

## **“Performance Report of the Intelligent System for the Assessment of Sarveen Farm’s Livestock physical condition at Taliseh Asil Farm”**

### **Introduction:**

A smart camera automatically measures the body condition and locomotion status of livestock by analyzing images of the animals in motion and calculates the Body Condition Score and Locomotion Score of the livestock. The data is transmitted wirelessly via internet to the Sarveen Farm's software system, making it available to farm management and veterinarians.

Since all assessments are carried out while the animals are moving, carefully positioning this device in the farm's workflow (for example, at the exit of the milking parlor) enables continuous evaluation of the herd's body condition and movement indicators. The data gathered from these evaluations helps provide quick care to certain animals or the herd regarding veterinary care, animal well-being, and farm management issues.

### **System layout:**

This report examines the performance of the assessment system at the farm in estimating the body condition score of animals. The test was conducted on June 17, 2022, at the Taliseh Asil Farm. During this test, the body condition assessment camera was installed in the exit corridor of the milking parlor and a recognition system was used alongside it. This setup enabled the comparison of actual scores with estimated scores. It is important to note that the system did not face challenges in detecting, tracking, and counting the cows, demonstrating good performance throughout the test.

During the testing phase, over 30 cows passed under the device, among which 24 cows had their body condition scores recently evaluated by a specialist and were chosen for system assessment.



Figure 1. the camera installation location at a height of 3 meters above the ground.

## Overall Data Analysis

In this part, the data will be assessed and analyzed. We will start by looking at the distribution of actual scores and the scores determined by the system. The left graph below shows the distribution of scores assigned by the specialist, while the right graph shows the distribution of scores estimated by the system.

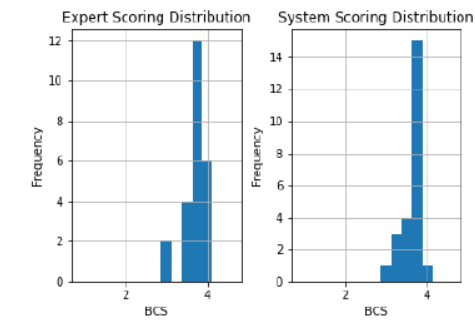


Figure 2. Left: Actual Scores Right: Estimated Scores

At first glance, these two charts look quite alike. Both have values within the range of  $[3, 4]$  with a peak value of 3.75 for each. A key difference between these two graphs is that in the actual score graph, the density of values is equally spread on both sides of the peak, whereas in the system's estimated score graph, the spread of values below the peak is greater.

The table below demonstrates the average of both the actual and estimated values:

Mean	
3.68	Actual Value
3.62	Estimated Value

As it can be seen, the mean is closer to the peak in the actual scores.

## Error Analysis

In this section, the performance of the system is examined. The left graph below shows the error distribution, while the right graph displays the distribution of absolute error values.

Figure 3. Left: Distribution of Errors in Automatic livestock Body Condition Score Estimation Right: Distribution of Absolute Error Values in Automatic livestock Body Condition Score Estimation

As noted, the highest error value is below 1, specifically 0.75 which occurred only once. The highest error is also at zero, which was expected given that the peaks of both the actual score distribution and the estimated score distribution were the same.

The table below presents the average and maximum error values:

Average	Score
0.19	Mean Error
0.75	Max Error

As noted, the average error is 0.19, which is under 0.25 or 1 unit of BCS.

The confusion matrix is presented below for a better understanding of the system's performance:

Figure 4: Confusion Matrix in Body Condition Score Detection

## Conclusion

Based on the results, the system's overall performance is good and promising. thus, the system can be used for long-term assessment and evaluation.

The following points are considered for future work:

The BCS of all the subject cows was within the normal range. If any animals in the herd have abnormal BCS values, a more thorough evaluation will be carried out.

With access to the locomotion scores of the tested animals from the dairy farm, a similar analysis can also be conducted for this index.