# Module II: Mathematical Foundations on Exploratory Data Analysis

On averages, variations, correlations and the rest…

# This module covers…

- Statistical Moments 1 - 4
  - 1st: mean / average /  median
  - 2nd: standard deviation / variance
  - 3rd: skewness
  - 4rd: kurtosis
- Covariance, covariance matrices and correlation
- Multidimensional vector spaces

# In this Video you will learn…

***Statistical Moments***

# The 1st moment

- known as “average” or “measure of central tendency”
- but there are more ways of doing it
  - mean
  - median
  - mode

# mean

- easy to calculate

$$AM = \frac{1}{n}\sum_{i=1}^{n} a_i = \frac{1}{n}\left(a_1 + a_2 + \cdots + a_n\right)$$

- “sum up all values and divide by the number of values”

# median

- more complex to calculate
- “sort the list and pick the middle element”

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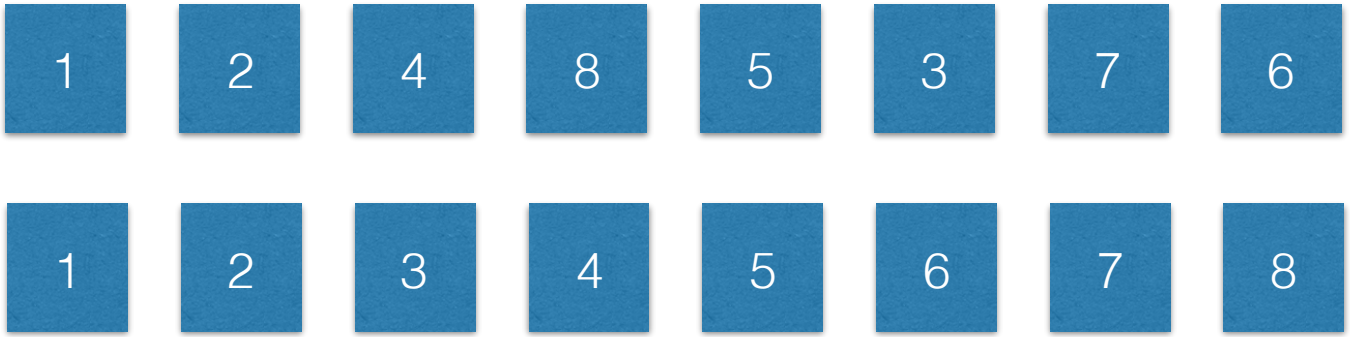

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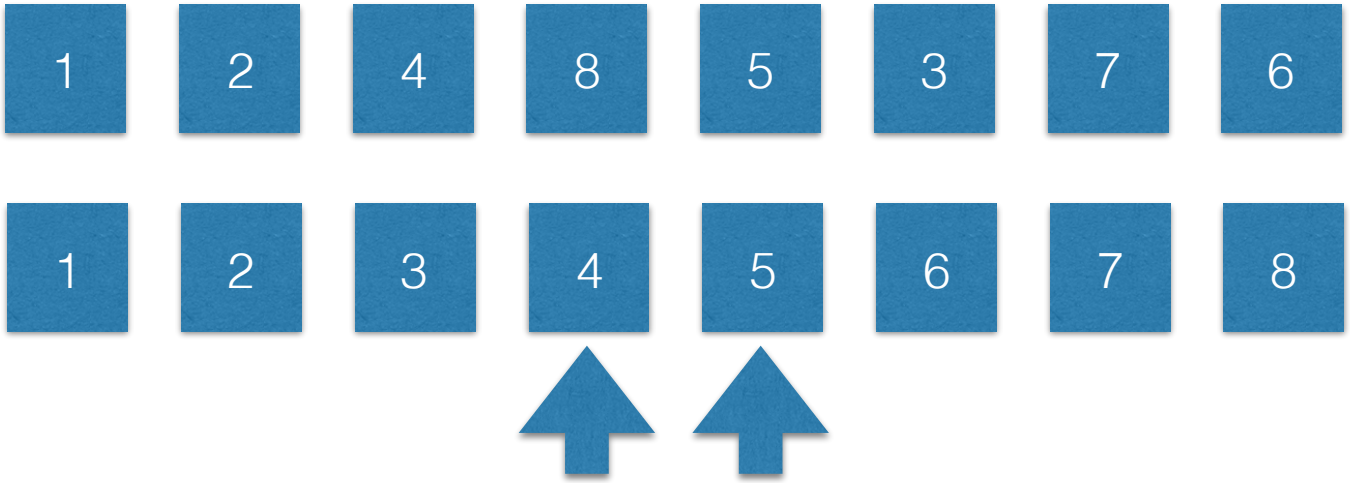

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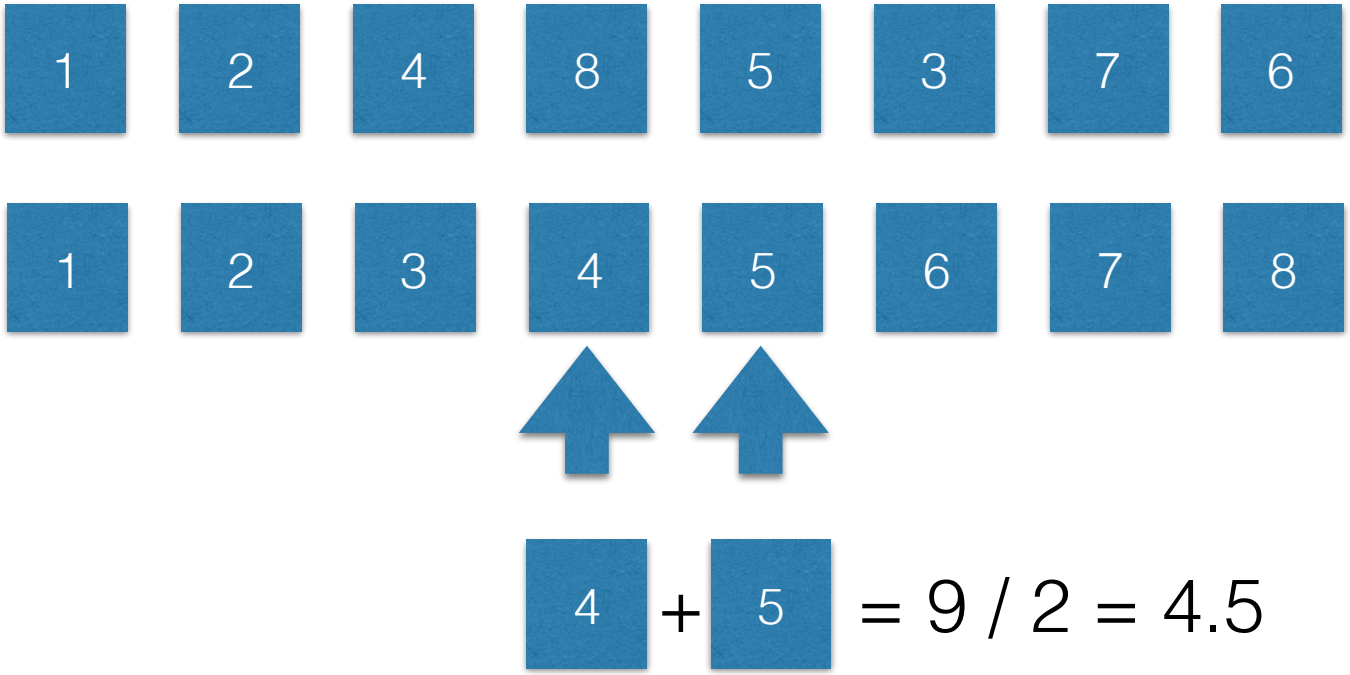

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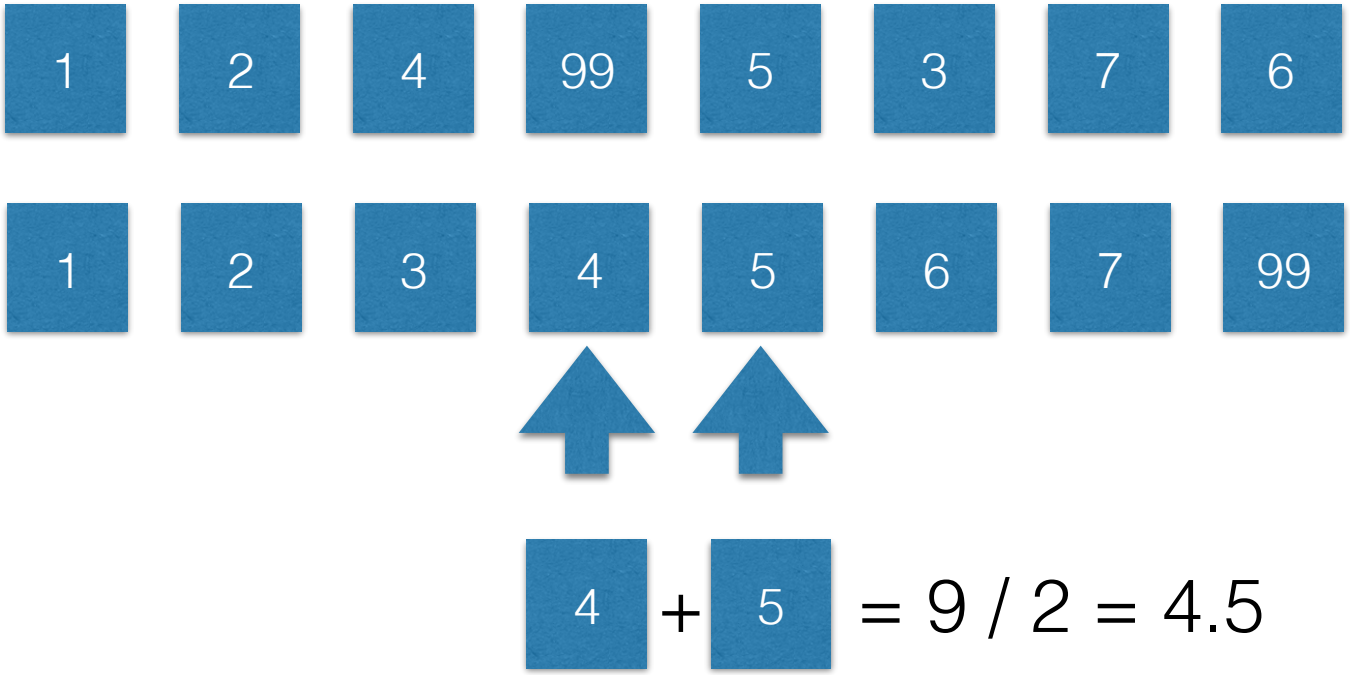

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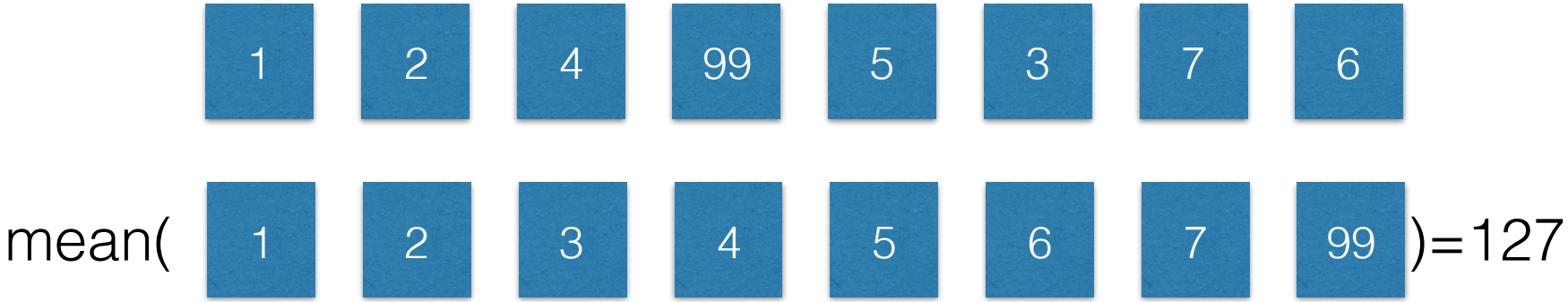

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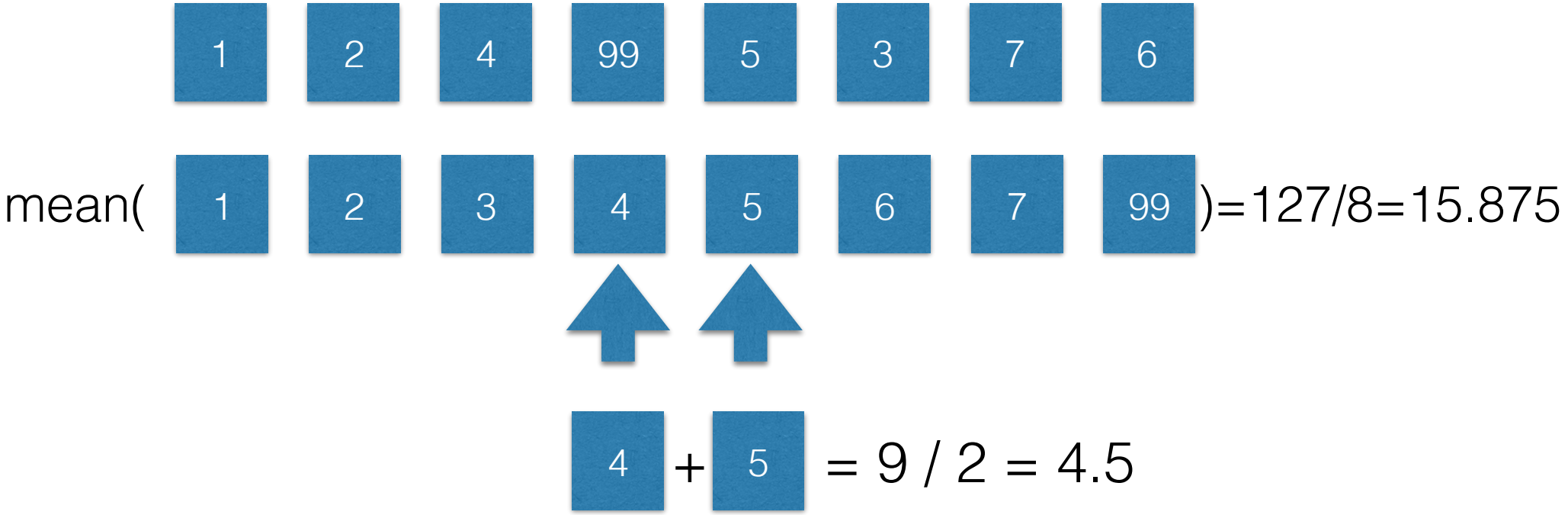

# median

- more complex to calculate
- “sort the list and pick the middle element”
- median is out-lier resistant version of mean

# Summary

- mean and median are the 1st moment of a statistical distribution
- give insights on central tendency of a sensor value
- ApacheSpark parallelises it’s computation using the lambda calculus
- The same program can be run on a couple of bytes as well as on multiple tera bytes of data

# The next video covers…

***Standard Deviation***