# **Squat Evaluation Report:**

## 1. Introduction

* **Purpose**: To evaluate the accuracy and performance of the AI Fitness Trainer's squat assessment model.
* **Approach**: *23 videos* were tested. Model predictions are compared against manual observations ("naked eye" analysis) using a standard reference squat video for consistency.

## 2**.** Reference Video

* **Title/Link**: [[***https://www.youtube.com/watch?v=YaXPRqUwItQ***](https://www.youtube.com/watch?v=YaXPRqUwItQ)]
* **Description**: This video demonstrates a proper squat, covering key posture elements:
  + Neutral spine alignment
  + Knee tracking over toes
  + Depth reaching parallel or slightly below
  + Balanced foot pressure (heel-to-toe)

This reference served as the benchmark for my naked eye evaluation.

**3. Model and Naked Eye Evaluation Results**

Below is the evaluation summary comparing the AI Fitness Trainer’s results to manual observations based on the reference video:

|  |  |  |  |
| --- | --- | --- | --- |
| Video # | Model Result | Naked Eye Comment | Match (Y/N) |
| 1 | |  | | --- | |  |  |  | | --- | | *0 reps detected*, *3 improper reps*, *squats too deep* | | Incorrect squats.  Going too deep down. | Y |
| 2 | *0 reps detected*, no proper detection.  *Side view missing*, causing joint detection and rep counting errors. | Slightly above parallel, Leaning forward | Y |
| 3 | *0 reps detected*, *2 improper reps* | Noticeable forward lean | Y |
| 4 | *3 clean reps detected* | Form, posture, reps too clean. | Y |
| 5 | 0 reps detected, *5 improper reps* | Going too deep, like sit-up | Y |
| 6 | *0 reps detected*  *Not side angle, unable to detect reps* | Not going down | Y |
| 7 | 0 reps detected, *3 improper reps* | Going too deep, like sit-up | Y |
| 8 | 0 reps detected  Not side angle, unable to detect reps | Not going down  Bending outwards and leaning forward | Y |
| 9 | *8 good reps* | Just perfect, form is too good | Y |
| 10 | *2 reps detected*, *1 improper rep* | 1st rep not complete, rest solid | Y |
| 11 | 0 reps detected, *2 improper reps* | Incomplete squats, not going down | Y |
| 12 | *0 reps detected*  Camera not aligned, unable to detect reps | Mild forward lean, toes too close | Y |
| 13 | *0 reps detected*  Camera not aligned, unable to detect reps | 3 solid reps with correct form | N |
| 14 | *0 reps detected*  Camera not aligned, unable to detect reps | 3 solid reps with correct form | N |
| 15 | *0 reps detected*  Camera not aligned, unable to detect reps | Significant forward lean  Back not aligned and straight | Y |
| 16 | *1 good rep, 3 improper reps* | 3 reps not good (too deep), 1 rep acceptable | Y |
| 17 | *1 good rep, 1 improper rep* | 1 rep not good (knee over toe, squat deep)  1 rep acceptable | Y |
| 18 | |  | | --- | |  |  |  | | --- | | *0 good reps, 3 improper reps* | | 3 incorrect reps, slightly leaning forward, hips not going down | Y |
| 19 | *0 good reps, 1 improper rep* | 1 incorrect rep, Camera misaligned | Y |
| 20 | *Unable to detect reps due to*  *Camera not aligned* | Camera not aligned, 3 incorrect reps | Y |
| 21 | *2 good reps, 3 improper reps* | First 2 and last one incorrect (deep squats), 3rd and 4th corrects | Y |
| 22 | *0 good reps, 1 incorrect rep* | 2 incorrect reps (hips not lowered) | N |
| 23 | *1 correct rep* | 2 correct reps | N |

## 4. Analysis

* **Total videos evaluated**: 23
* **Model and Naked Eye Agreement**: 19/23 matches
* **Overall Accuracy**: 83%

**Key Observations:**

* **Strong Performance**:
  + The AI model was highly effective at detecting major errors (incorrect form, squat depth, missing reps due to poor angles).
  + Whenever camera positioning was bad, the model correctly failed to detect clean reps — matching human judgment.

### **Limitations Observed:**

* **Side View Dependency**:  
  The model is optimized to evaluate squats based on a **side profile view**. Videos recorded from other angles (e.g., front, diagonal) led to **inaccurate joint detection** and **rep counting failures**. Proper side alignment is critical for reliable squat assessment using this model.
* **Deep Squat Sensitivity**:  
  The model tends to **flag squats that are too deep** — where the hips drop excessively below knee level. Such depth, although sometimes acceptable in specific training contexts, was treated as improper by the AI due to **disruptions in standard knee positioning and back alignment**.
* **Minor Over-Flagging**:  
  Slight deviations (e.g., minor forward lean or slightly reduced depth) were occasionally classified as improper, showing the model’s **strictness towards ideal squat form**.