**Difference and Relation**

The primary difference between offline and online systems lies in the frequency of data processing.

Online gesture recognition processes data periodically during the interaction, providing real-time feedback. The frequency of recognition updates determines the system's responsiveness.

Offline gesture recognition processes all data in one go after the human interaction is completed. This method can be viewed as an online recognition approach where a single window encompasses all the collected data.
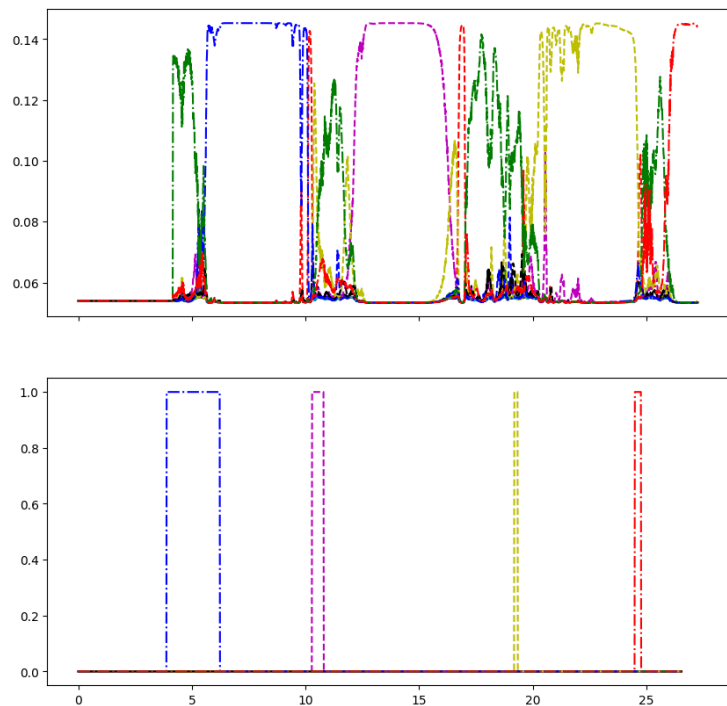


(Upper figure: online predicted gestures. Lower figure: true gestures.)

**Compared to the offline method, online recognition responds faster, but at the cost of:**
1. **Duplicated Detections**
   If the duration of a gesture exceeds the window width, the same gesture might be recognized multiple times, causing redundancy (See yellow line near x=21). Setting a recur_threshold in the Jupyter notebook can mitigate this issue, ensuring that a gesture is not repeatedly recognized within a short period. However, user data variability requires different recur_threshold settings for different users or scenarios, complicating the tuning process.
2. **Ambiguous Gesture Boundaries**
   During a gesture, the model's predicted softmax value typically increases steadily. Without a clear mechanism to define gesture boundaries, high thresholds can result in a delayed start, leading to inaccuracies. (The peaks in the predicted graph come after true peaks)
3. **High Memory and Computation Costs**
   The width and step length of sliding windows affect computational load. Larger windows improve accuracy by containing more information from longer sequences, while smaller steps enhance responsiveness but increase computation due to overlapping calculations. This results in higher memory usage and processing demands, particularly challenging for real-time processing on embedded devices.