**Question 6.1**

Describe a situation or problem from your job, everyday life, current events, etc., for which a Change Detection model would be appropriate. Applying the CUSUM technique, how would you choose the critical value and the threshold?

**Situational Context**

At my workplace, I developed a dashboard to monitor incoming data as it undergoes real-time parsing. The system is configured with multiple export triggers based on critical values, which are periodically updated in consultation with the team. Our latency metrics are directly tied to the efficiency of the parsing process; we've seen marked improvements in latency following recent code optimizations. Notably, the parser experiences a spike in latency during the first 15 minutes each morning—particularly on Mondays—due to the backlog of weekend quotes. To account for this, I've set the notification system to activate only 30 minutes after the parser starts each day.

**Monitoring Parameters**

Here are some examples of the metrics being monitored:

1. **Parser Latency over 10 minutes**
   * Critical Value: 10 minutes
   * Thresholds: Maybe add a warning alert at 7 minutes and a critical alert at 10 minutes.
2. **Zero quotes don’t pass the first parsing process in an hour**
   * Critical Value: 0 quotes in 60 minutes
   * Thresholds: I have a warning threshold at 30 minutes with zero quotes. If it reaches 60 minutes, that’s the critical threshold.
3. **Time between passed versus matched quotes is over 10 minutes**
   * Critical Value: 10 minutes
   * Thresholds: A warning alert might go off at 5 minutes, escalating to a critical alert at 10 minutes.

**Example Calculation:**

# Data Points: Maybe an example for parser latency data for 5 time points as follows:

# [9,11,12,8,13] minutes.

# Calculation: calculate the CUSUM at each time point t as:

# CUSUM(t)=CUSUM(t−1)+(X(t)−critical value)

# CUSUM(1)=0+(9−10)=−1

# CUSUM(2)=−1+(11−10)=0

# CUSUM(3)=0+(12−10)=2

# CUSUM(4)=2+(8−10)=0

# CUSUM(5)=0+(13−10)=3

# None of the CUSUM values exceeded the set threshold of 7 minutes, so no alert would be sent out.