



24AIM113 & 24AIM114

Blood Drain Monitoring System

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Problem Statement:

Post-surgical fluid drainage monitoring is crucial for identifying complications such as excessive bleeding or infection. Traditional drainage systems remove fluids but lack monitoring capabilities. Current practices require manual inspection of fluid properties , which can lead to delays in detecting abnormalities.



Indroduction:

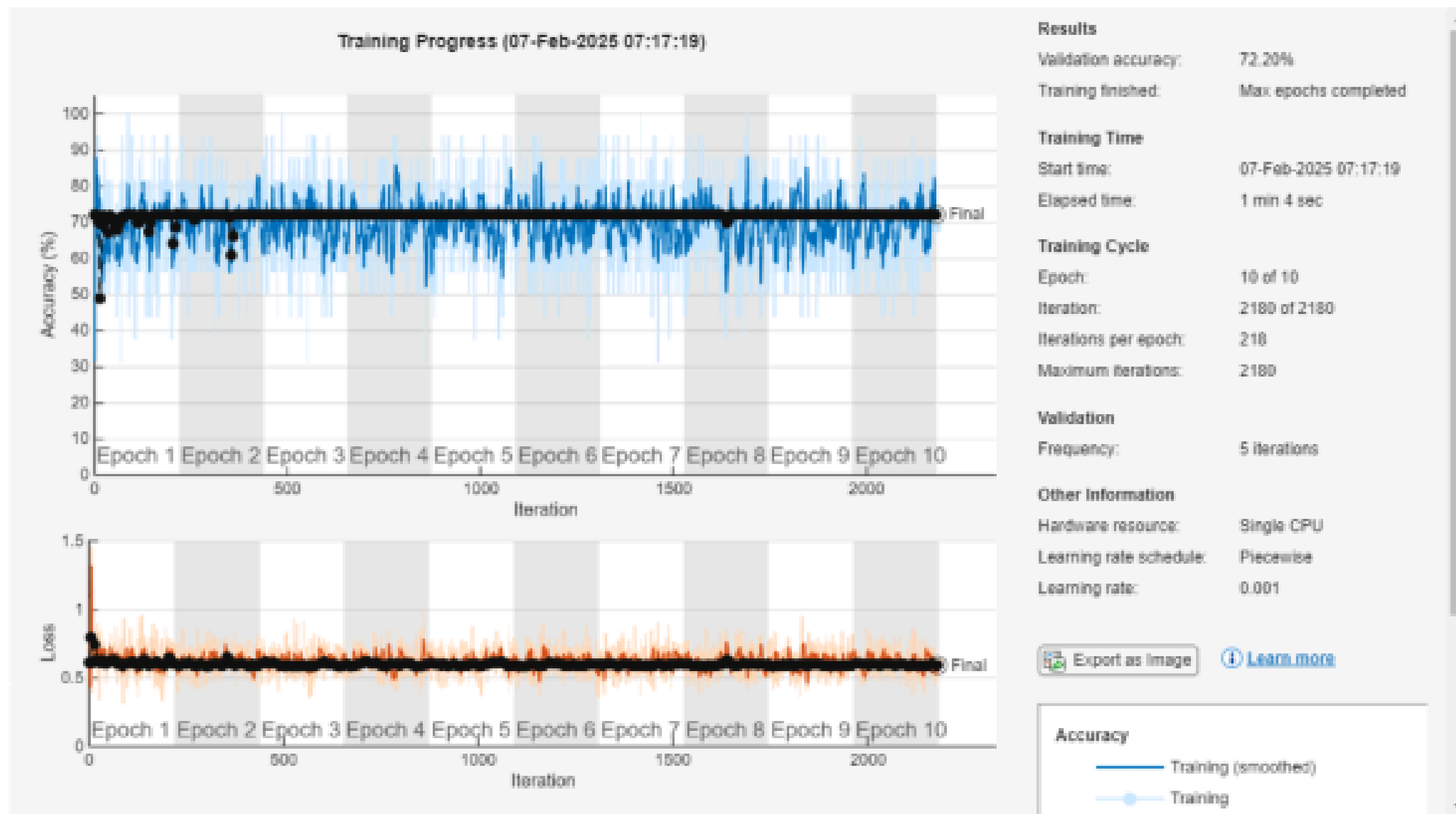
- Objective:
 - Develop a wound drainage monitoring system using density, color, and pH sensors to detect infections or abnormalities in real time.
- Expected Impact: This system will help in early infection detection, reduce the need for constant manual monitoring, and improve patient recovery outcomes.

Workflow:

- Data Collection: The system collects data from the three sensors:
 - Density sensor: Measures the viscosity
 - Color sensor: Detects changes in the fluid color
 - pH sensor
- Data Processing & Analysis
- Infection Detection & Alert:
 - Based on the analysis, the system classifies the drainage as infected or non-infected

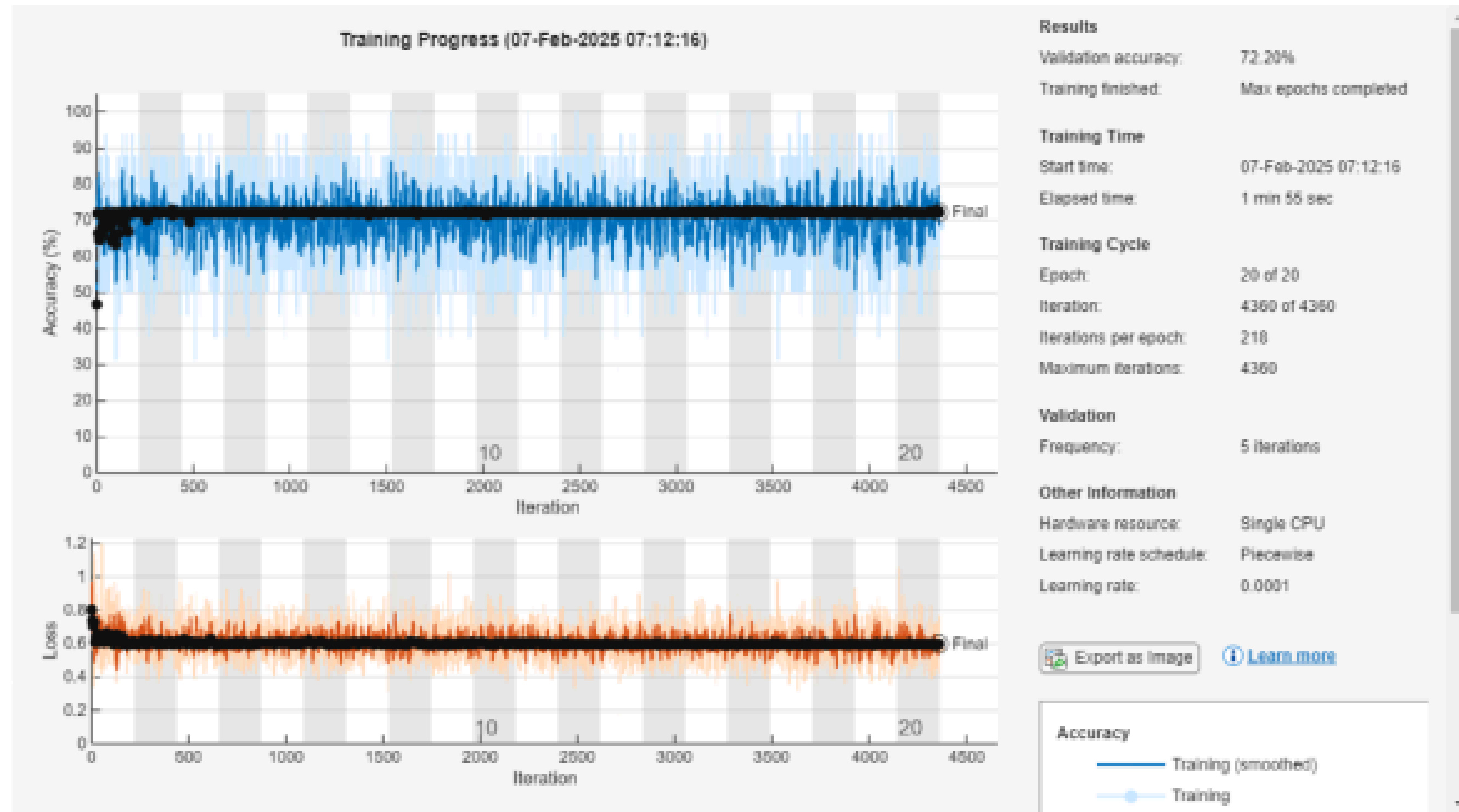
Dataset:

pH	Density	Color_R	Color_G	Color_B	Label
7.387886	1.022466	254	254	230	0
7.370784	1.006862	235	240	223	0
7.371613	1.007699	208	237	243	0
6.8	1.05	100	120	100	1
6.5	1.08	180	120	90	1
7.448436	1.000905	208	208	251	0
7.368363	1.020213	230	254	237	0
7.393064	1.026831	235	225	220	0
7.421735	1.010937	240	235	244	0
7.388355	1.026992	232	200	225	0



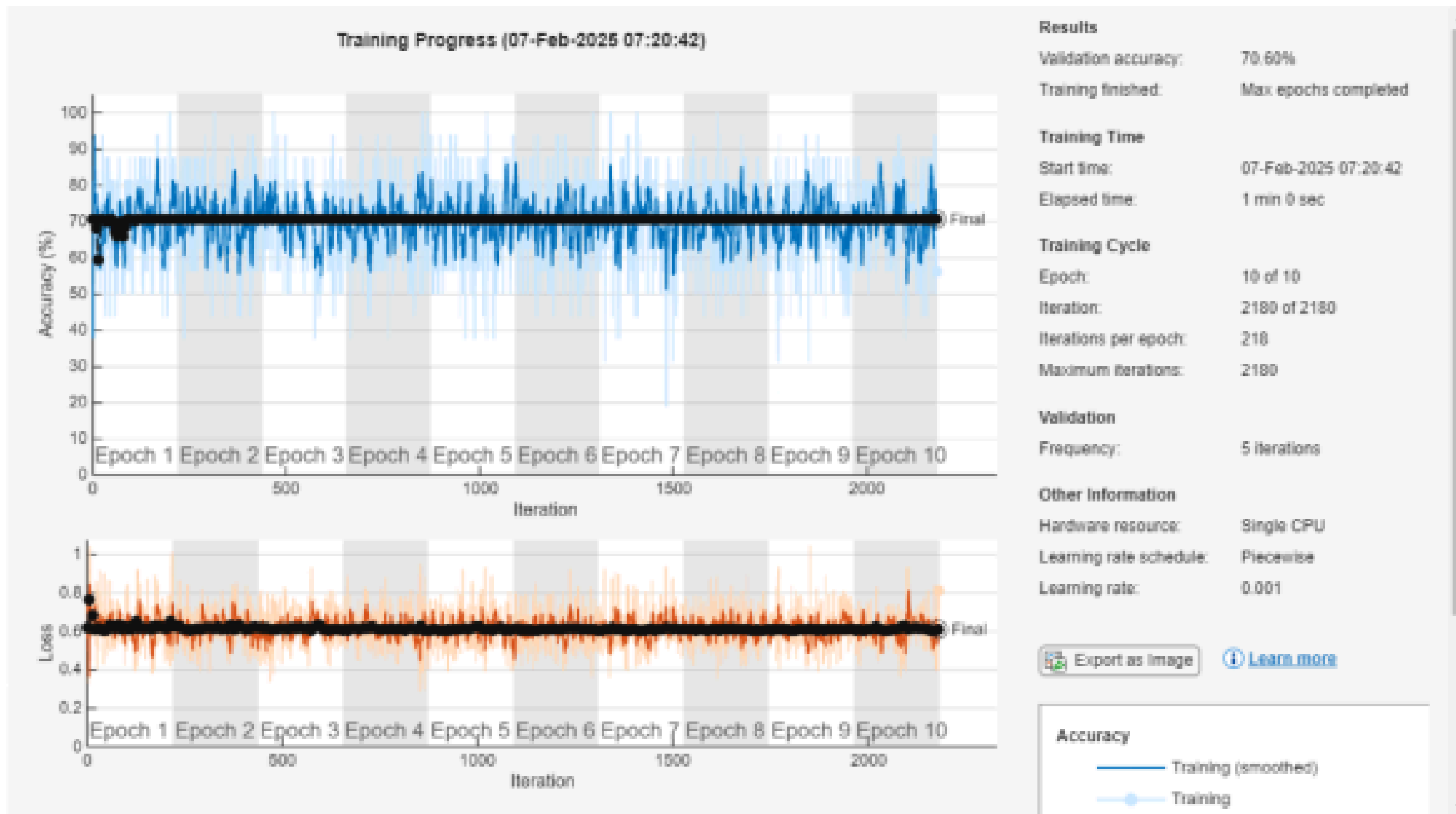
Test Accuracy: 70.60%

Layers: 2; Epoch: 10; Batch Size: 16



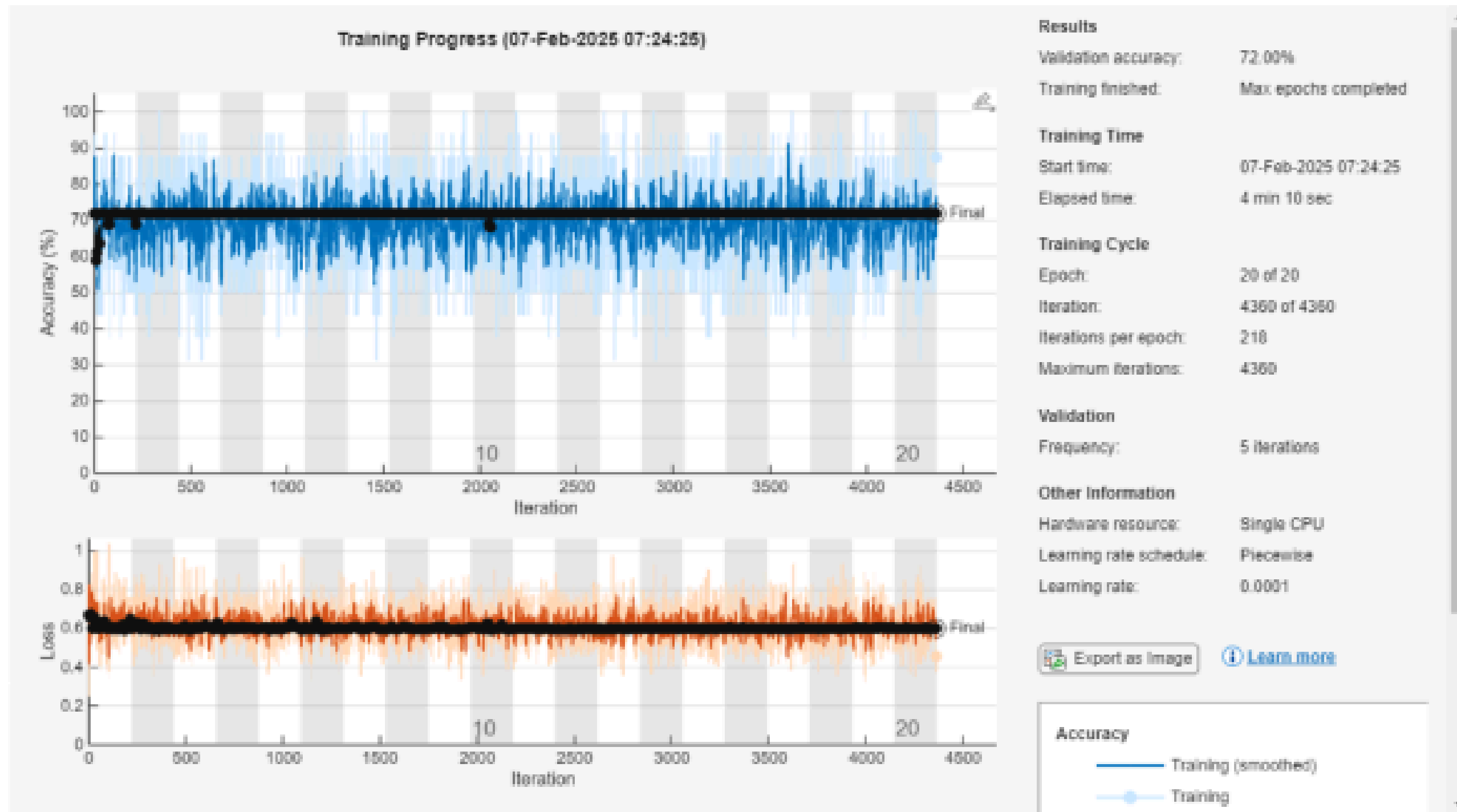
Test Accuracy: 68.70%

Layers: 2; Epoch: 20; Batch Size: 16



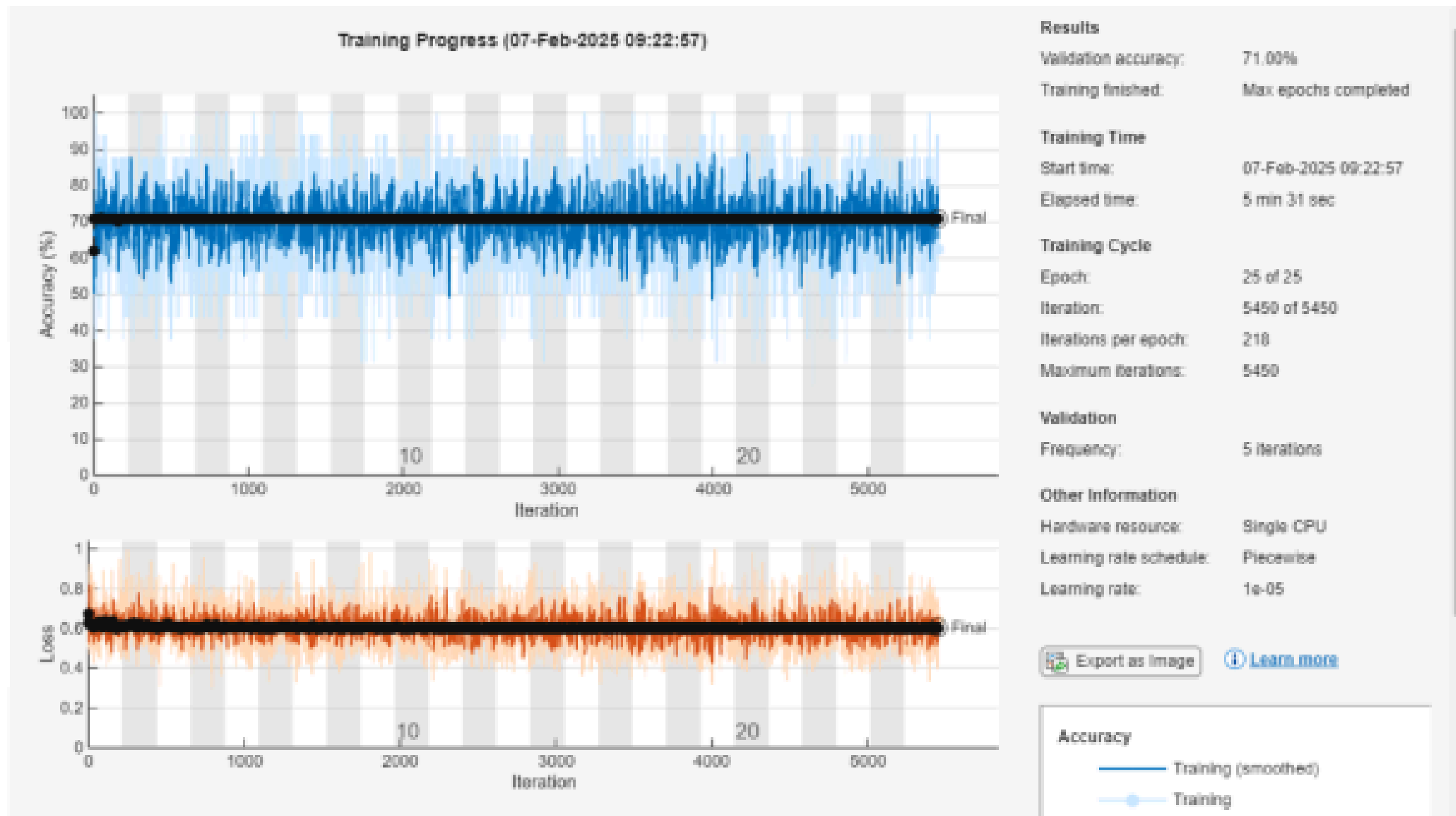
Test Accuracy: 69.40%

Layers: 3; Epoch: 10; Batch Size: 16



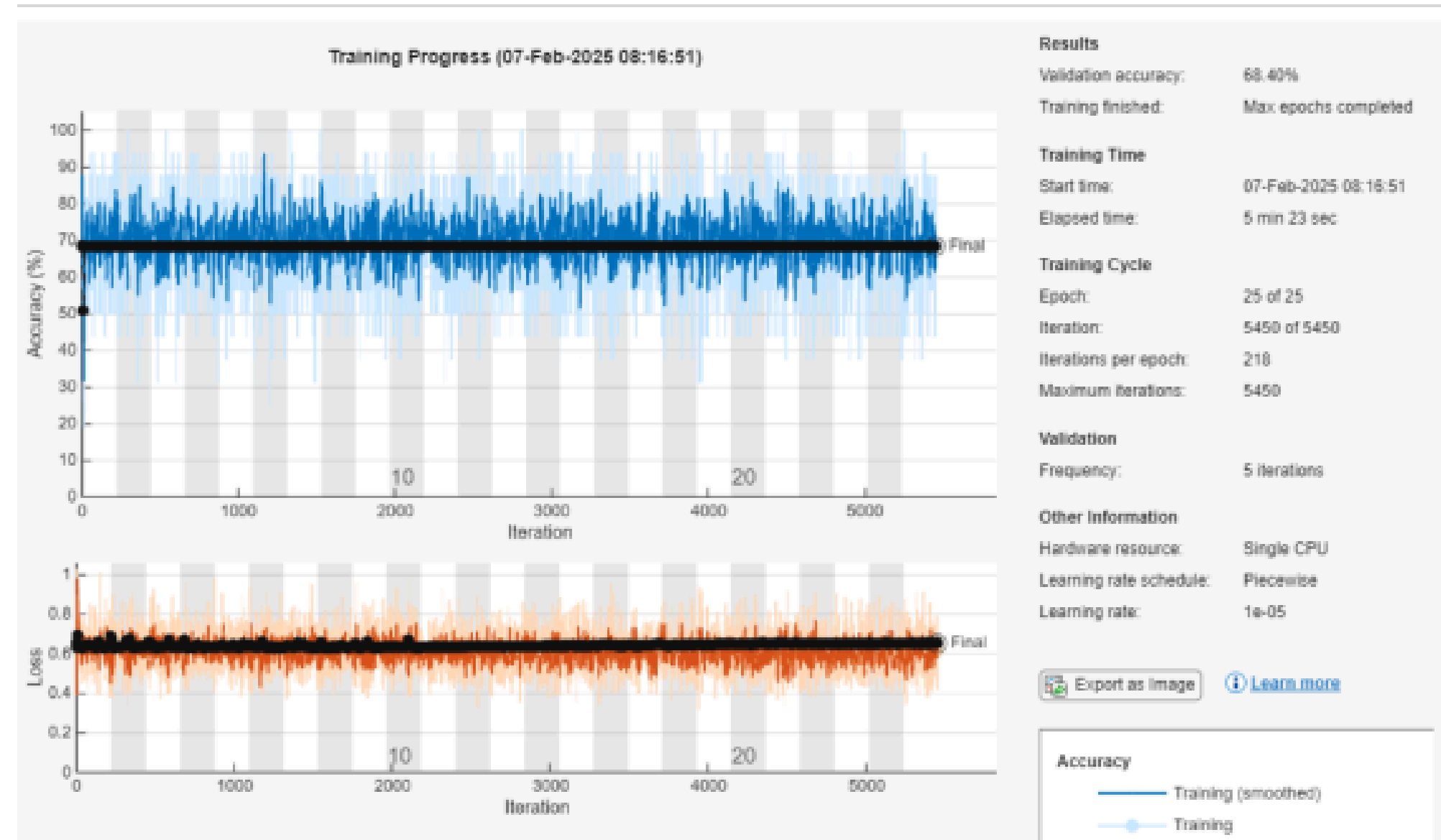
Test Accuracy: 71.50%

Layers: 3; Epoch: 20; Batch Size: 16



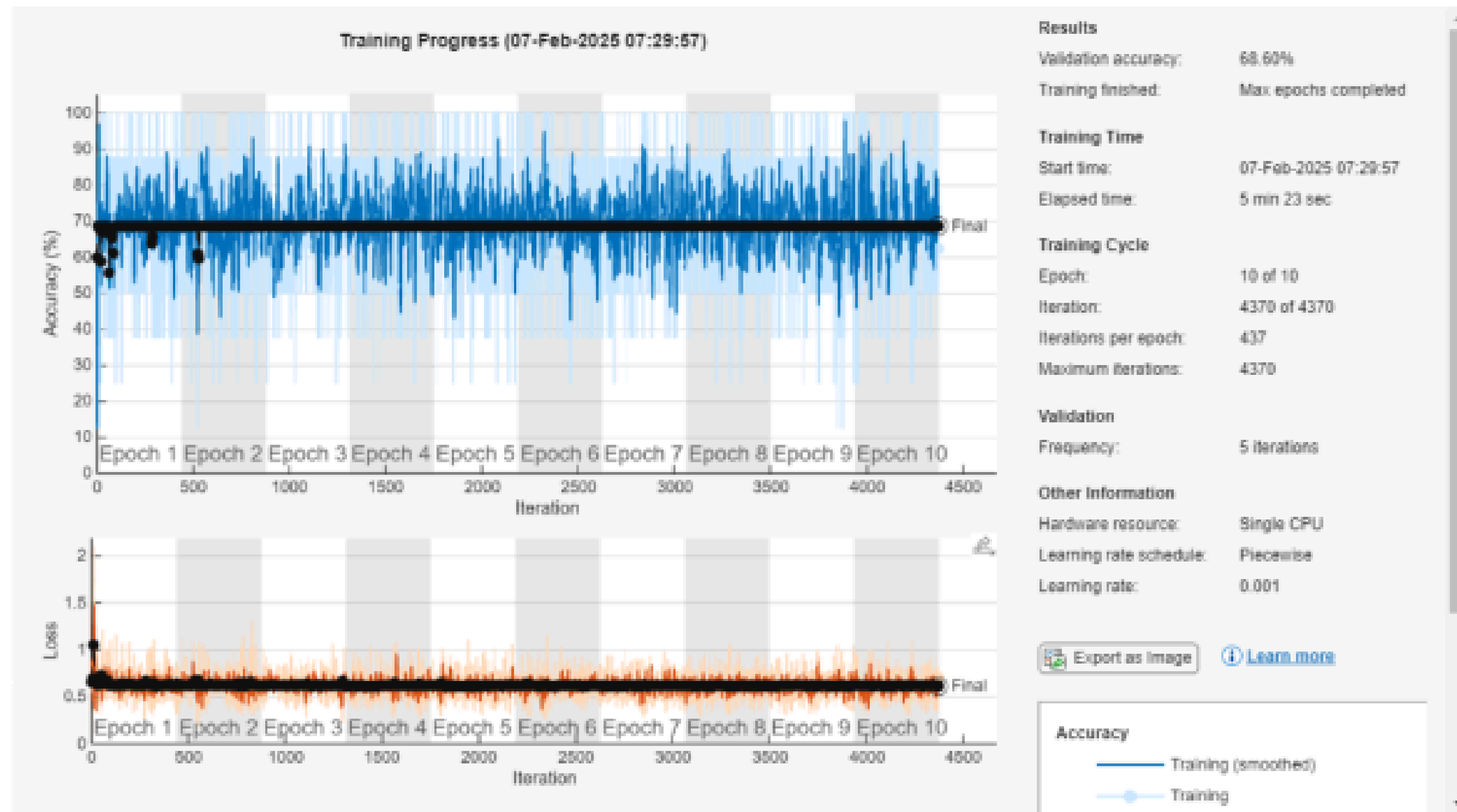
Test Accuracy: 68.80%

Layers: 5; Epoch: 25; Batch Size: 16



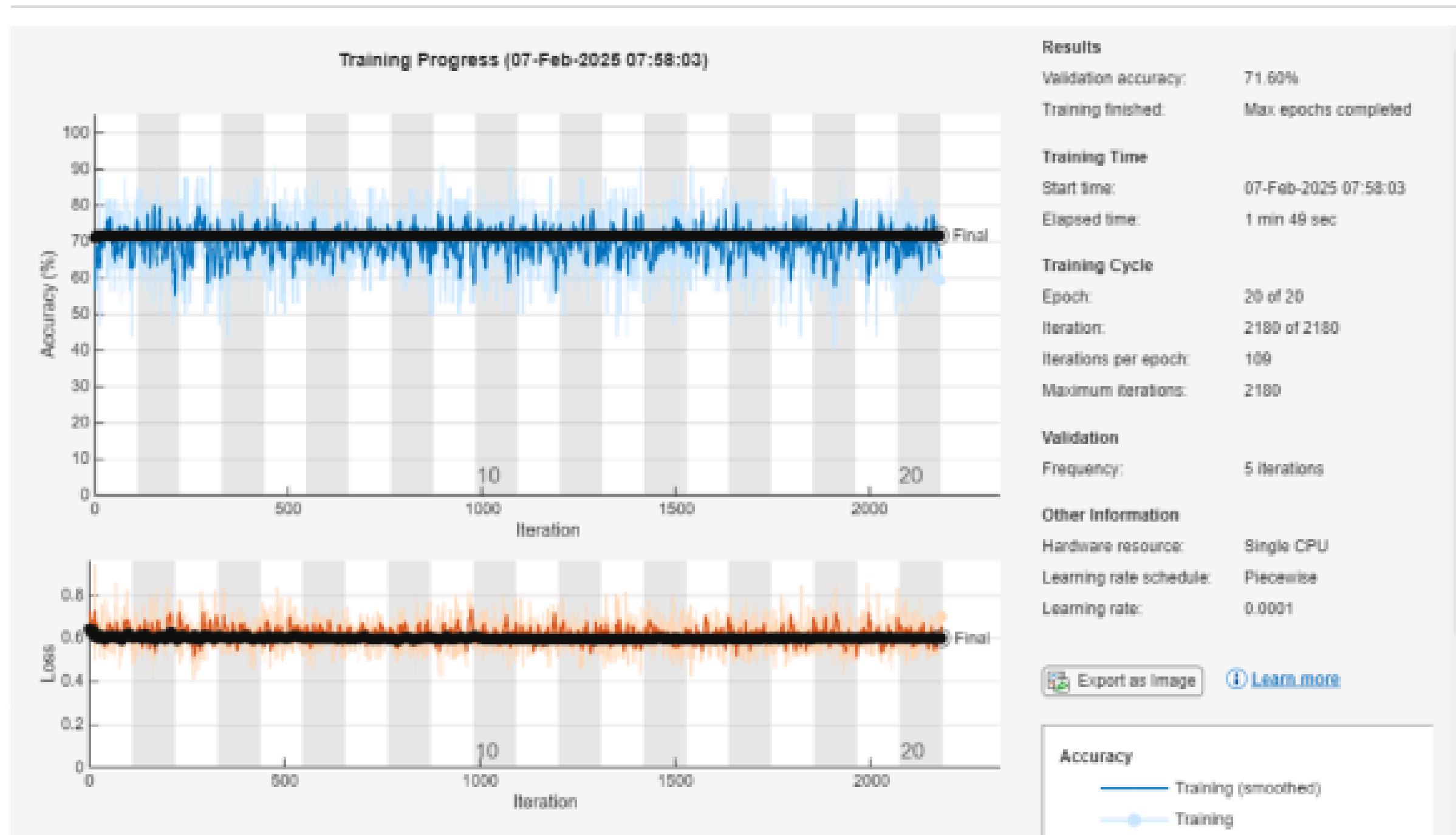
Test Accuracy: 70.80%

Layers: 4; Epoch: 25; Batch Size: 16



Test Accuracy: 70.90%

Layers: 3; Epoch: 10; Batch Size: 8



Test Accuracy: 71.00%

Layers: 4; Epoch: 20; Batch Size: 32

Components Used:

pH sensor:SEN0161

The SEN0161 pH sensor measures the acidity or alkalinity of water by calculating the concentration of hydrogen ions. It uses a mathematical method to create a linear relationship between the pH value and the voltage.

Temperature Range: 0°C to 60°C

Voltage Output: 0V to 5V (corresponding to pH values)

Operating Voltage: 3.3V - 5V

Color sensor:TCS3200

When light hits the photodiodes in the sensor, it generates a current which is converted into a square wave output with a frequency proportional to the light intensity, by which the dominant color of the object can be determined.

Light Sensitivity Range: Works best in normal indoor lighting

Output Frequency: 2 Hz to 500 kHz

Optimal Detection Distance: 1 cm to 3 cm

Gravity Liquid Level Sensor

The sensor uses capacitive sensing technology to detect liquid levels. When placed outside a non-metallic container it detects the change in capacitance caused by the presence or absence of liquid.

Detection Distance: 0 - 12mm

Operating Temperature: -5°C to 105°C

Literature review

"Wound Drainage Monitoring and Warning System" by Tong-Jin Chou et al.,2023

- System that monitors and analyzes the flow rate and color changes of wound drainage fluid to detect potential complications.
- The system using color sensor and weight sensor to continuously monitor the drainage fluid's flow rate and color, providing real-time data .
- By implementing this monitoring system, the authors aim to enhance patient care by enabling early detection of complications related to wound drainage.

Thank you