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Measures of Central Tendency and Measures of Dispersion in Graphical Demonstration

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Abstract: Quite possibly the most helpful insights for instructors is the middle purpose of the information. Realizing the middle point answers such inquiries as, "what is the center score?" or "which understudy achieved the normal score?" There are three key insights that measure the central tendency of information: the mode, middle, and mean. Every one of the three give experiences into "the middle" of a distribution of information focuses. These measures of central tendency are characterized distinctively in light of the fact that they each portray the information in an alternate way and will regularly mirror an alternate number. Every one of these insights can be a decent proportion of central tendency in specific circumstances and an unseemly measure in different situations. The following segment portrays every measurement and the two its instructive worth and its impediments.

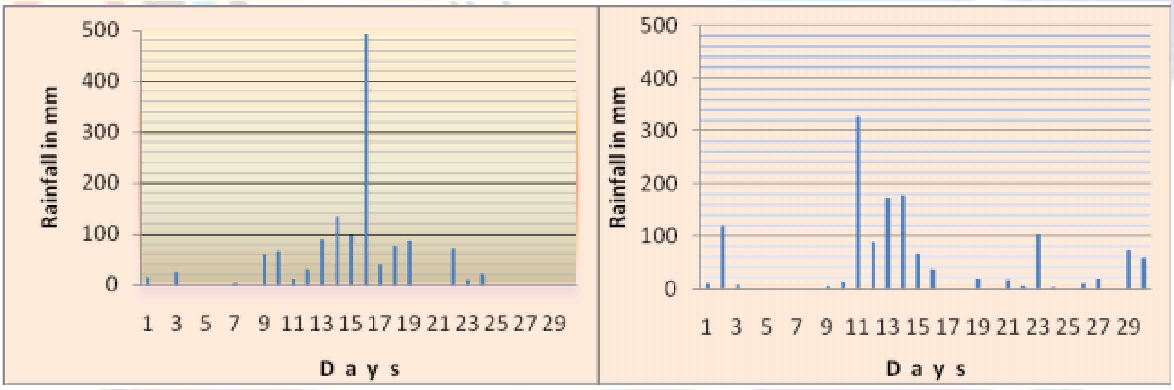
INTRODUCTION

Distribution of any topographical characteristic called Xi where I = 1,2,3, ... , n and n means the quantity of perceptions, is at first described measurably by estimating its two measurements. To start with, the focal propensity that is subject to the examination of concentration of the estimations of perceptions in the distribution. In factual sense, this assertion is said to be the concentration of n things in Xi variable. Furthermore, the dispersion that shows the width of distribution. It is similarly significant measurement in factual investigation on the grounds that, a few times, there is same estimation of focal propensity of two factors however dispersion may change or same magnitude of dispersion yet focal pattern may contrast. For instance, the two sets of day by day precipitation for the long periods of April and May 2004 in Cherrapunji have same magnitude of normal precipitation (a most recognizable proportion of focal propensity) called mean, while the scopes of distribution (a distinction of greatest and least estimation of information – arrangement) are distinctive as it fluctuate from 0 to 492.2 mm in the period of April and from 0 to 327.6mm in the long stretch of May. It shows diverse level of dispersion notwithstanding a similar estimation of their mean. So the idea of these two distributions is not the same as each other indicating contrasts in distributions. Accordingly, the investigation of focal worth and dispersion are fundamental measurements in comprehension the distributional qualities of an arrangement/variable.

Daily Rainfall of the month of April and May 2004 at Cherrapunji

Days	April 2004	May 2004
1	15.2	10.1
2	0	119.1
3	25.8	8.6
4	0	0
5	1.4	0
6	1.4	1.4
7	2.7	0
8	0	0
9	60.6	6.2
10	66.8	12.6
11	11.2	327.6
12	29.4	90

13	89.2	172
14	135.1	175.8
15	98.3	66.8
16	492.2	36.3
17	39.5	0
18	76	0
19	87.3	18.6
20	0	0
21	0	16.4
22	70.3	4.4
23	9.2	104.6
24	20.2	2.8
25	0	0
26	0	10.2
27	0	19
28	1.5	0
29	0	73.4
30	1.6	59
Total	**1334.9**	**1334.9**
Mean	**44.49**	**44.49**



COMPARISON OF DAILY RAINFALL PATTERN OF APRIL AND MAY MONTHS OF THE YEAR 2004 IN CHERRAPUNJI

In this module, the details about the measures and application of central tendency are given, while the dispersion of a data series would be described separately in another module.

MEASURES OF CENTRAL TENDENCY

Central tendency is a solitary central worth that endeavors to portray a bunch of information by recognizing the centrality (Central Value) inside that set of information containing n perceptions/things. Mean is notable proportion of central tendency that is frequently called 'math normal'. Yet, there are others likewise as the medium and the mode. When distribution is more slanted, mean isn't all around spoke to estimation of the arrangement. Sorts of factors decide the utilization of various types of central propensities. At the point when nature of distribution is unique, its scaling is utilized according to necessity and, in like manner, utilized for proper measures.

2 Types of Variables and Used of Central Tendency

Type of variables	Best measure of central tendency
Nominal	Mode
ordinal	medium
Interval/ratio (not skewed)	mean
Interval/ratio (skewed)	Medium

It is to note that skewness of distribution that would be described in the separate module, determines the use of best measure of central tendency

CONCEPT OF THE BALANCE SCALE

We have three different ways of defining the centre of a distribution, called measures of central tendency. Centre of the distribution may define in the sense of its 'mid value' called mean. Secondly it is defined as 'mid position' where total number of observation items of a distribution is divided into two halves based on the 50% observation on one side and remaining on the others. It is {(n+1)/2}, the value falls at this position of distribution is called median. Lastly, the location of the most frequent value occurring in a distribution is called mode. In frequency distribution, the class of the highest frequency is called model-class where mode lies.

MEASURES OF MEAN

As portrayed over, the mean is the mid estimation of the arrangement having a perception that shows balance purpose of the estimations of perceptions in a distribution. For instance, the mean every day precipitation from a given arrangement of information of consistent precipitation (mm) of 21 days in the month of April 2004 at Cherrapunji is determined by finding mid worth. It adjusts the esteem scale as tallied it by summarizing all the estimations of precipitation if every individual day (called perception, that are N=21) and separated it by number of perceptions. It is just figured as.

$X^* = \{X1+X2+X3 + ... + X n)/N\}$

$= (\sum Xi/N), i = 1,2,3, ... , n$ … …

where X* is mean, Xi is daily rainfall of total number of n observations. In above example, rainfall total is 1098 mm with a number of 21 days. It means that mean daily rainfall is 1098/21 = 52 mm. In fact, it is the way to find out the point of distribution at which value of distribution balances. We must know about the characteristics of mean value in distribution. It has two main features. First, it is dependent on least sum of absolute deviation being balancing point of distribution. It is statistically written as

$\sum(Xi – X^*) = \text{minimum}$ … … …

and secondly, it also least sum of squared deviation, that is

$\sum(Xi – X^*)\ 2 = \text{minimum}$ …

Mean and Absolute and Squared Deviations of Daily Rainfall at Cherrapunji

Sl no	Rainfall (X)	Mean (X*)	Absolute Deviation (X-X*)	Squared Deviation (X-X*)2
(1)	(2)	(3)	(4)	(5)
1	15	52.29	-37.09	1375.6681
2	26	52.29	-26.49	701.7201
3	5	52.29	-47.29	2236.3441
4	1	52.29	-50.89	2589.7921
5	3	52.29	-49.59	2459.1681
6	61	52.29	8.31	69.0561
7	67	52.29	14.51	210.5401
8	11	52.29	-41.09	1688.3881
9	29	52.29	-22.89	523.9521
10	89	52.29	36.91	1362.3481
11	135	52.29	82.81	6857.4961
12	98	52.29	46.01	2116.9201
13	249	52.29	196.71	38694.8241
14	40	52.29	-12.79	163.5841
15	76	52.29	23.71	562.1641
16	87	52.29	35.01	1225.7001
17	70	52.29	18.01	324.3601
18	9	52.29	-43.09	1856.7481
19	20	52.29	-32.09	1029.7681
20	4	52.29	-48.29	2331.9241
21	2	52.29	-50.69	2569.4761
Sum	**1097.80**		**924.2700**	**70949.9421**

The amount of total deviation and the amount of squared deviation are 924.27 mm and 70949.94 mm separately (segments 4 and 5 in Table - 3). These are the littlest qualities as determined subsequent to going astray downpour from its mean, for example 52.29 mm. In the event that this arrangement of precipitation information is digressed from another worth either lesser or higher than 52.29 mm, the estimations of the amount of deviation will be consistently be higher than the previous qualities. That is the reason, mean is the central estimation of the arrangement demonstrating a worth equilibrium.

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Extension of the Concept of Mean

In addition, if we add one observation in any series of n observations and calculate mean of this series containing n+1 observation as

X*n+1 = (X1+X2+X3+ ... + Xn + Xn+1)/(n+1) . …

Its simplification becomes

X*n+1 = (n/n+1).X*n + (1/n+1).Xn+1 ,

where Xn+1 is value of newly added observation. Similarly, if a large number of observations are added to a series, it will be difficult to arrange the data in the series of individual observations. A frequency distribution as made in which mid value of the class is weighted by the frequencies, fi . The sum of the weighted product is divided by the size of data to get the mean.

X* = (f1m1, + f2m2 + f3m3 + ... + fcmc) / (f1+f2+f3 + ...+fc)

X* = ∑fimi /∑fi

Where c is number of classes in the recurrence distribution, mc is mid estimation of the class also, fc is recurrence of the class c. Such idea of relegating weight, Wi , either for every individual perception (Wi X I) or for each class in recurrence distribution (fimi) is called weighted mean which is determined by given recipe

X* = (w1m1, + w2m2 + w3m3 + ... + wcmc)/(w1+w2+w3 + ...+wc)= ∑wimi/∑wi

Computing mean by coding strategy

In frequency distribution table where class-timespan and each class is same, rather than midpoint esteem, mi , one can accept a worth known as expected to be mean, Xa, and deviations of expected mean from midpoint estimation of each class (mi–Xa) are utilized to disentangle the strategy of count. Consequently, mean of a recurrence is conceptualized as: 'Genuine mean of an arrangement, X*, is 'the result of expected to be mean, Xa, in addition to the amount of the results of deviation, d, and recurrence f of each class that is at last the partitioned by number of perception n'. It is figured as

X* = Xa + (1/n ∑fidi), where di = (m i–Xa)

Mean of the same series of data is calculated by applying simple arithmetic mean and weighted mean techniques

Application of Central Tendency

Indeed, use of various kinds of central tendency depends on their benefits. There are numerous employments of mean, middle and mode for portrayal of concentration of recurrence in distribution. Notwithstanding, significant employments of central tendency are given underneath:

As number-crunching mean is the agent of mid estimation of a distribution, the total of deviation of qualities from mean is equivalent to zero, i.e., ∑(X-X*) = 0. Furthermore, the amount of the squared deviation of distribution turns into the littlest incentive as ∑(X-X m) 2 = least. Because of this property of math mean, it helps in ascertaining dispersion, skewness and furthermore used to process last square property of fitting relapse line in distribution.

In basic time arrangement information, if there is information missing of a specific year, math mean helps in filling hole of this information. For instance, a long term precipitation information with the information missing of long term is given with the mean of the entire arrangement, at that point precipitation of missing year is determined by discovering all out of 10 years and given 9 a long time precipitation information. Distinction of such precipitation information should be precipitation of the missing year.

Conclusion

As mathematical mean is the normal of proportions of changes of geological credits, it means the information arrangement may increment at accumulate rate over the long run. For instance, definition of build development pace of populace from base year P0 to current year P1 is likewise founded on mathematical movement. Moving average is used to visualize the general trend of the fluctuating long data series. As exemplified earlier in the discussion that smoother trend can be seen by transfer of series on the basis of moving average that controls the fluctuating trend. Progressive or rolling average is having its use in checking the consistency of data recorded at a place or determining the years in which fast fluctuation and changes in the nature of trend took place.

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REFERENCES

1. Swinscow TD, Campbell MJ. Statistics at square one. 10th ed. (Indian). New Delhi: Viva Books Private Limited; 2003.
2. Sundaram KR, Dwivedi SN, Sreenivas V. Medical statistics principles and methods. 1st ed. New Delhi: B.I Publications Pvt Ltd; 2010.
3. Gravetter FJ, Wallnau LB. Statistics for the behavioral sciences. 5th ed. Belmont: Wadsworth – Thomson Learning; 2000.
4. Dawson B, Trapp RG. Basic and Clinical Biostatistics. 4th ed. New York: Mc-Graw Hill; 2004.
5. Alexander, Robert D., Andrew L. Gatlin, Gregory Meehan, and David 0. Williams. "Graphical Proper ties of Sequences and Equations." Mathematics Teacher 70 (November 1977) :665-72.
6. Ghyka, Matila. The Geometry of Art and Life. New York : Dover Publications, 1977.
7. Huntley, H. E. The Divine Proportion. New York: Dover Publications, 1970.
8. Wellen, Darrell. "More Discoveries in Linear Al gebra." Mathematics Teacher 69 (January 1976)