Octave

Generation of a Sine wave

```
x = -10: 0.1 : 10;
y = Sin(x)
Plot( x, y)
title (" Simple 2-D Plot);
xLabel ("x")
ylabel ("sin(x)");
```

Python

Mathematical operations

```
2+2
↳ 4

>> 50 - 5 * 6
↳ 20

>> (50 - 5.0 * 6) / 4
↳ 5.0

>> 8 / 5.0
↳ 1.6

>> 17 / 3
↳ 5.66 . . . 7

>> 17 // 3.0     # Explicit floor division discards
↳ 5.0              the fractional Part

>> 17 % 3      # The % operator returns the
↳ 2               remainder of the division.
```

LISTS

→ append // To append
→ del a[0] // To delete

Tuples

t = 12345, 54321, "hello!"

```
>> t[0]
↳ 12345

>> t
 (12345, 54321, "hello!");
```

>> Tuples are immutable

Sets

```
a = ['A', 'B', 'A']
b = set(a)

>> b
↳ set(['A', 'B']).

>> 'A' in b
↳ True

>> 'C' in b
↳ False
```

Dictionaries

```
>> tel = {'jack': 4098, 'Sape': 4139}

>> tel['guido'] = 4127

>> tel

{'Sape': 4139, 'guido': 4127, 'jack': 4098}

>> tel['jack']
↳ 4098
```

If Statements

```
x = input(" Enter an Integer");
if x < 0:
    Print(" Negative");
elif x > 0:
... Print (" Positive ");
elif x = = 0:
... Print(" zero ");
...
```

While Statement

```
b = 1
While b < 5:
    Print b
    b = b + 1.
```

↳ 1
2
3
4

for Statement

```
words = ['cat', 'window', 'defenestrate']
>) for w in words:
... Print w, len(w)
```

↳ Cat 3

↳ window 6

↳ defenestrate 12.

Defining functions

```
>>> def fib(n):
        a, b = 0, 1
        while a<n:
        print a;
        a, b = b, b+a

>>> fib (2000)
↳ 0 1 1 2 3 5 8 13 21 34 55 89 144 233
377 610 987 1597
```

numpy

```
>>> import numpy as np
>>> a = np. array([2, 3, 4])
>>> a
array([2, 3, 4]).
```

06/01/2020

Visualization (objective)

Feature Representation

2 class

0	1
2	3
8	9

3 set of data is given. The Task is to discriminate b/w them.

→ Symmetry
→ Circle
→ holes
→ x - Symmetry
→ y - Symmetry

→ Contrast ratio
→ Aspect ratio
→ perimeter

Classification of 0 and 1 (TA)

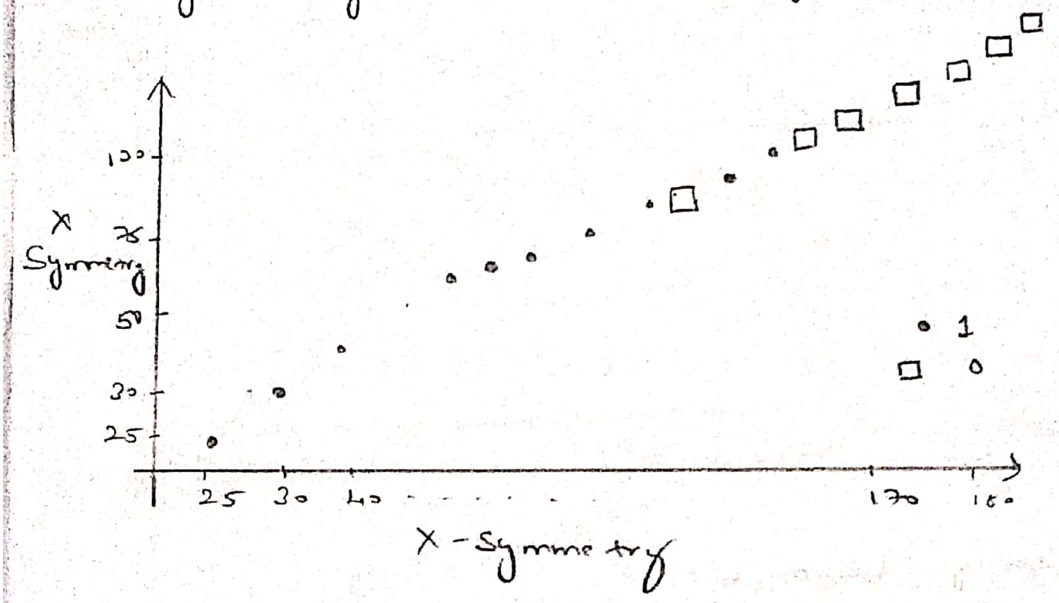
Features

Target accuracy : 96.0

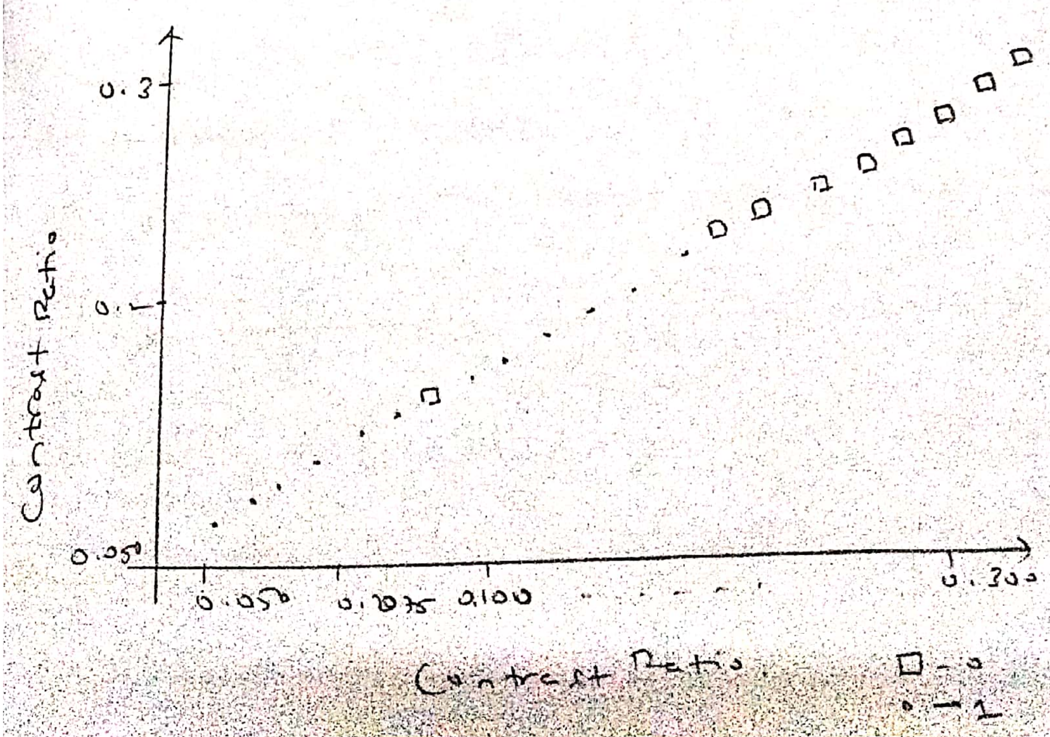
Current accuracy : 90.08%

Maximum accuracy : 90.8%

Y-Symmetry V/S X-Symmetry.



→ This can be classified by a straight line which discrete the values of zeros and one's (linearly separable)



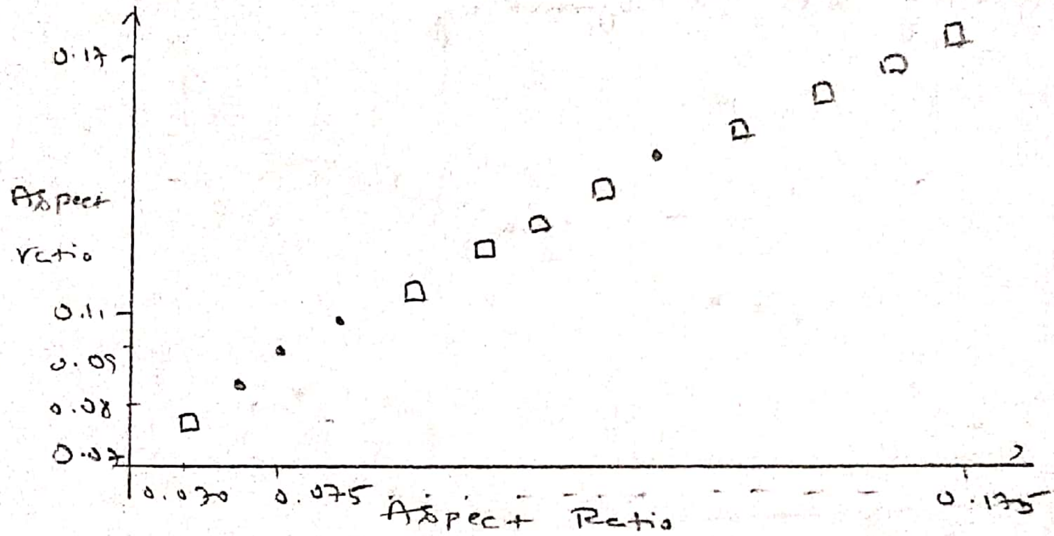
Classification of 2 and 3 (T2).

(Aspect ratio is more accurate)

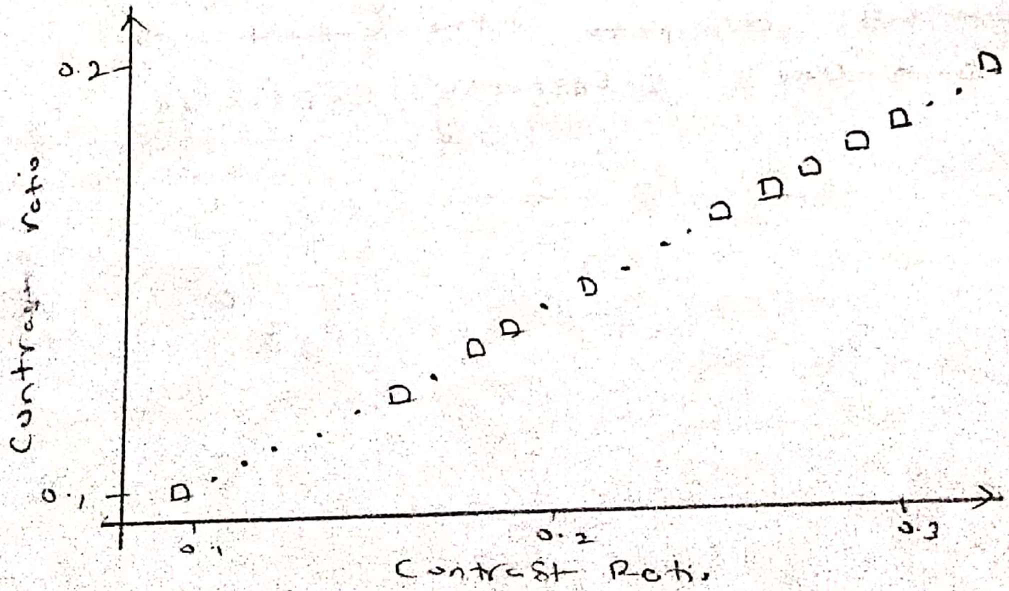
Target Accuracy : 70.0

Current Accuracy : 46.48%

Maximum Accuracy : 46.48%



→ Linearly Separable.

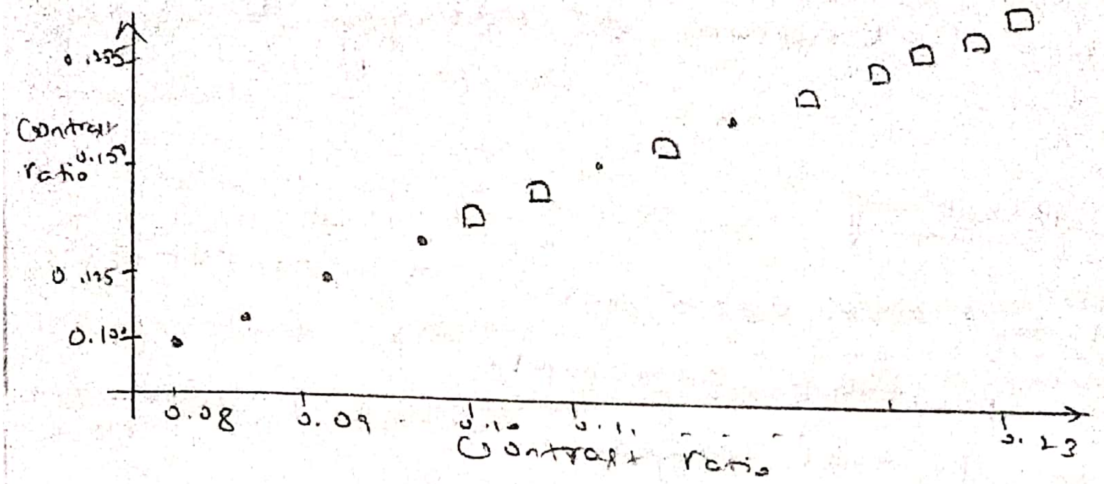


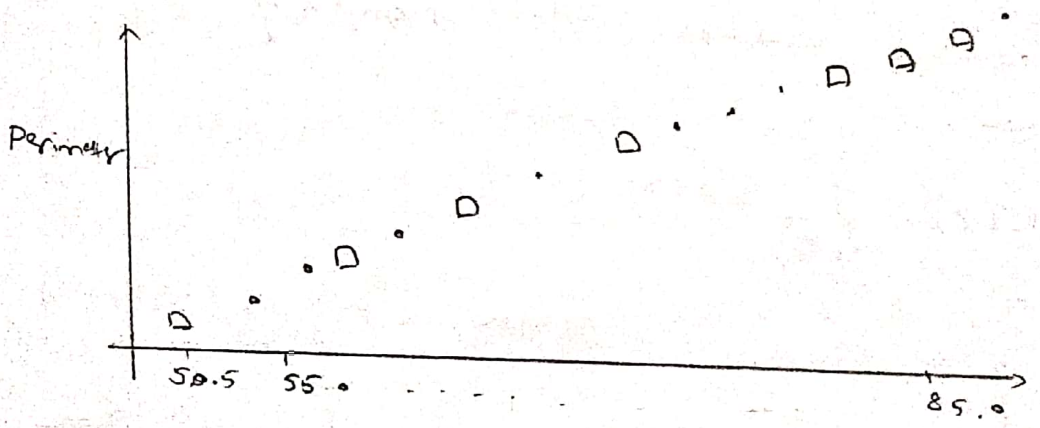
□ – 2

• – 3

T3 → Classification of 8 and 9

Contrast ratio v/s Contrast ratio





NOTE: In T1 classification, Since the accuracy is more i.e 96%. the way of classifying the zero's and one is very Easy and it can be achieved by simple Line which discrete the 2 clusters of data separately to classify them as zero's and one's (linearly separable).

Website : seeing-theory.brown.edu.

Scatter plot (Experiment 2 in vlab)
(nature of underlying distribution)

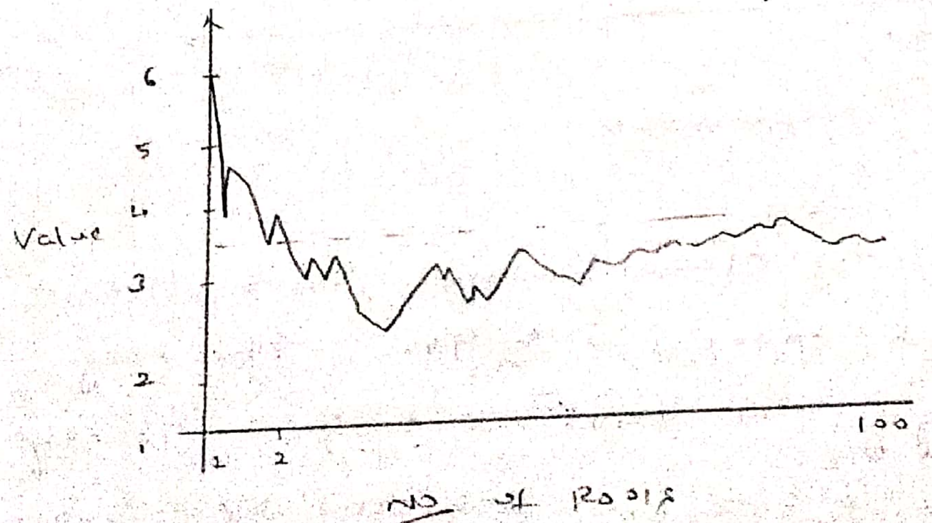
Basic Probability

Expectation : The expectation of a random variable is a number that attempts to capture the center of that random variable's distribution.

→ It is the Probability-weighted sum of all possible values in the random variable Supports

$$E[X] = \sum_{x \in X} x P(x)$$

Rolling a die for 100 times



Variance: The variance is the avg value of the squared ~~difference~~ b/w the random variable and its expectation.

$Var(x) = E[(x - E[x])^2]$.

__Random Variables__ : It is a function that assigns a real number to each outcome in the probability space.

__Discrete and Continuous__

if x is a discrete random variable, has a ~~finite~~ (on countable number of possible values. then there exists unique non-negative functions, f(x) and F(x), such that the following are true:

$P(X = x) = f(x)$

$P(X < x) = F(x)$

p.d.f → f(x)

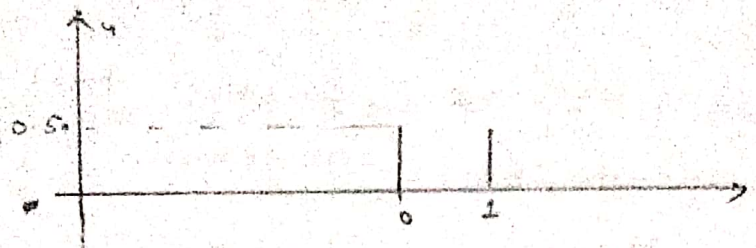
c.d.f → F(x)

A Bernoulli random variable takes the value 1 with probability of p and the value 0 with probability 1-p.

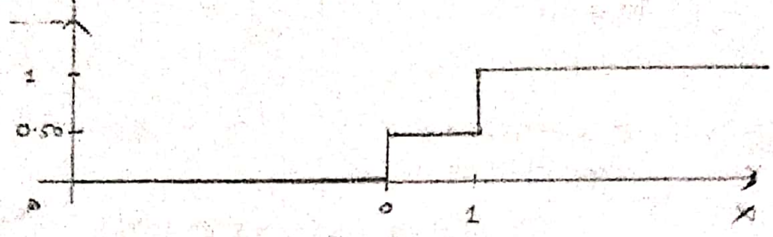
for tossing a coin p = 0.50

PMF	mean	variance
$f(x;p) = \begin{cases} p & \text{if } x = 1 \\ 1-p & \text{if } x = 0 \end{cases}$	p	p(1-p)

Pdf.



CDF:



Binomial Distribution

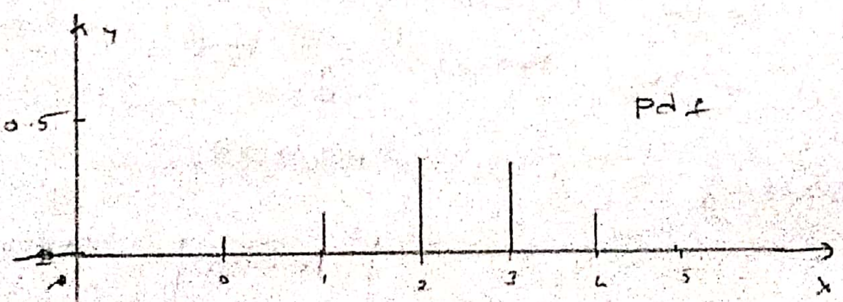
A binomial random variable is the sum of n independent Bernoulli random variable with parameter p.

PMF	mean	variance
$f(x; n, p) = {}^{n}C_{x}\, p^{x} (1-p)^{n-x}$	np	$np(1-p)$

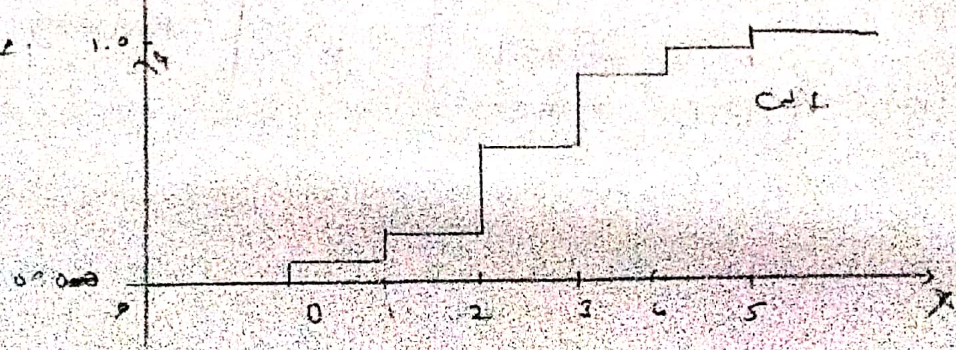
For $n = 5.0$

$p = 0.50$

Pdf:



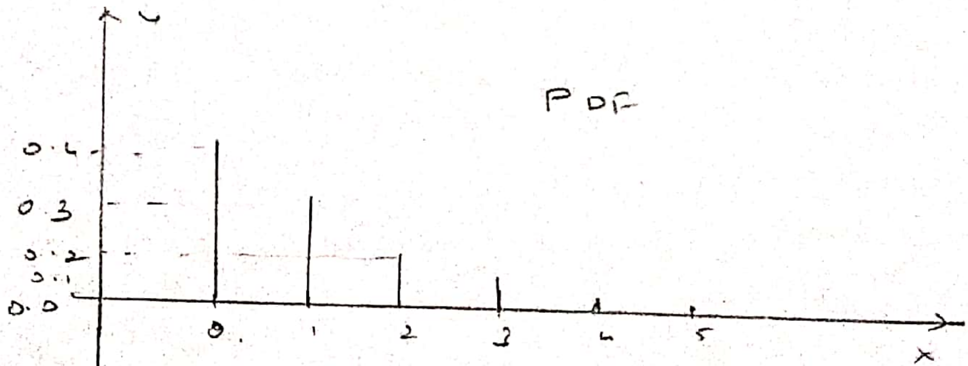
cdf:

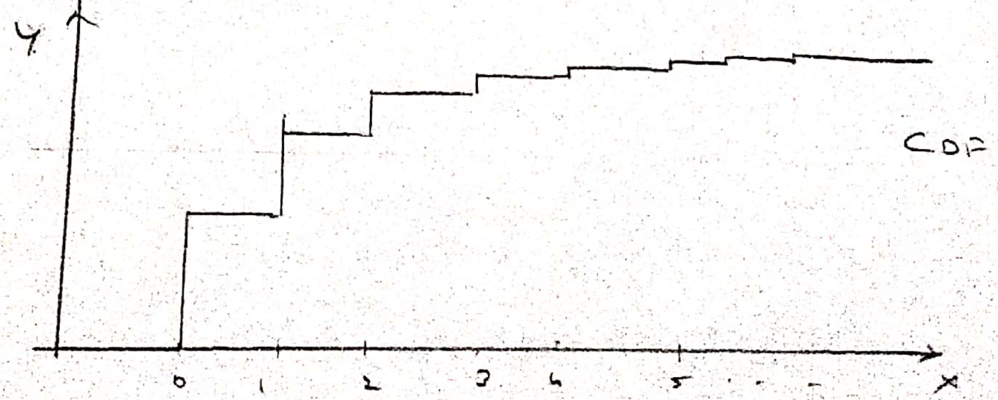


Geometric Distribution: A geometric random variable counts the number of trials that are required to observe a single success, where each trial is independent and has success probability p. For ex: this distribution can be used to model the number of times a die must be rolled in order for a six to be observed.

PMF	mean	variance
$f(x;p) = (1-p)^x p$	$1/p$	$\frac{1-p}{p^2}$

for $p = 0.50$.





Poisson

~~A~~ Poisson random variable counts the number of events occuring in the fixed interval of time or space, given that these events occur with an average rate λ. This distribution has been to model events such as meteor showers and goals in a soccer match.

PMF	mean	variance
$f(x;\lambda) = \frac{\lambda^x e^{-\lambda}}{x!}$	λ	λ.