Ministry of Higher Education

& Scientific Research
Al-Mustaqbal University
Department of Artificial
Intelligence
Statistics and Probability
First Year

Lecture Four
Frequency Distribution Table

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General Steps in Constructing a Frequency

Distribution Table

To construct a frequency distribution table, the following steps should be followed:

1. Determine the **range of the variable** (Range).
2. Choose and determine the **number of classes** (Number of Classes).
3. Find the **class length or width** (Class Length or Width).
4. Write the **class limits** (Class Limits).
5. Determine the **frequency of each class** (Class Frequency).

Example

The following values represent the crop yield (in tons) of a certain type of wheat from forty farms. The values are measured in tons and rounded to one decimal place:

3.0	3.7	3.2	2.0	3.5	4.1	2.2	2.6
2.4	3.1	3.8	3.3	3.1	1.6	3.4	3.7
3.9	3.3	2.9	3.6	3.4	4.3	2.5	3.1
1.9	4.1	3.2	4.4	3.7	3.1	3.3	3.4
4.2	3.0	3.9	2.6	3.2	3.8	2.3	3.5

Solution:

1. Range

Range $= \text{max} - \text{min}$

$= 4.4 - 1.6$
$= $ **2.8 tons**

2. Determining the Number of Classes (K)

Method (1):

Sturges' Formula

$K = 1 + 3.3 \log(n)$
$= 1 + 3.3 \log(40)$
$\approx$ **6.3 $\cong$ 6 classes**

Method (2):

Square Root Method

$K = \sqrt{n}$
$= \sqrt{40}$
$\approx$ **6.25 $\cong$ 6 classes**

3. Class Length (L)

$L = R / K = 2.8 / 6$
$\approx$ **0.467 $\cong$ 0.5**

4. Writing the Class Limits

The minimum value is 1.6, therefore the lower limit of the first class is taken as **1.5**.

Class No.	Class Limits	True Class Limits	Class Midpoint	Frequency
1	1.5 – 1.9	1.45 – 1.95	1.7	2
2	2.0 – 2.4	1.95 – 2.45	2.2	4
3	2.5 – 2.9	2.45 – 2.95	2.7	4
4	3.0 – 3.4	2.95 – 3.45	3.2	15
5	3.5 – 3.9	3.45 – 3.95	3.7	10
6	4.0 – 4.4	3.95 – 4.45	4.2	5

Relative Frequency Distribution Table

A relative frequency distribution table shows the relative importance of each class.

The relative frequency for any class is calculated as:

Relative Frequency$= \frac{f_i}{\sum f_i} * 100$

The **percentage frequency** is obtained by multiplying the relative frequency by 100%.

Example:

Find the **relative frequency** and **percentage frequency** for the frequency distribution of cotton plant heights.

Classes	f_i	Relative Frequency	Percentage Frequency
31 – 40	1	0.0125	1.25
41 – 50	2	0.0250	2.50
51 – 60	5	0.0625	6.25
61 – 70	15	0.1875	18.75
71 – 80	25	0.3125	31.25
81 – 90	20	0.2500	25.00
91 – 100	12	0.1500	15.00
Total	**80**	**1.0000**	**100**

There are two types of cumulative distributions:

1. Ascending Cumulative Frequency Distribution

It shows the number of observations whose values are **less than** the upper limit of a given class.
The cumulative frequency is denoted by F_i.

Class Limits	Ascending Cumulative Frequency (F_i)
Less than 31	0
Less than 41	1
Less than 51	3
Less than 61	8
Less than 71	23
Less than 81	48
Less than 91	68
Less than 101	80

2. Descending Cumulative Frequency Distribution

It shows the number of observations whose values are **greater than or equal to** the lower limit of a given class.

Class Limits	F_i
31 and above	80
41 and above	79
51 and above	77
61 and above	72
71 and above	57
81 and above	32
91 and above	12
101 and above	0

The following table shows the frequency distribution of a sample of patients with a certain disease:

Classes	50–59	60–69	70–79	80–89	90–99	100–109	110–119	Total
Number of Patients	8	10	16	14	10	5	2	65

Required:

1. Find the **true class limits**
2. Determine the **class midpoint**
3. Calculate the **relative frequency**
4. Calculate the **percentage frequency**
5. Find the **ascending cumulative frequency**
6. Find the **descending cumulative frequency**