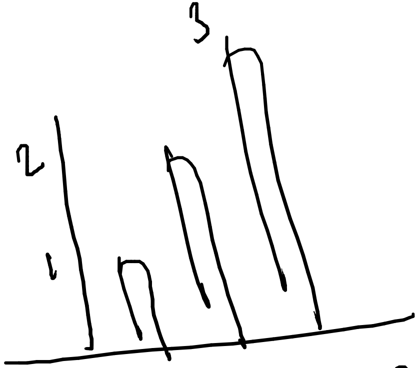
$5\hat{j} + 0\hat{i}$ 90° $\vec{v}_1 = 3\hat{i} + 0\hat{j}$

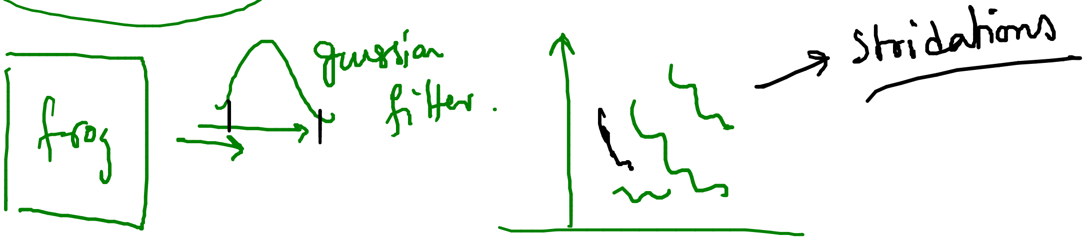
Vector Projection

$\vec{v}_1$ θ $\vec{v}_2$ $\vec{v}_1 \cos\theta$


Tensorflow,
Pytorch.
MNIST → Digit Dataset-
0 1 2 ... 9.
CIFAR10 → Images of objects.
Feature extraction
Local binary pattern
Filter based features.
SK learn
GNB
CIFAR10
MNIST
Dataset.
Torch Vision
Torch.
ECG classification
Google
Colab account







$\sum |x(n)|^2 \rightarrow$ energy feature

$= 1^2 + 2^2 + 3^2$

Entropy $= -\sum x \log x$

$= -(1 \cdot \log 1 + 2\log 2 + 3\log 3)$

$e^{+j\theta}$ Real Img.

$= \cos\theta + j\sin\theta$.

$\square \xrightarrow{e^{j\theta}} \square + j\square$

Real Img.

$\rightarrow$ mod $= \sqrt{Re^2 + Img^2}$

1 → 4 feature

6000 —features→ (6000 x 4)

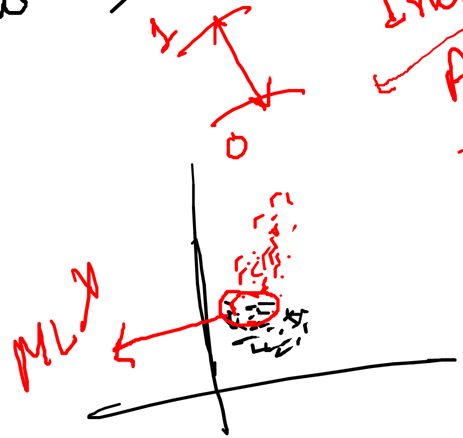
(1x4)

2000 → nd.array.

1-D vector.
2D - matrix.
ND - High Dimensional Tensors.

Normalization
Min-max
→ Z-score.

	P1	P2
Income	10LPA	10Cr
Age	23yrs	65yrs



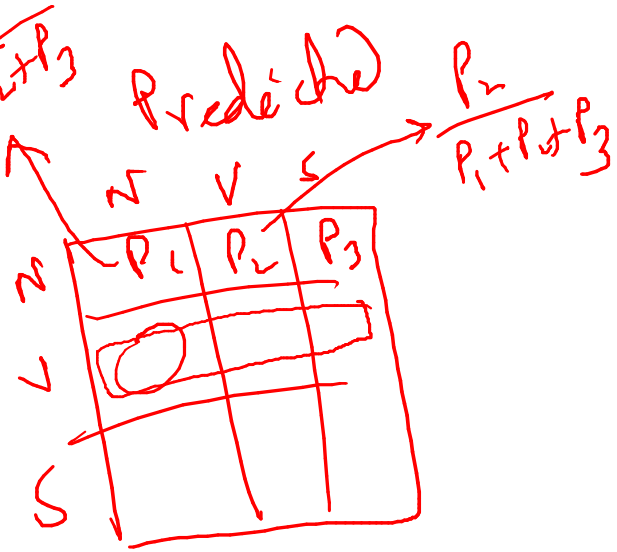
N, S, V → 3 classes.

True Labels.

Tr Data → GNB → Prediction: $\hat{y}$

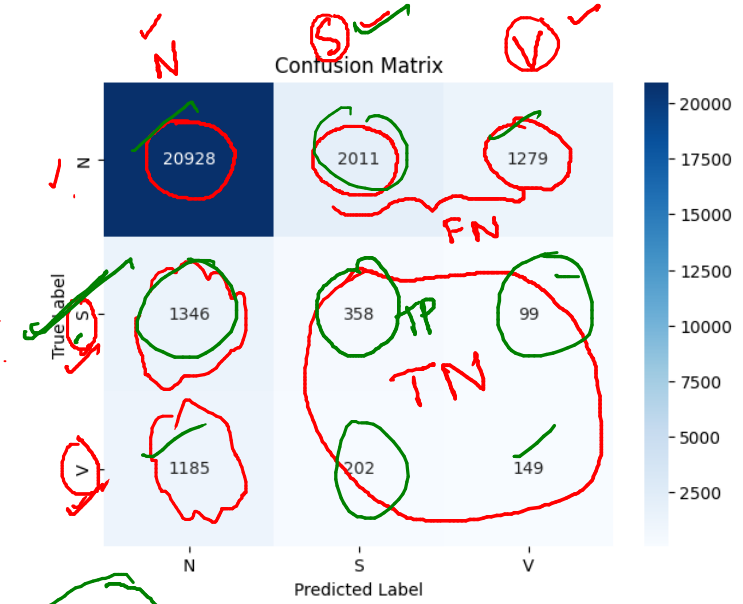
ML

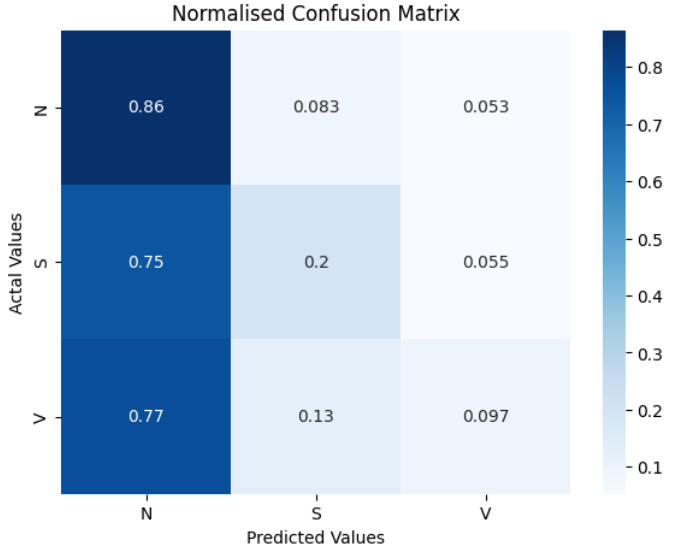
Actual



Conf mat $(y, \hat{y})$

(3x3)





FP = your True label is {S, V} ... neg class

But predicting as True class (N)

FP = 1346 + 1185

class N

True class = N

False class : {S, V}

TN = your original label neg class, Pred → Neg.

TP = 20928

FN = your True label is 'N' But you are predicting as {S, V}. negative class.

= 2011 + 1279.