DESCRIPTIVE STATISTICS

Statistics Basics

Distributions

Central Tendency

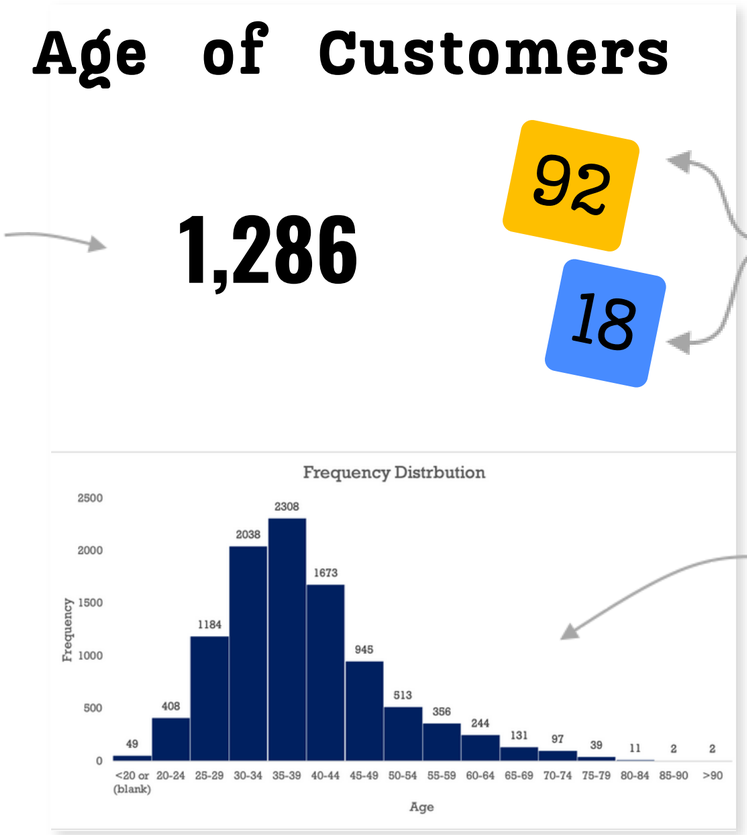
Variability

Descriptive statistics consists of the collection, organization, summarization and presentation of data.

They reduce a large array of numbers into a handful of figures that describe it accurately

customer_id	age
15634602	42
15647311	41
15619304	42
15701354	39
15737888	43
15574012	44
15592531	50
15656148	29
15792365	44
15592389	27
15767821	31
15737173	24
15632264	34
15691483	25
15600882	35
15643966	45
15737452	58
15788218	24
15661507	45
15568982	24

n=10000



Mean

Min & Max

Histrogram (Frequency Distribution)

TYPES OF VARIABLES

There are two main **types of variables** in a dataset: Numerical & Categorical

- **Numerical** or **Quantitative variables**
- **Categorical** or **Qualitative variables**

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NUMERICAL:

customer_id	age	tenure	balance	products_nur	credit_card	active_memb	estimated_sa	churn
15634602	42	2	0	1	1	1	101348.88	1
15647311	41	1	83807.86	1	0	1	112542.58	0
15619304	42	8	159660.8	3	1	0	113931.57	1
15701354	39	1	0	2	0	0	93826.63	0
15737888	43	2	125510.82	1	1	1	79084.1	0
15574012	44	8	113755.78	2	1	0	149756.71	1
15592531	50	7	0	2	1	1	10062.8	0
15656148	29	4	115046.74	4	1	0	119346.88	1
15792365	44	4	142051.07	2	0	1	74940.5	0
15592389	27	2	134603.88	1	1	1	71725.73	0
15767821	31	6	102016.72	2	0	0	80181.12	0
15737173	24	3	0	2	1	0	76390.01	0
15632264	34	10	0	2	1	0	26260.98	0
15691483	25	5	0	2	0	0	190857.79	0
15600882	35	7	0	2	1	1	65951.65	0
15643966	45	3	143129.41	2	0	1	64327.26	0
15737452	58	1	132602.88	1	1	0	5097.67	1
15788218	24	9	0	2	1	1	14406.41	0
15661507	45	6	0	1	0	0	158684.81	0
15568982	24	6	0	2	1	1	54724.03	0
15577657	41	8	0	2	1	1	170886.17	0
15597945	32	8	0	2	1	0	138555.46	0
15699309	38	4	0	1	1	0	118913.53	1
15723737	48	3	0	2	0	1	8487.75	0
15625047	38	5	0	1	1	1	187616.16	0

Possible question:

CATEGORICAL:

country	gender
France	Female
Spain	Female
France	Female
France	Female
Spain	Female
Spain	Male
France	Male
Germany	Female
France	Male
France	Male
France	Male
Spain	Male
France	Female
France	Female
Spain	Female

TYPES OF DESCRIPTIVE STATISTICS

There are 3 main **types of descriptive statistics** that can be applied to a variable:

Statistics Basics

- **Distributions**
- **Central Tendency**
- **Variability**

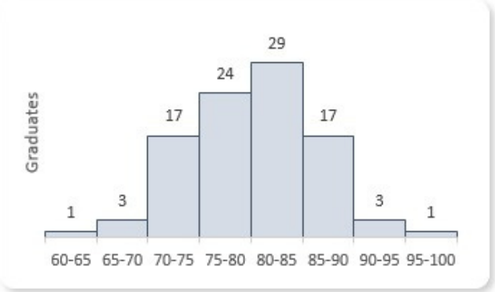
Distribution

*Represents the **frequency** of each value*

Examples:

- Frequency Tables
- Histograms

Grade Distribution



Central Tendency

*Represents the **middle** of the values*

Examples:

- Mean, Median, and Mode
- Skew

Class Average

80.17

Variability

*Represents the **dispersion** of the values*

Examples:

- Min, Max, and Range
- Quartiles & Interquartile Range
- Box & Whisker Plots
- Variance & Standard Deviation

Highest Grade **96.1**

Lowest Grade **62.6**

HEY THIS IS IMPORTANT!

Most measures of central tendency and variability can only be applied to numerical variables

FREQUENCY DISTRIBUTIONS

Statistics Basics

Distributions

Central Tendency

Variability

A **frequency distribution** counts the observations of each possible value in a variable

They are commonly depicted using frequency tables

Undergrad Degree	Undergrad Grade
Business	78.9
Business	74
Business	74.6
Engineering	79.3
Engineering	70.1
Business	88.8
Business	66
Art	82.9
Business	93.6
Business	75.6
Finance	67.5
Computer Science	68.7
Business	76
Computer Science	67.7
Engineering	75.3
Engineering	68.1
Finance	63.3

n=17

FREQUENCY TABLE:

Undergrad Degree	Frequency	Relative Frequency
Art	1	6%
Business	8	47%
Computer Science	2	12%
Engineering	4	24%
Finance	2	12%

The relative frequency shows the count of each value as a % of the total

TIP: Use a PivotTable or the COUNTIFS() function to calculate frequencies for categorical variables in Excel

FREQUENCY DISTRIBUTIONS

For numerical variables, a frequency distribution typically counts the number of observations that fall into defined ranges or "bins" *(1-5, 6-10, etc.)*

- They are commonly depicted using grouped frequency tables or histograms

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Business	78.9
Business	74
Business	74.6
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Business	66
Art	82.9
Business	93.6
Business	75.6
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Computer Science	67.7
Engineering	75.3
Engineering	68.1
Finance	63.3

FREQUENCY TABLE:

Undergrad Grade	Frequency
63.3	1
66	1
67.5	1
67.7	1
68.1	1
68.7	1
70.1	1
74	1
74.6	1
75.3	1
75.6	1
76	1
78.9	1
79.3	1
82.9	1
88.8	1
93.6	1

This isn't a meaningful representation of the distribution of the data

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GROUPED FREQUENCY TABLE:

Undergrad Grade	Frequency	Cumulative Relative Frequency
60-65	1	6%
65-70	5	35%
70-75	3	53%
75-80	5	82%
80-85	1	88%
85-90	1	94%
90-95	1	100%
Grand Total	**17**	

The cumulative relative frequency shows the running total of the relative frequencies

TIP: Group the numerical values in a PivotTable or use the FREQUENCY() function with the upper limits to calculate frequencies for each bin in Excel

HISTOGRAMS

Statistics Basics

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Histograms are used to visualize the distribution of a numerical variable

They also provide a glimpse of the variable's central tendency and variability

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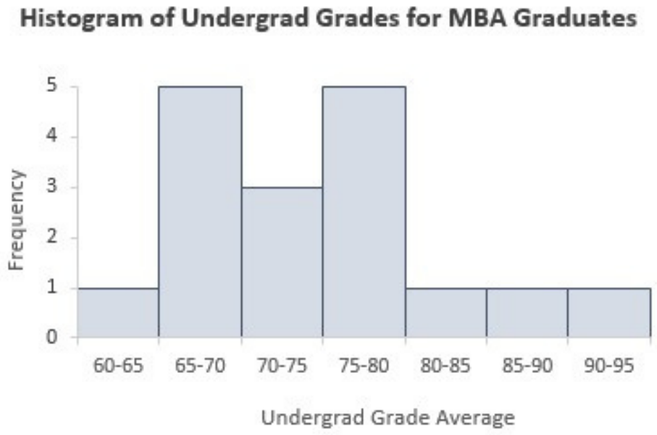
n=17



TIP: Create a histogram by using a column chart to plot the variable's frequency table, instead of using Excel's native histogram chart type (not as customizable)

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Business	76
Computer Science	67.7
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Engineering	68.1
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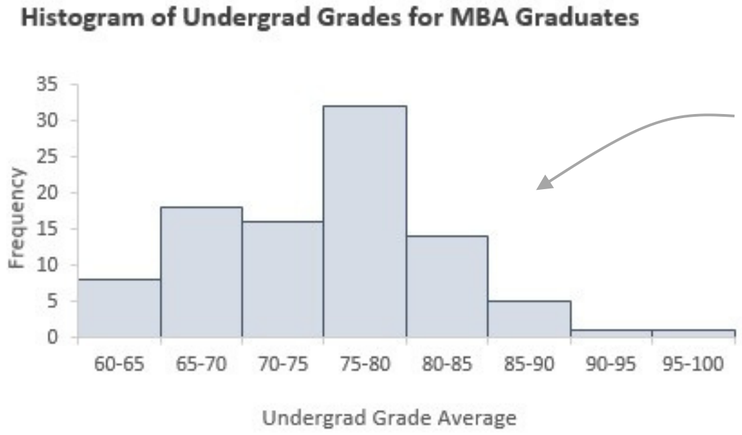
n=95



Histograms are best suited for variables with many observations, to reflect the true population distribution

TIP: Bin size can significantly change the shape and "smoothness" of a histogram, so select a bin width that accurately shows the data distribution

MEAN

Statistics Basics

Distributions

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Variability

The **mean** is the calculated "average" value in a set on numbers

- It is calculated by dividing the sum of all values by the count of all observations
- It can only be applied to numerical variables *(not categorical)*

customer_id	credit_score	age
15634602	619	42
15647311	608	41
15619304	502	42
15701354	699	39
15737888	850	43
15574012	645	44
15592531	822	50
15656148	376	29
15792365	501	44
15592389	684	27
15767821	528	31
15737173	497	24
15632264	476	34
15691483	549	25
15600882	635	35
15643966	616	45
15737452	653	58
15788218	549	24
15661507	587	45
15568982	726	24
15577657	732	41
15597945	636	32
15699309	510	38
15725737	669	46
15625047	846	38
15738191	577	25
15736816	756	36
15700772	571	44
15728693	574	43

Mean = 37.92

*(average **37.9***

TIP: Use the **AVERAGEIFS**() function if you want to calculate the mean for values that meet a specified criteria *(i.e., Mean by Undergrad Degree)*

LIMITATIONS OF THE MEAN

The main **limitation of the mean** is that it is sensitive to outliers *(extreme values)*

"The average income in America is not the income of the average American"

$35,000 $50,000 $65,000

$100,000,000

*mean = **$50,000***

*mean = **$25,037,500***

HEY THIS IS IMPORTANT!

While the mean is typically great for making a "best-guess" estimate of a value, it's important to complement this value with other descriptive statistics like the distribution, median, and mode to see if the mean value is being distorted by outliers

MEDIAN

The **median** is the "middle value" in a sorted set of numbers

- Unlike the mean, the median is NOT sensitive to outliers
- When there are two middle-ranked values, the median is the average of the two

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67.5
67.7
68.1
68.7
70.1
74
74.6
75.3
75.6
76
78.9
79.3
82.9
88.8
93.6

n=17

Median = **74.6**