

Class Exercise 2

1. Trimodal Distribution

Describe a realistic scenario that would produce a trimodal histogram. Identify the continuous variable being measured and explain why three distinct peaks occur.

2. AI Vision Quality Inspection

Last month, a robotics startup trained an AI vision system to inspect assembled consumer electronics moving along a factory conveyor belt. During an early trial run, the AI repeatedly misidentified human fingers as “defective hotdogs” and triggered automated emergency halts. Quality control engineers recorded the number of false emergency halts triggered per production shift across several manufacturing lines. The results are summarized in the table below:

Number of Shifts	Number of False Halts
15	1
28	2
34	3
27	4
16	5

Calculate the mean and the median number of false emergency halts per shift.

3. Tensile Strength of Titanium Alloy Brackets

A quality control engineer at an aerospace manufacturing facility tested the tensile strength of six newly fabricated titanium alloy brackets designed for an aircraft wing assembly. The six specimens were loaded in a universal testing machine until mechanical failure. The recorded failure loads (in kilonewtons, kN) are:

40, 41, 44, 47, 48, 50

- Calculate the sample mean failure load, $\bar{x}$ (include appropriate units).
- Compute the sample variance s^2 of the failure loads. Show your work clearly by constructing a table with deviations $(x_i - \bar{x})$ and squared deviations $(x_i - \bar{x})^2$.
- Compute the sample standard deviation s of the failure loads (include appropriate units).