Batch-wise Performance Analysis Report

1. Executive Summary of Performance

Batch	Mean Score	Median Score	Std. Deviation	Total Students	Min Score	Max Score
AI_ELITE_4	3.79	4.0	1.44	48	0	7
AI_ELITE_6	4.23	4.0	1.64	48	0	7
AI_ELITE_7	5.06	5.0	1.45	53	2	7

2. Key Insights

A. Batch AI_ELITE_7 — The Top Performers

- **Performance:**
  This batch leads with the highest average score of **5.06 / 7**.
- **High Scorers:**
  Approximately **43.4%** of students scored **6 or 7**, more than double the high-scorer rate of AI_ELITE_6.
  This indicates a strong mastery of concepts across a large portion of the batch.
- **Consistency:**
  The minimum score is **2**, indicating that even the lowest-performing students outperform the weakest students in other batches (min = 0).

Overall, AI_ELITE_7 demonstrates both high achievement and consistency.

B. Batch AI_ELITE_6 — High Variance Group

- **Performance:**
  Mid-range performance with an average score of **4.23**.
- **Diversity in Learning Levels:**
  Highest standard deviation (**1.64**), suggesting a wide gap between strong and weak performers.
- **Score Spread:**
  - **18.8%** scored very high
  - **12.5%** scored **2 or below**
- **Potential:**
  While top students perform well, a sizable portion may require additional academic support.

This batch needs targeted intervention rather than uniform teaching.

C. Batch AI_ELITE_4 — The Struggling Batch

- **Performance:**
  Lowest average score at **3.79**.
- **Low Scorers:**
  Nearly **19%** of students scored **2 or less**, the highest low-score rate among all batches.
- **High Achievers:**
  Only **8.3%** managed to score **6 or 7**.
- **Challenge Identified:**
  The pace or difficulty of the material may be overwhelming for this group.

AI_ELITE_4 shows clear signs of foundational gaps.

3. Comparative Visualization Insights

Average Scores

- The bar chart **`avg_score_per_batch.png`** shows a steady upward trend from AI_ELITE_4 to AI_ELITE_7.

Score Distribution

- The boxplot **`score_distribution_boxplot.png`** highlights:
  - Median score of **5.0** for AI_ELITE_7
  - Median score of **4.0** for AI_ELITE_4 and AI_ELITE_6
- The entire distribution of AI_ELITE_7 is shifted higher.

Score Frequency

- The frequency plot **`score_frequency_by_batch.png`** shows:
  - AI_ELITE_7 peaks at score **7**
  - AI_ELITE_4 peaks around **3**
  - AI_ELITE_6 peaks around **4**

4. Exploratory Data Analysis (EDA)

4.1 Univariate Analysis (Individual Variable Study)

Focus:

- Understanding the distribution of `Score`
- Evaluating the balance of the `Batch` variable

Score Distribution

- The histogram illustrates whether the test difficulty was appropriate.
- A peak at mid-to-high scores suggests the test was not overly difficult.
- The score spread indicates effective differentiation between student performance levels.

Batch Balance

- The pie chart shows that batches are nearly equal in size (approximately 32%–35% each).
- This balance ensures that comparisons across batches are statistically fair and reliable.

4.2 Bivariate Analysis (Relationship Study)

Focus:

- Examining how the `Batch` variable impacts `Score`.

Violin Plots

- Violin plots extend boxplots by visualizing score density.
- **AI_ELITE_7** shows maximum density at scores **6–7**, indicating a strong concentration of high performers.
- **AI_ELITE_4** is denser in the middle and lower score ranges, reflecting weaker overall performance.

KDE (Kernel Density Estimate) Plots

- **AI_ELITE_7** exhibits a right-shifted peak, confirming high performance.
- **AI_ELITE_6** displays a flatter, wider curve, indicating high variance in student outcomes.
- **AI_ELITE_4** has a left-shifted peak, signaling a lower central tendency.

5. Student Performance Recommendations

The analysis indicates that performance differences across batches are driven not only by average scores, but by the **shape and spread of learning distributions** within each batch.

AI_ELITE_7 (The High-Density Group)

This batch shows a strong concentration of students scoring **6 and 7**, indicating high mastery of the current curriculum.

Challenge High Performers

- The clustering at the top suggests that the existing material may be insufficiently challenging.
- Introduce **advanced elective modules** or **honors-level projects** to sustain engagement and promote deeper learning.

Peer Mentoring

- Leverage high-performing students as **peer mentors** for learners in other batches.
- This reinforces the mentors' own understanding while supporting students with foundational gaps.

AI_ELITE_6 (The High-Variance Group)

This batch exhibits a **polarized performance distribution**, with students concentrated at both high and low score ranges.

Bifurcated Teaching Strategy

- Avoid a uniform, middle-paced teaching approach.
- Design **parallel learning tracks** that address differing student readiness levels.

Targeted Remediation

- Identify the **12.5% of students scoring below 2** and enroll them in **mandatory foundation bridge classes**.
- Allow the **top-performing 18%** to progress to advanced problem sets or enrichment activities.

AI_ELITE_4 (The Left-Shifted Group)

The score distribution for this batch is shifted toward the lower end, indicating systemic challenges rather than isolated underperformance.

Curriculum Review

- The consistently lower scores suggest that the **pace of instruction may be too fast**.
- Slow the introduction of new concepts and reinforce prerequisites before advancing.

Frequent Low-Stakes Assessment

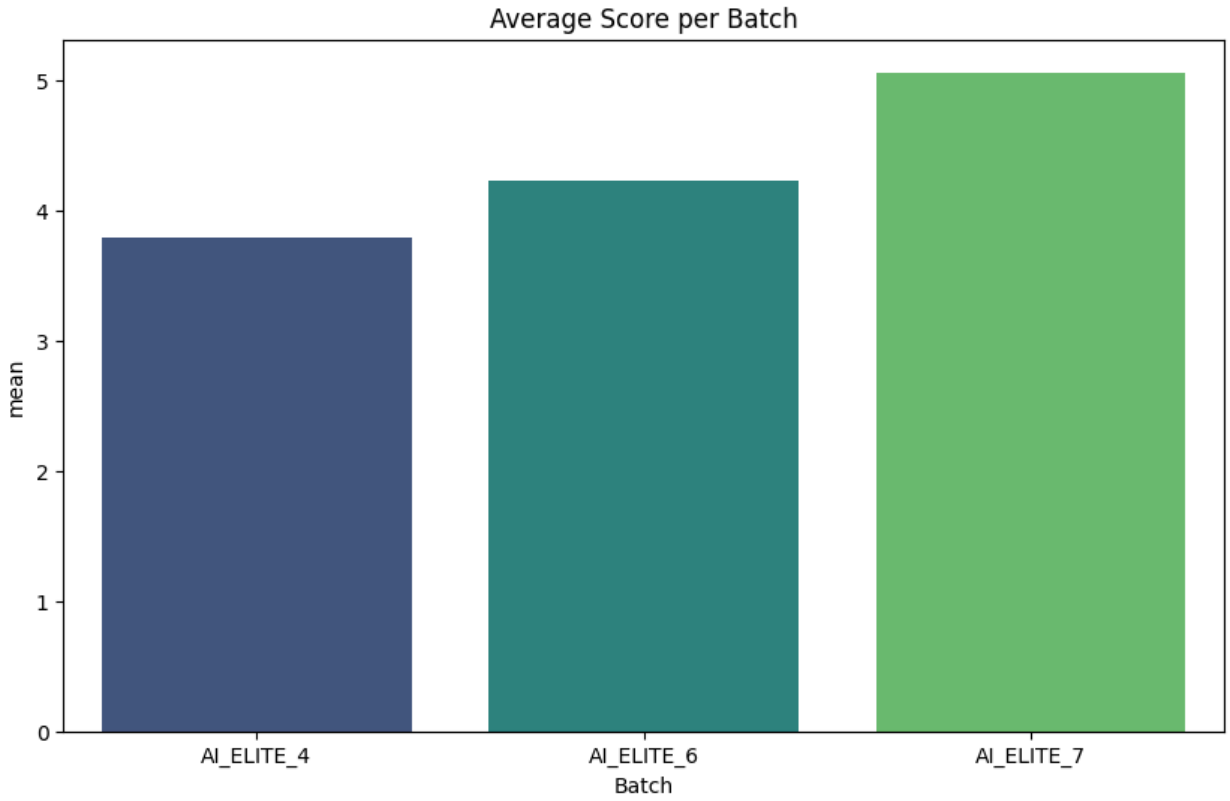
- Implement **daily or weekly low-stakes quizzes** to continuously assess understanding.
- Early detection of learning gaps allows instructors to intervene before deficiencies accumulate into poor final outcomes.

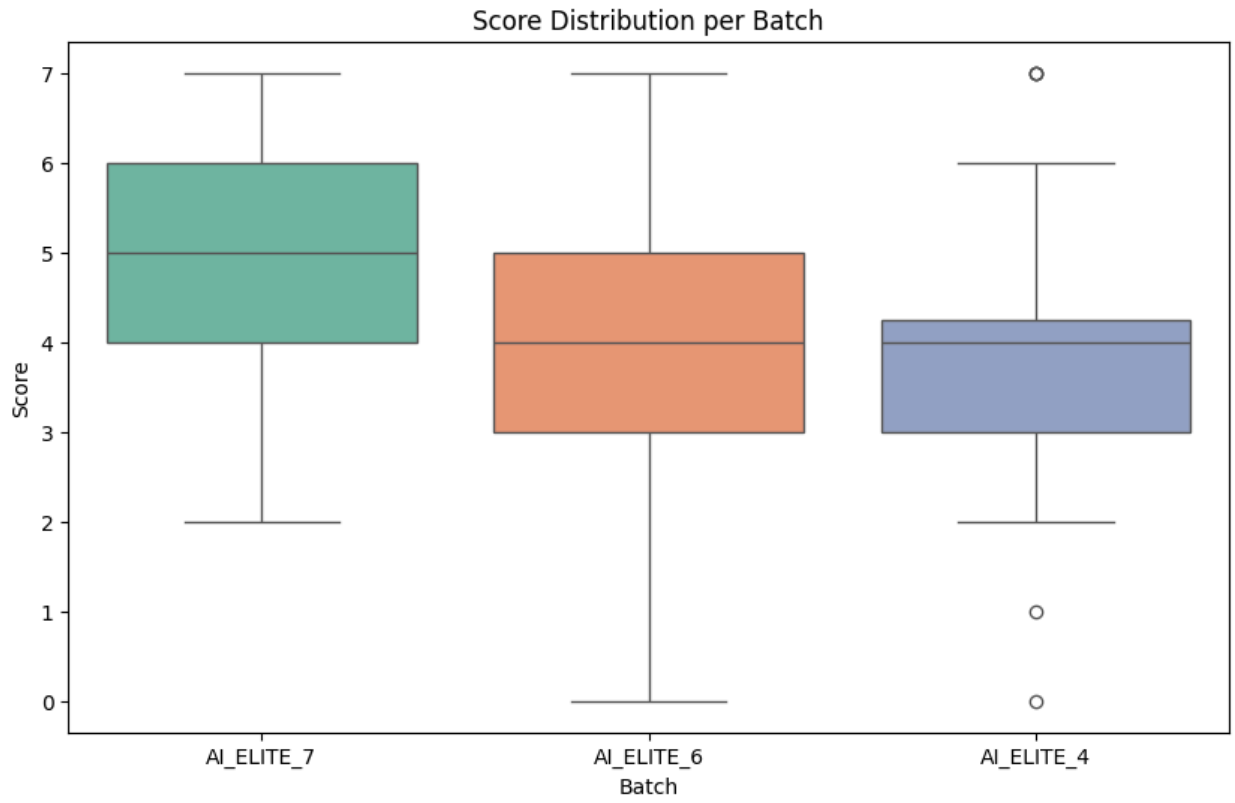
Overall, these recommendations align instructional strategies with the **observed learning patterns** of each batch, enabling more effective, equitable, and data-driven educational interventions.

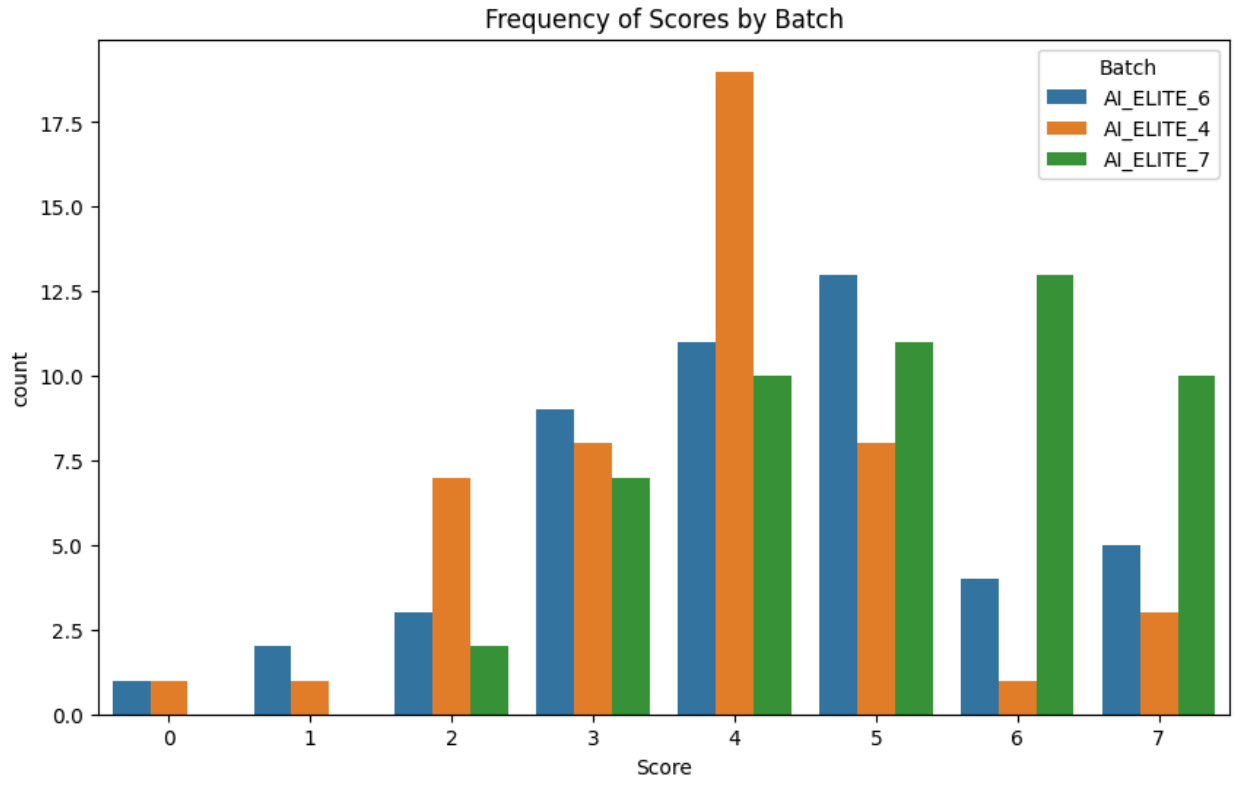
Conclusion

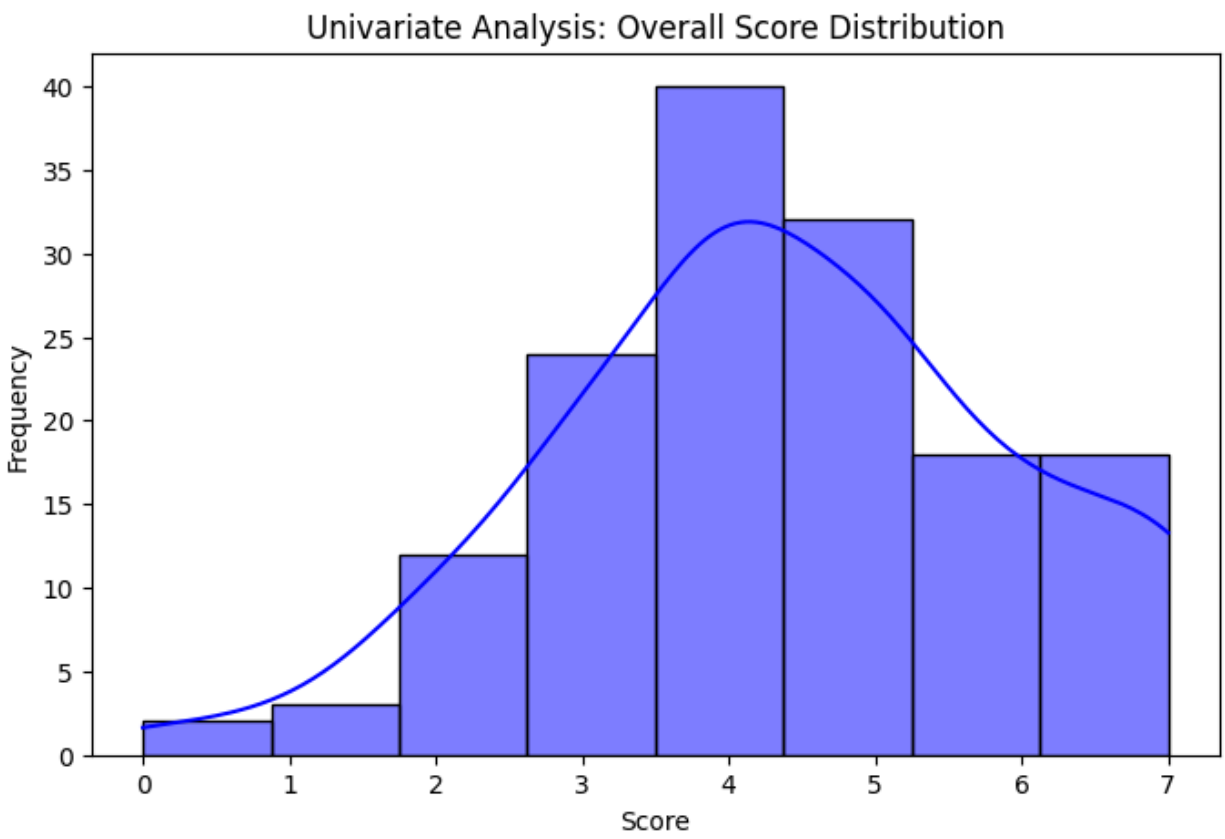
- **AI_ELITE_7** is excelling and ready for advancement
- **AI_ELITE_6** has strong potential but needs focused support
- **AI_ELITE_4** requires immediate academic reinforcement

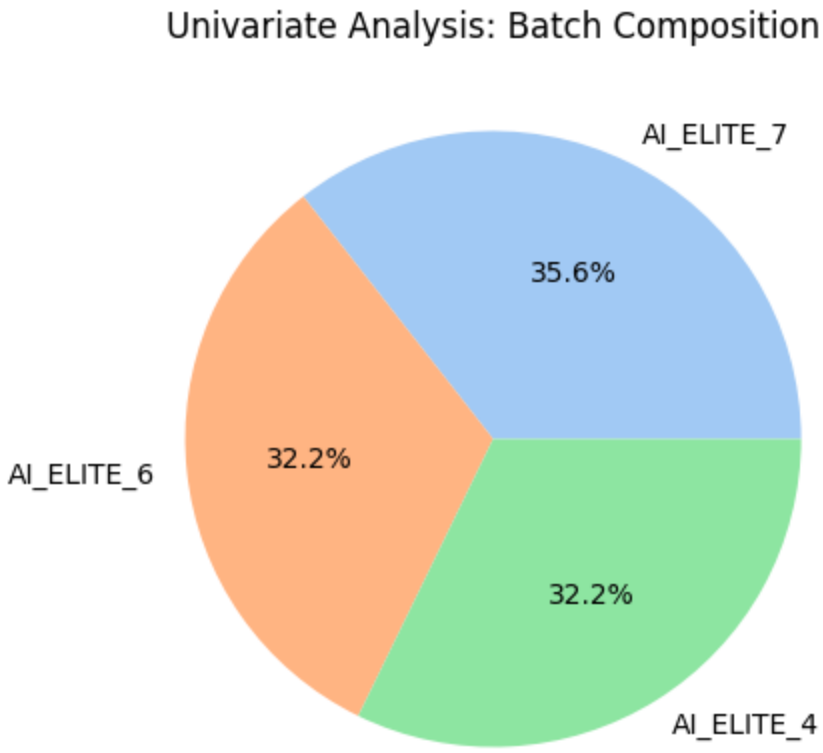
Strategic, batch-specific interventions will significantly improve overall learning outcomes.

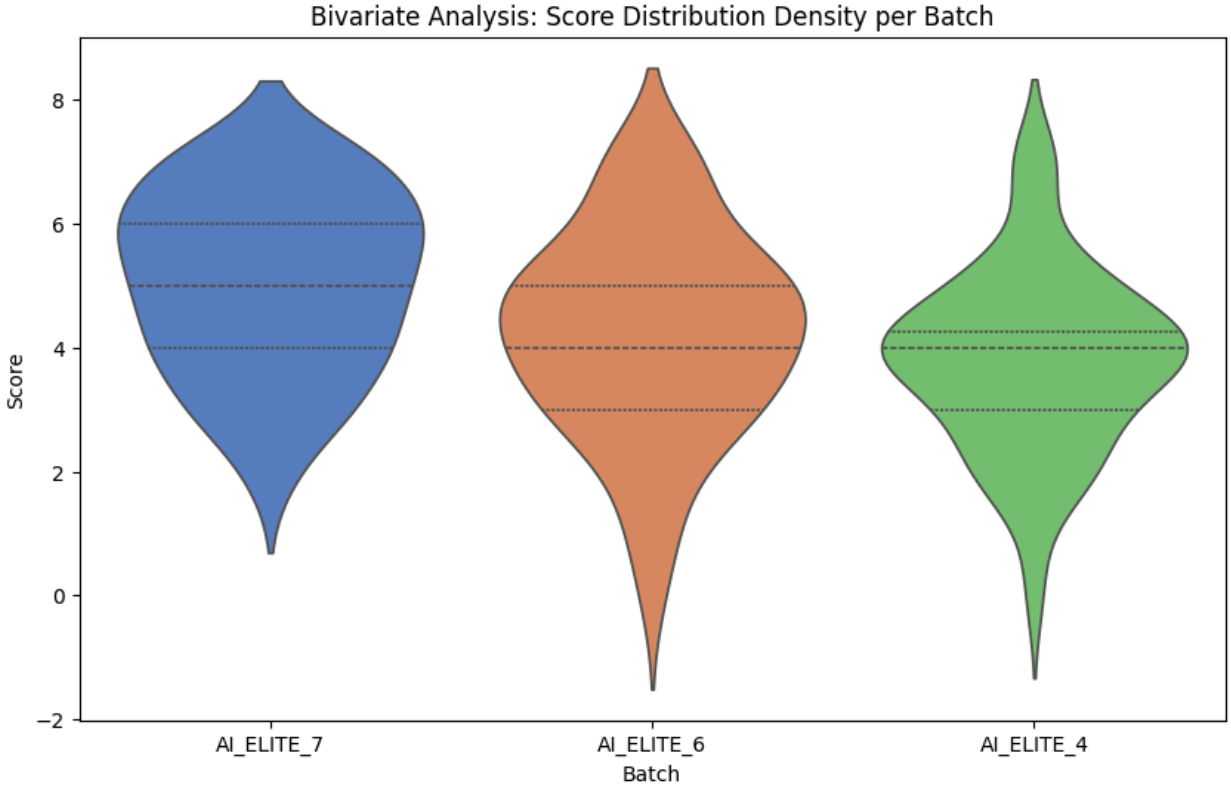



Score Distribution per Batch
Score
Batch
AI_ELITE_7
AI_ELITE_6
AI_ELITE_4
0
1
2
3
4
5
6
7


Frequency of Scores by Batch
Batch
AI_ELITE_6
AI_ELITE_4
AI_ELITE_7
count
Score
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
0
1
2
3
4
5
6
7


Univariate Analysis: Overall Score Distribution
Frequency
Score
0
5
10
15
20
25
30
35
40
0
1
2
3
4
5
6
7


Univariate Analysis: Batch Composition
AI_ELITE_7
35.6%
AI_ELITE_6
32.2%
32.2%
AI_ELITE_4


Bivariate Analysis: Score Distribution Density per Batch
Score
8
6
4
2
0
−2
AI_ELITE_7
AI_ELITE_6
AI_ELITE_4
Batch