① What if $P(x_i/y) = 0$?

- Smoothing - Add a constant in Numerator & Denominator

$$P(x_i/y) = \frac{\#(x_i \cap y) + 1}{\# y + 1}$$

② What if feature variables are continuous?

$X_1 = [0, 1]$ or $[0, 1, 2]$

$0, 1, 2, \_ \_ \_ 100$

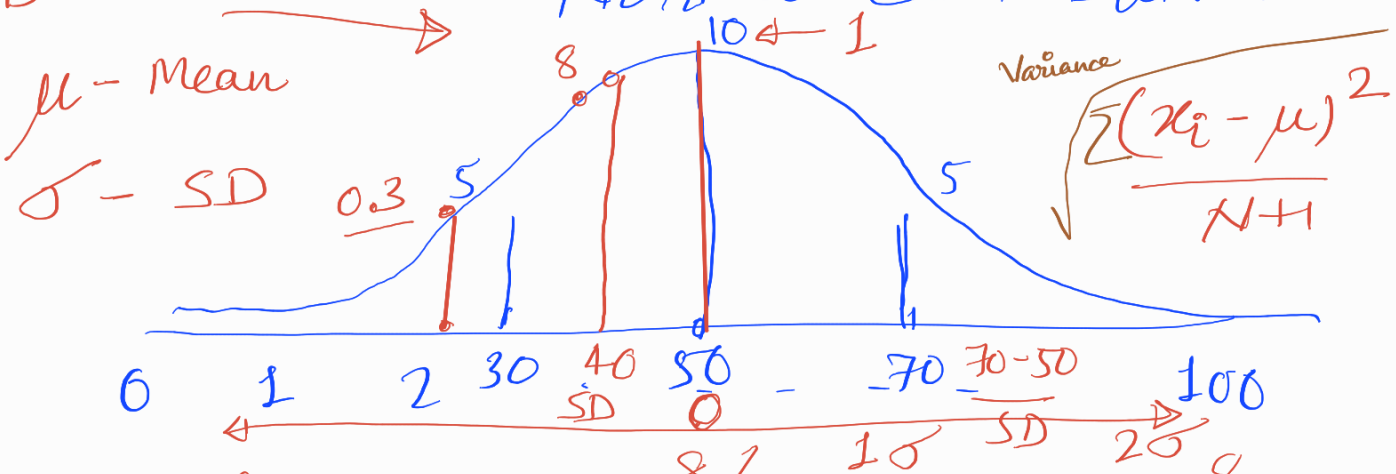
$P(X_1 = 0/Y = 0) \ldots P(X_1 = 100/Y = 0)$

Assumption : X_i values come from Normal destribution

Bell Curve

μ - Mean

σ - SD



$P(X_i = 40) = 8/\#\text{examples} = \frac{8}{10} = 0.8$

$p(x_i = 25.5) = 0.3$

$\frac{X_i - \mu}{SD} = \frac{1}{1} = 1$

Z - Score

$= \frac{x_i - \mu}{\sigma}$ ← zero mean

x_i / SD ratio

x_i	$x_i - \mu_{x_i}$
1	-1
2	0
3	1

$\mu_{x_i} = 2$

$x_i - \mu = 2$

$SD = 1$

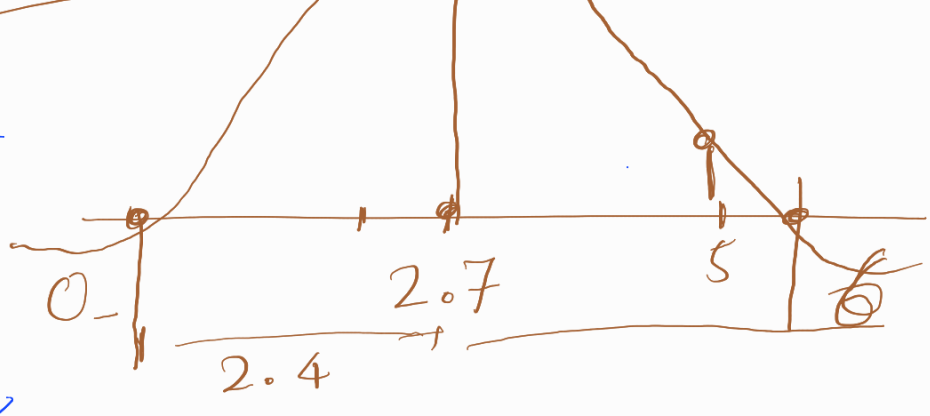
$= 2$

μ, σ, Z-score

X_1	$x_i - \mu$
1	-2.7
2	-2.7
3	.
.	.
1	2.7

$P(X_1 = 5)$

2
4
2
4
6



Find μ & σ

$= 2.7$

$= 2.4$

What if the feature variable are continuous?

(A) Values from the feature variable come from a normal distribution

(B) The distribution is defined by μ & σ ← Model parameters

(C) Calculate μ & σ

(D) Use μ & σ and apply it in the formula of Gaussian Distri. to find '$P(x_i)$' of an value x_i of X_i

How about $P(x_i / y)$?

$y = \{0, 1\}$

x_i = is continuous

$P(X_i = 1.2 / y = 0)$ {

take all examples where $Y=0$

& calculate μ_{x_i} & σ_{x_i} for only those examples where 'Y = 0'.

Use μ_{x_i} & σ_{x_i} to calculate

First sessional - Introduction

- Naive Bayes Classifier
- Bayesian Network
- Exact inference in Bayesian Network