- **Parametric Methods vs Non-Parametric Methods**

Machine Learning

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PARAMETRIC METHODS

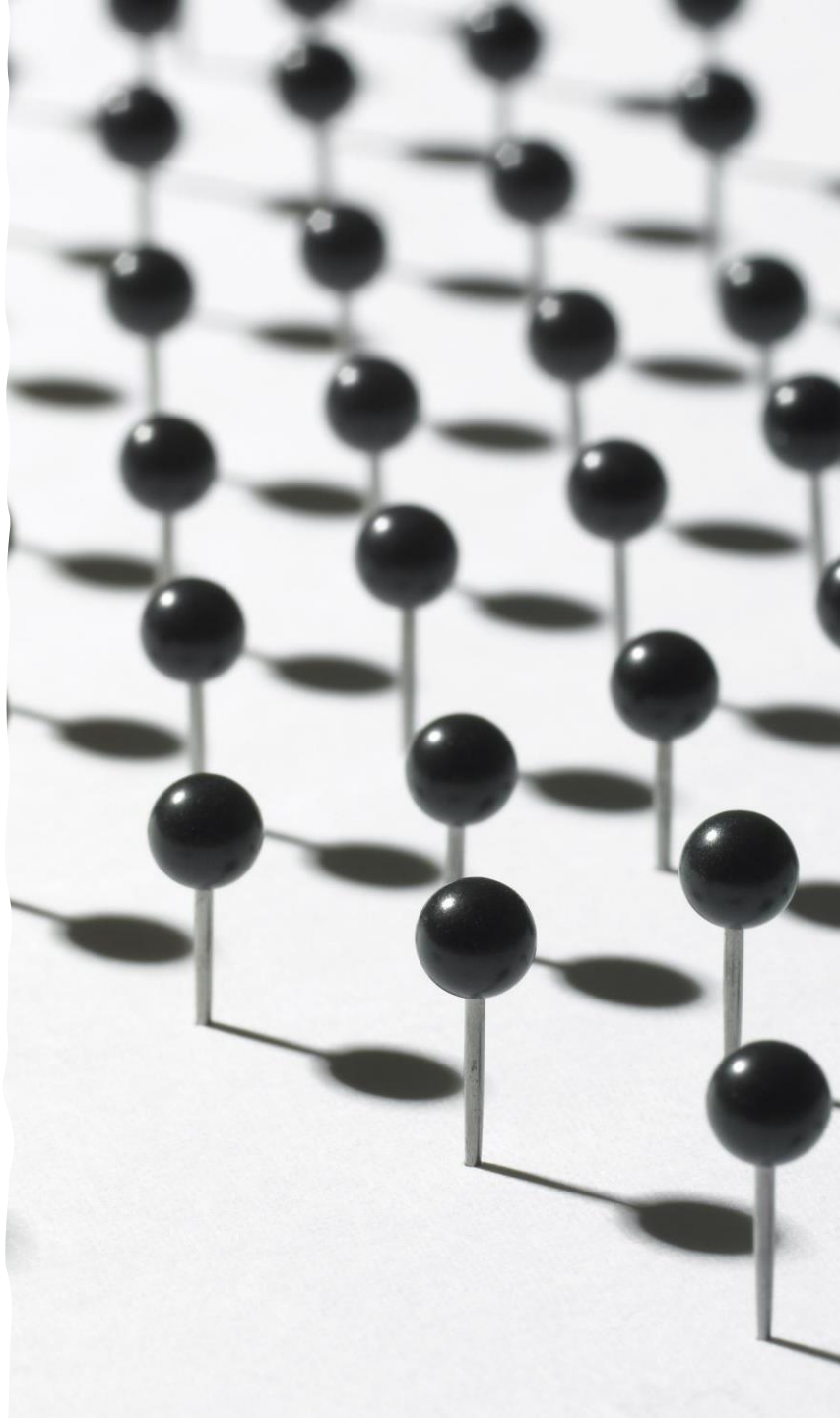
- The basic idea behind the parametric method is that there is a set of fixed parameters that uses to determine a probability model that is used in Machine Learning as well.
- Parametric methods are those methods for which we priory knows that the population is normal.
- Parameters for using the normal distribution is as follows:

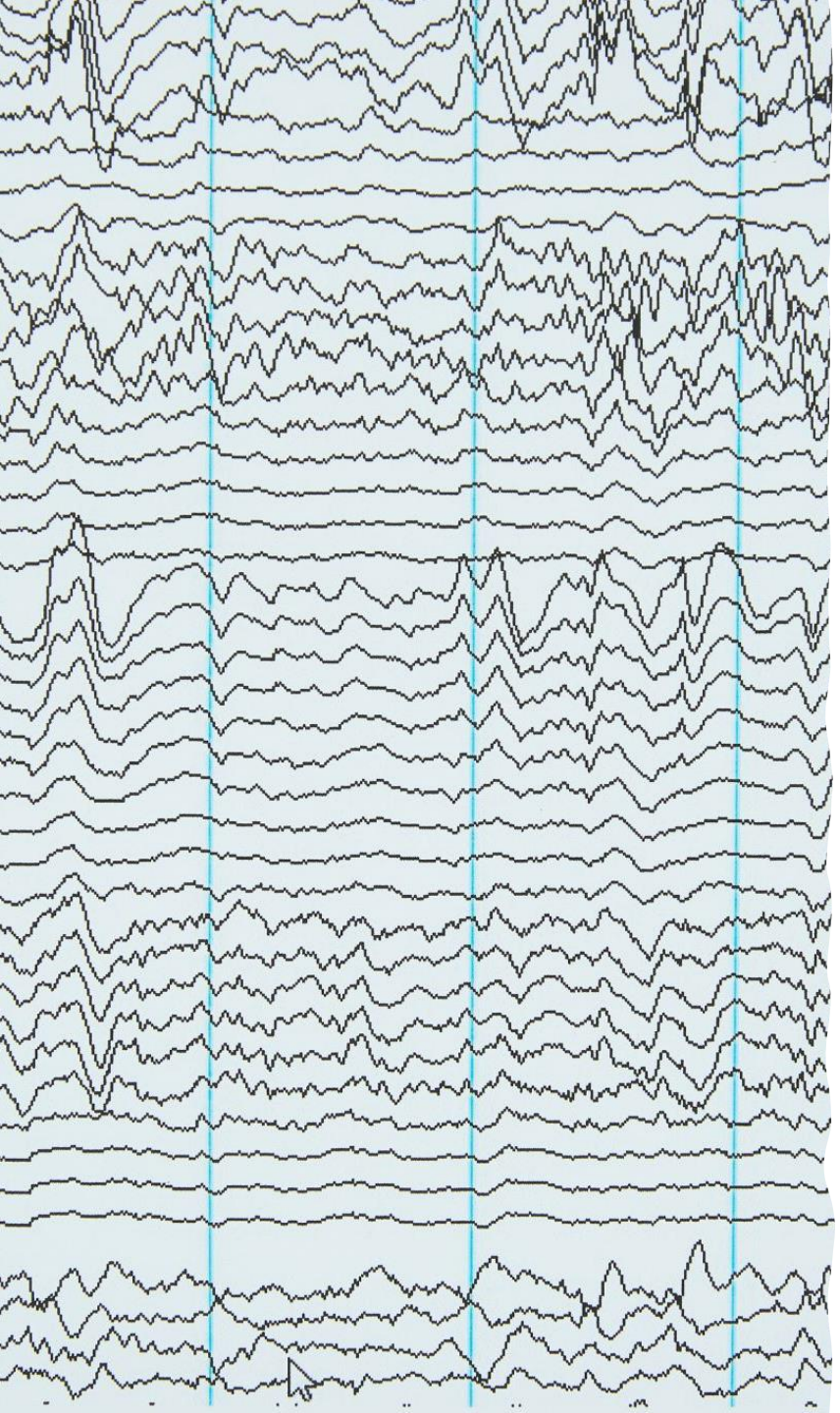
. Mean

. Standard Deviation

PARAMETRIC METHODS

- Eventually, the classification of a method to be parametric is completely depends on the presumptions that are made about a population.





PARAMETRIC METHODS

- There are many parametric methods available some of them are:
- Confidence interval used for – population mean along with known standard deviation.
- The confidence interval is used for – population means along with the unknown standard deviation.
- The confidence interval for population variance.
- The confidence interval for the difference of two means, with unknown standard deviation.

PARAMETRIC METHODS: MEAN

- Suppose that the entire population of interest is eight students in a particular class.
- For a finite set of numbers, the population standard deviation is found by taking the square root of the average of the squared deviations of the values subtracted from their average value.
- The marks of a class of eight students (that is, a statistical population) are the following eight values:

PARAMETRIC METHODS: MEAN,

$$2,\ 4,\ 4,\ 4,\ 5,\ 5,\ 7,\ 9.$$

These eight data points have the mean (average) of 5:

$$\mu = \frac{2+4+4+4+5+5+7+9}{8} = \frac{40}{8} = 5.$$

First, calculate the deviations of each data point from the mean, and square the result of each:

$$(2-5)^2 = (-3)^2 = 9 \qquad (5-5)^2 = 0^2 = 0$$
$$(4-5)^2 = (-1)^2 = 1 \qquad (5-5)^2 = 0^2 = 0$$
$$(4-5)^2 = (-1)^2 = 1 \qquad (7-5)^2 = 2^2 = 4$$
$$(4-5)^2 = (-1)^2 = 1 \qquad (9-5)^2 = 4^2 = 16.$$

VARIANCE, STANDARD DEVIATION

The variance is the mean of these values:

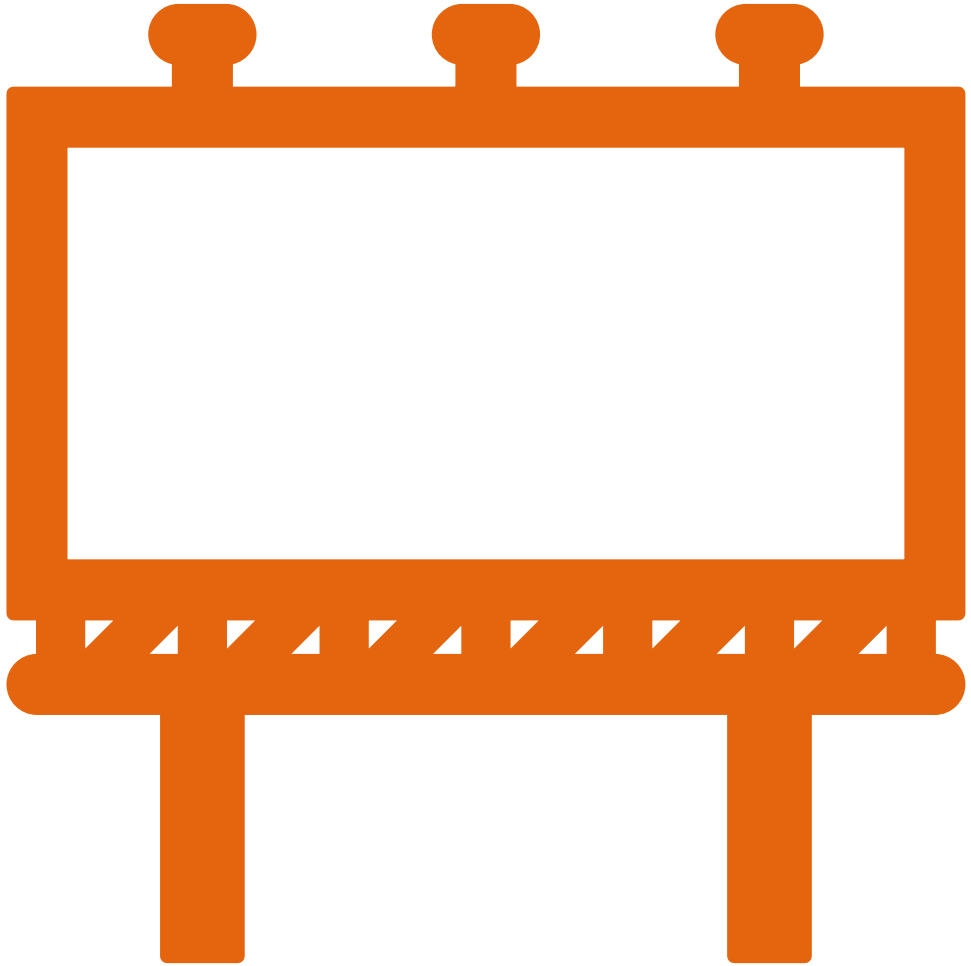
$$\sigma^2 = \frac{9+1+1+1+0+0+4+16}{8} = \frac{32}{8} = 4.$$

and the *population* standard deviation is equal to the square root of the variance:

$$\sigma = \sqrt{4} = 2.$$

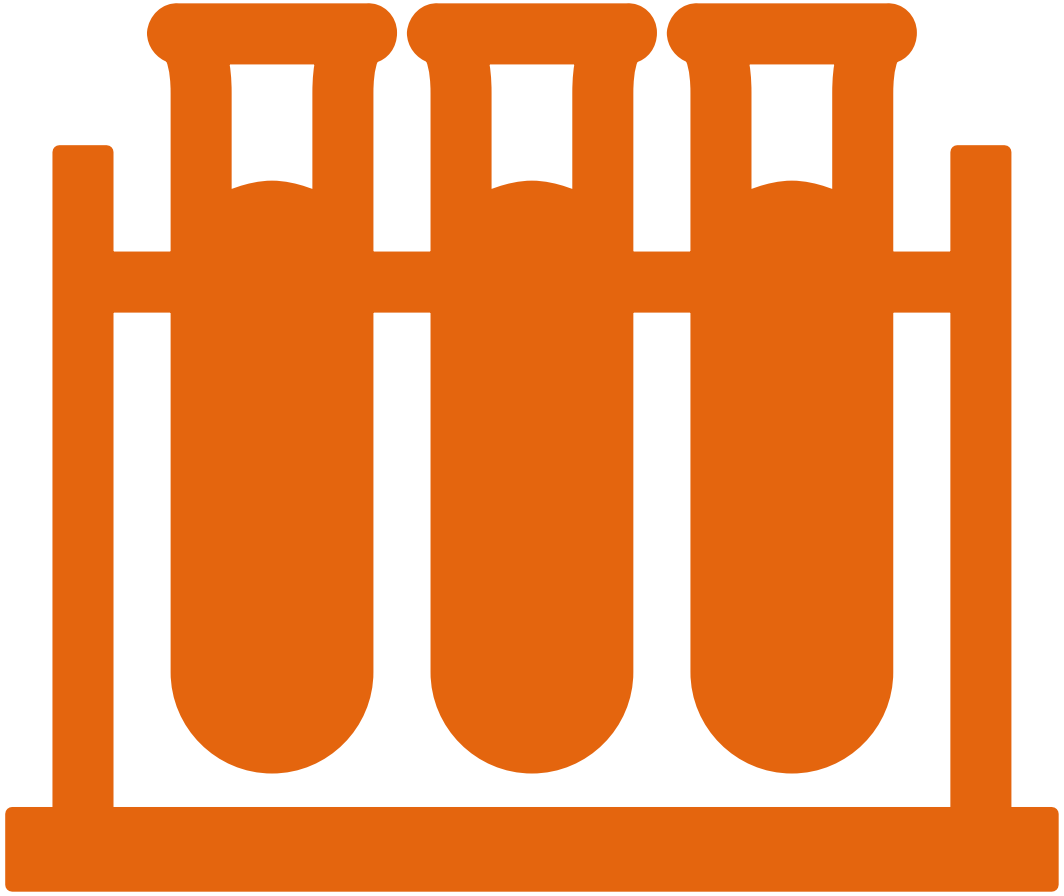
NONPARAMETRIC METHODS

- The basic idea behind the parametric method is no need to make any assumption of parameters for the given population or the population we are studying.
- In fact, the methods don’t depend on the population. Here there is no fixed set of parameters are available, and also there is no distribution (normal distribution, etc.) of any kind is available for use.
- This is also the reason that nonparametric methods are also referred to as distribution-free methods.



NONPARAMETRIC METHODS

- Nowadays Non-parametric methods are gaining popularity and an impact of influence some reasons behind this fame is:
- The main reason is that there is no need to be mannered while using parametric methods.
- The second important reason is that we do not need to make more and more assumptions about the population given (or taken) on which we are working on.
- Most of the nonparametric methods available are very easy to apply and to understand also i.e. the complexity is very low.



NONPARAMETRIC METHODS

- There are many nonparametric methods are available today but some of them are as follows:

- Spearman correlation test
- Sign test for population means
- U-test for two independent means

Parametric Methods	Non-Parametric Methods
Parametric Methods uses a fixed number of parameters to build the model.	Non-Parametric Methods use the flexible number of parameters to build the model.
Parametric analysis is to test group means.	A non-parametric analysis is to test medians.
It is applicable only for variables.	It is applicable for both – Variable and Attribute.
It always considers strong assumptions about data.	It generally fewer assumptions about data.
Parametric Methods require lesser data than Non-Parametric Methods.	Non-Parametric Methods requires much more data than Parametric Methods.
Parametric methods assumed to be a normal distribution.	There is no assumed distribution in non-parametric methods.

DIFFERENCE

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Here when we use parametric methods then the result or outputs generated can be easily affected by outliers.	When we use non-parametric methods then the result or outputs generated cannot be seriously affected by outliers.
Parametric Methods can perform well in many situations but its performance is at peak (top) when the spread of each group is different.	Similarly, Non-Parametric Methods can perform well in many situations but its performance is at peak (top) when the spread of each group is the same.
Parametric methods have more statistical power than Non-Parametric methods.	Non-parametric methods have less statistical power than Parametric methods.

THANK YOU