Day 4 of #100daysofmathandstats: Estimates of Variability

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Outline

- Variance
- Standard deviation
- Mean absolute deviation
- Mean absolute deviation from the median
- Range
- Percentile
- Interquartile Range

Variance (Mean squared error - MAE)

The sum of squared deviations from the mean divided by n – 1 where n is the number of data values.

$$\text{Variance} \qquad = s^2 = \frac{\sum_{i=1}^{n} (x_i - \overline{x})^2}{n-1}$$

Standard deviation (SD)

The square root of the variance.

$$\text{Standard deviation} = s = \sqrt{\text{Variance}}$$

Mean absolute deviation (L1-norm/ Manhattan norm)

The mean of the absolute values of the deviations from the mean.

$$\text{Mean absolute deviation} = \frac{\sum_{i=1}^{n} |x_i - \overline{x}|}{n}$$

Median absolute deviation from the median (MAD)

The median of the absolute values of the deviations from the median.

$$\text{Median absolute deviation} = \text{Median}(|x_1 - m|, |x_2 - m|, ..., |x_N - m|)$$

Range

The difference between the largest and the smallest value in a data set.

$$\text{Range}(X) = \text{Max}(X) - \text{Min}(X)$$

Percentile (Quantile)

The value such that P percent of the values take on this value or less and (100–P) percent take on this value or more.

$$n = (P/100) \times N$$

where N = number of values in the data set, P = percentile, and n = ordinal rank of a given value (with the values in the data set sorted from smallest to largest).

Interquartile range (IQR)

The difference between the 75th percentile and the 25th percentile.

$$IQR = Q3 - Q1$$

$$IQR = 75\text{th percentile} - 25\text{th percentile}$$

Thank you

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