

MATHEDA Engineering Data Analysis

Descriptive Statistics

Performance analysis for Jaguar and Panther Equipment

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Chapter 1: Introduction

Due to the inconsistent performance metrics of the equipment manufactured by *Jaguar* and *Panther*, Ms. Ada Lovelace has tasked me to conduct a *Performance Analysis* for the Resistors provided by both *Jaguar* and *Panther*. The report includes the manual calculations and boxplots and along with the Operations Manager request to analyze the:

- Mean
- Median
- Mode
- Range
- Variance
- Standard Deviation
- Coefficient of Variance

Chapter 2: Overview

Performance Data Provided and Summary Statistics

Lot_No Jaguar Panther								Lot_No Jaguar Panther			
0	1	997	1035	15	16	933	935	count	30.000000	30.000000	30.000000
1	2	1153	975	16	17	790	1710	mean	15.500000	1087.800000	1005.333333
2	3	920	982	17	18	999	946	std	8.803408	284.165129	166.261392
3	4	1074	1038	18	19	1028	1073	min	1.000000	790.000000	590.000000
4	5	1013	891	19	20	976	986	25%	8.250000	938.000000	949.500000
5	6	960	907	20	21	1015	1078	50%	15.500000	998.000000	994.500000
6	7	890	960	21	22	932	969	75%	22.750000	1060.250000	1040.250000
7	8	910	978	22	23	957	1083	max	30.000000	1840.000000	1710.000000
8	9	944	1041	23	24	936	790				
9	10	1065	1026	24	25	977	1007				
10	11	1083	590	25	26	1037	934				
11	12	1820	990	26	27	997	999				
12	13	859	1076	27	28	1730	1011				
13	14	1043	1092	28	29	1046	942				
14	15	1710	1026	29	30	1840	1090				

Chapter 3: Jaguar Performance Analysis

<p>Mean:</p> $\text{Mean } (\bar{x}) = \frac{\sum x}{n}$ $\frac{(997+1153+920+1074+1013+960+890+910+944+1065+1083+1820+859+1043+1710+933+790+999+1028+976+1015+932+957+936+977+1037+997+1730+1046+1840)}{30}$ $= \underline{1087.8}$	<p>Median:</p> $\text{median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{ term} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{ term}}{2}$ $\frac{(997+999)}{2}$ $= \underline{998}$
<p>Mode:</p> $= \underline{997}$	<p>Range:</p> $\text{Range} = \text{Maximum} - \text{Minimum}$ $1840 - 790$ $= \underline{1050}$
<p>Variance:</p> $\text{Variance} = \frac{\sum (x_i - \mu)^2}{(N-1)}$ $\frac{[(997-1082.90)^2 + (1153-1082.90)^2 + (920-1082.90)^2 + (1074-1082.90)^2 + (1013-1082.90)^2 + (960-1082.90)^2 + (890-1082.90)^2 + (910-1082.90)^2 + (944-1082.90)^2 + (1065-1082.90)^2 + (1083-1082.90)^2 + (1820-1082.90)^2 + (859-1082.90)^2 + (1043-1082.90)^2 + (1710-1082.90)^2 + (933-1082.90)^2 + (790-1082.90)^2 + (999-1082.90)^2 + (1028-1082.90)^2 + (976-1082.90)^2 + (1015-1082.90)^2 + (932-1082.90)^2 + (957-1082.90)^2 + (936-1082.90)^2 + (977-1082.90)^2 + (1037-1082.90)^2 + (997-1082.90)^2 + (1730-1082.90)^2 + (1046-1082.90)^2 + (1840-1082.90)^2]}{(30-1)}$ $= \underline{80749.82}$	<p>Standard Deviation:</p> $\text{Standard Deviation} = \sqrt{\text{Variance}} = \sqrt{\frac{\sum (x_i - \mu)^2}{(N-1)}}$ $\sqrt{[(997-1082.90)^2 + (1153-1082.90)^2 + (920-1082.90)^2 + (1074-1082.90)^2 + (1013-1082.90)^2 + (960-1082.90)^2 + (890-1082.90)^2 + (910-1082.90)^2 + (944-1082.90)^2 + (1065-1082.90)^2 + (1083-1082.90)^2 + (1820-1082.90)^2 + (859-1082.90)^2 + (1043-1082.90)^2 + (1710-1082.90)^2 + (933-1082.90)^2 + (790-1082.90)^2 + (999-1082.90)^2 + (1028-1082.90)^2 + (976-1082.90)^2 + (1015-1082.90)^2 + (932-1082.90)^2 + (957-1082.90)^2 + (936-1082.90)^2 + (977-1082.90)^2 + (1037-1082.90)^2 + (997-1082.90)^2 + (1730-1082.90)^2 + (1046-1082.90)^2 + (1840-1082.90)^2]}{(30-1)}$ $= \underline{284.16}$

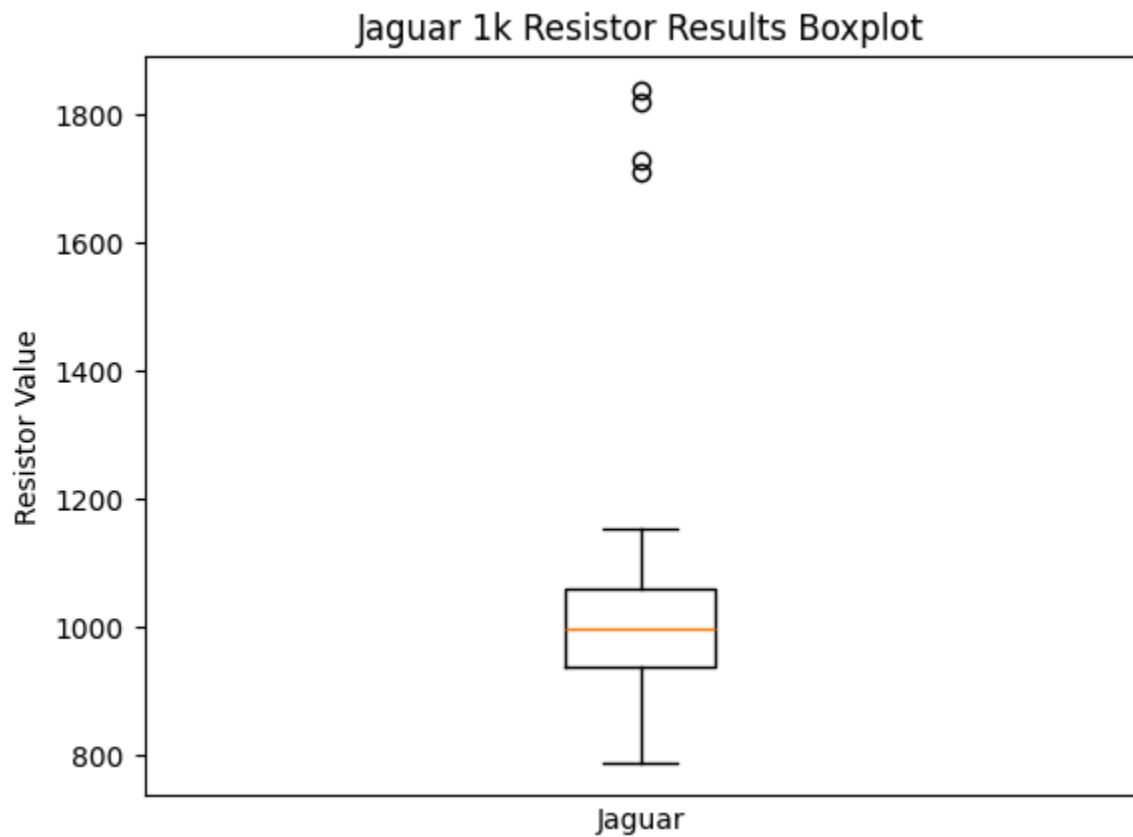
Coefficient of Variation:

**Coefficient of Variation = (Standard
Deviation / Mean) * 100**

(284.16 / 1087.8) * 100

= 0.2612 or ≈26%

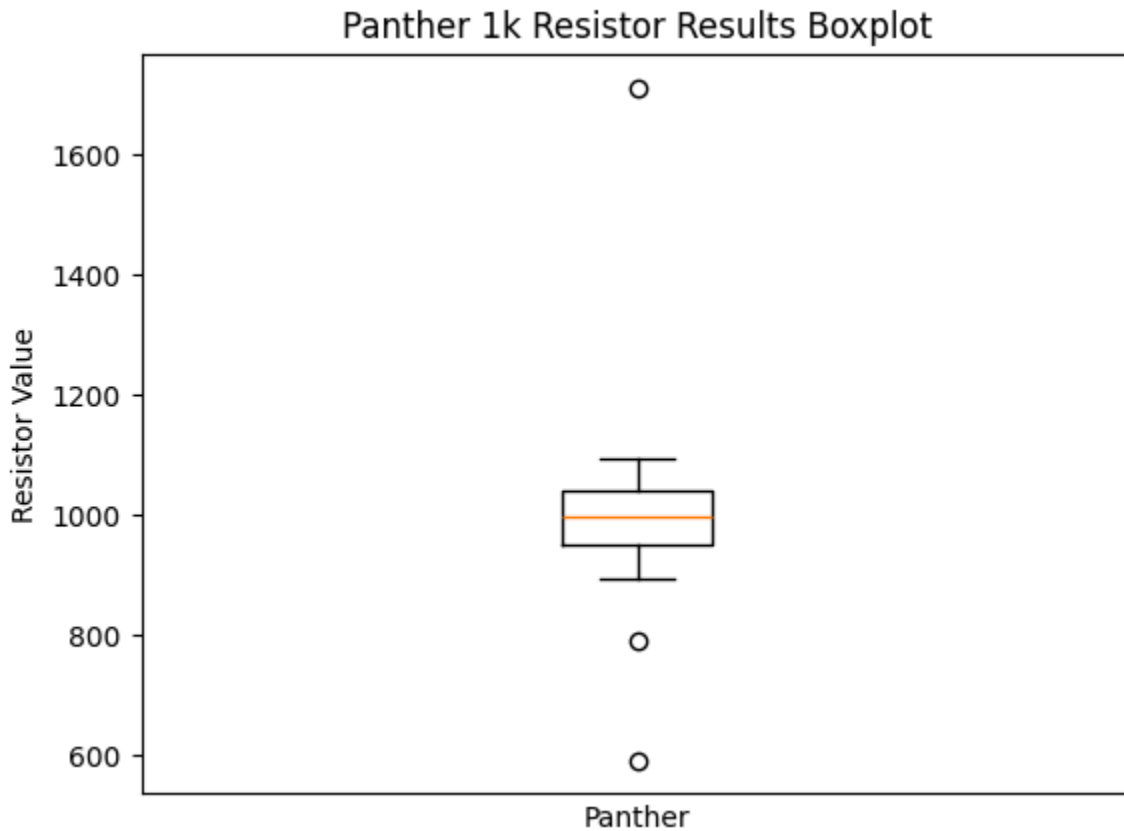
Nothing Follows



Chapter 4: Panther Performance Analysis

<p>Mean:</p> $\text{Mean } (\bar{x}) = \frac{\sum x}{n}$ $\frac{(1035+975+982+1038+891+907+960+978+1041+1026+590+990+1076+1092+1026+935+1710+946+1073+986+1078+969+1083+790+1007+934+999+1011+1090+942)}{30}$ $= \underline{1005.33}$	<p>Median:</p> $\text{median} = \frac{\left(\frac{n}{2}\right)^{th} \text{ term} + \left(\frac{n}{2} + 1\right)^{th} \text{ term}}{2}$ $(990 + 999) / 2$ $= \underline{994.5}$
<p>Mode:</p> $= \underline{1026}$	<p>Range:</p> $\text{Range} = \text{Maximum} - \text{Minimum}$ $1710 - 590$ $= \underline{1120}$
<p>Variance:</p> $\text{Variance} = \Sigma(xi - \mu)^2 / (N-1)$ $\begin{aligned} & [(1035-1000.73)^2 + (975-1000.73)^2 + (982-1000.73)^2 + (1038-1000.73)^2 + (891-1000.73)^2 + (907-1000.73)^2 + (960-1000.73)^2 + (978-1000.73)^2 + (1041-1000.73)^2 + (1026-1000.73)^2 + (590-1000.73)^2 + (990-1000.73)^2 + (1076-1000.73)^2 + (1092-1000.73)^2 + (1026-1000.73)^2 + (935-1000.73)^2 + (1710-1000.73)^2 + (946-1000.73)^2 + (1073-1000.73)^2 + (986-1000.73)^2 + (1078-1000.73)^2 + (969-1000.73)^2 + (1083-1000.73)^2 + (790-1000.73)^2 + (1007-1000.73)^2 + (934-1000.73)^2 + (999-1000.73)^2 + (1011-1000.73)^2 + (1090-1000.73)^2 + (942-1000.73)^2] \\ & \quad / (30-1) \end{aligned}$ $= \underline{27642.85}$	<p>Standard Deviation:</p> $\text{Standard Deviation} = \text{sqrt}(\text{Variance}) = \text{sqrt}[\Sigma(xi - \mu)^2 / (N-1)]$ $\text{sqrt}[((1035-1000.73)^2 + (975-1000.73)^2 + (982-1000.73)^2 + (1038-1000.73)^2 + (891-1000.73)^2 + (907-1000.73)^2 + (960-1000.73)^2 + (978-1000.73)^2 + (1041-1000.73)^2 + (1026-1000.73)^2 + (590-1000.73)^2 + (990-1000.73)^2 + (1076-1000.73)^2 + (1092-1000.73)^2 + (1026-1000.73)^2 + (935-1000.73)^2 + (1710-1000.73)^2 + (946-1000.73)^2 + (1073-1000.73)^2 + (986-1000.73)^2 + (1078-1000.73)^2 + (969-1000.73)^2 + (1083-1000.73)^2 + (790-1000.73)^2 + (1007-1000.73)^2 + (934-1000.73)^2 + (999-1000.73)^2 + (1011-1000.73)^2 + (1090-1000.73)^2 + (942-1000.73)^2)]$ $/ (30-1)$ $= \underline{166.26}$

<p>Coefficient of Variation: Coefficient of Variation = (Standard Deviation / Mean) * 100</p> <p>(166.26 / 1005.33) * 100</p> <p>= <u>0.1654</u> or <u>≈ 17%</u></p>	<p><i>Nothing Follows</i></p>
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Chapter 5: Hypothesis

Hypothesis:

Jaguar and Panther exhibit comparable performance overall, with Jaguar demonstrating a *slightly higher average and greater variability*. However, Panther shows a *more consistent performance with less extreme variations* and is closer to the *1000 ohm* target. The most noticeable outlier is in *Lot 12 for Jaguar*, with a value of *1820*, significantly exceeding other Jaguar values. This outlier might mean that there is something wrong with the manufacturing overall.