

# Clinical Validation Questionnaire

## ECG Anomaly Detection Using Finite Automata Expert Review Form

Mohammed VI Polytechnic University (UM6P)  
College of Computing – Computational Theory Course  
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### Instructions

Thank you for participating in this clinical validation study. We have developed an automated system that detects ECG anomalies by encoding heartbeats into symbolic patterns and highlighting segments that deviate from normal patterns.

**Your task:** Review 20 ECG heartbeat images. For each sample:

1. Examine the ECG waveform
2. Identify any abnormalities you observe
3. Compare your assessment to the system's highlighted regions (shown in red)
4. Complete the questionnaire for that sample

**Time required:** Approximately 15–20 minutes

**Segment Reference:**

Position	Symbol	ECG Region
1	A/a	P-wave onset
2	B/b	P-wave peak
3	C/c	PR segment / Q-wave
4	D/d	R-wave onset
5	E/e	R-wave peak
6	F/f	S-wave
7	G/g	ST segment
8	H/h	T-wave onset
9	I/i	T-wave peak
10	J/j	T-wave end

**Note:** Uppercase letters (A–J) indicate normal segments; lowercase (a–j) indicate system-detected abnormality.

## Sample #1

Please refer to the image file: *sample\_01.png*

### Q1. Overall Assessment

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

### Q2. Type of Abnormality (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: rhythm

### Q3. Abnormal Regions (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

### Q4. System Agreement

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

### Q5. Clinical Usefulness

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

**Comments:** The system was able to highlight the ST-elevation yet it lacks the crucial details that a physician needs

for clinical assessment of the case ( a trained physician can spot a rythme abnormality yet for accurate assessment you need at least 2 cardiac cycles .

## Sample #2

Please refer to the image file: *sample\_02.png*

### Q1. Overall Assessment

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

### Q2. Type of Abnormality (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

### Q3. Abnormal Regions (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

### Q4. System Agreement

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

Comments: rhythm indication is crucial in this case the sample provided does not show enough data for the reviewer (lead and scale)

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**Sample #3**

Please refer to the image file: *sample\_03.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
 P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

Comments: the case represents a blue-print of left bundle branch block (LBBB) with probable ischemia due the abnormal concordance the system has successfully almost detected the type yet it highlighted everything including normal sections that could mislead the physician

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**Sample #4**

Please refer to the image file: *sample\_04.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1     2     3     4     5     6     7     8     9     10  
 P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match     Partial match     No match     N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful     Somewhat helpful     Not helpful     Misleading

**Comments:** the system was useful interpreting the case and highlighted the areas that show pathology there is some sort of mismatch but it doesn't affect the end interpretation result it clearly detected the crucial defects that would orient the physician

**Sample #5**

Please refer to the image file: *sample\_05.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal     Yes, mildly abnormal     Borderline     No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality     ST segment abnormality  
 PR interval abnormality     T-wave abnormality  
 QRS complex abnormality     Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1     2     3     4     5     6     7     8     9     10  
 P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match     Partial match     No match     N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful     Somewhat helpful     Not helpful     Misleading

**Comments:** the system couldn't detect the proper pathology and labeled it as an artifact and the data is not sufficient to review

**Sample #6**

Please refer to the image file: *sample\_06.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Sample #7**

Please refer to the image file: *sample\_07.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

**Comments:** the system was able to detect the ectopy

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## Sample #8

Please refer to the image file: *sample\_08.png*

### Q1. Overall Assessment

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

### Q2. Type of Abnormality (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

### Q3. Abnormal Regions (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

### Q4. System Agreement

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

### Q5. Clinical Usefulness

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

**Comments:** the system couldn't label the proper pathology and may have considered it and artifact a filtered ECG would be more accurate than a raw one

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## Sample #9

Please refer to the image file: *sample\_09.png*

### Q1. Overall Assessment

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

### Q2. Type of Abnormality (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

### Q3. Abnormal Regions (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

**Comments:** \_\_\_\_\_ the P wave amplitude is beyond the nomal range suggesting an enhanced atrial depolarization and the T wave being symmetrical could indicate some sort of pathology further paraclinical assessment is necessary

**Sample #10**

Please refer to the image file: *sample\_10.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2 \_\_\_\_\_  
 P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

**Comments:** \_\_\_\_\_ the BBB is indeed present ;the system has detected it however it still lacks crucial details and has highlighted what

\_\_\_\_\_ appear to be normal regions

**Sample #11**

Please refer to the image file: *sample\_11.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality  ST segment abnormality  
 PR interval abnormality  T-wave abnormality  
 QRS complex abnormality  Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1  2  3  4  5  6  7  8  9  10  
 P-onset P-peak PR/Q R-onset R-peak S-wave ST T-onset T-peak T-end

**Q4. System Agreement**

- 2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match  Partial match  No match  N/A (normal)

**Q5. Clinical Usefulness**

- 2 Would the system's highlighting be helpful in clinical practice?

- Very helpful  Somewhat helpful  Not helpful  Misleading

Comments: As stated before ST elevation is an emergency not to be missed the system has detected it successfully

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**Sample #12**

Please refer to the image file: sample\_12.png

**Q1. Overall Assessment**

- 2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal  Yes, mildly abnormal  Borderline  No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality  ST segment abnormality  
 PR interval abnormality  T-wave abnormality  
 QRS complex abnormality  Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1  2  3  4  5  6  7  8  9  10  
 P-onset P-peak PR/Q R-onset R-peak S-wave ST T-onset T-peak T-end

**Q4. System Agreement**

- 2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match  Partial match  No match  N/A (normal)

**Q5. Clinical Usefulness**

- 2 Would the system's highlighting be helpful in clinical practice?

- Very helpful  Somewhat helpful  Not helpful  Misleading

Comments: A TWI is most of the times abnormal and could indicate emergencies such as ischemia the system has successfully detected it yet it highlighted what appear to be normal regions

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## Sample #13

Please refer to the image file: *sample\_13.png*

### Q1. Overall Assessment

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

### Q2. Type of Abnormality (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

### Q3. Abnormal Regions (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

### Q4. System Agreement

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

### Q5. Clinical Usefulness

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

Comments: the system picked up on the abnormalities

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## Sample #14

Please refer to the image file: *sample\_14.png*

### Q1. Overall Assessment

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

### Q2. Type of Abnormality (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

### Q3. Abnormal Regions (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

### Q4. System Agreement

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

Comments: the system was able to detect the crucial abnormalities

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**Sample #15**

Please refer to the image file: sample\_15.png

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
 P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

Comments: abnormalities detected by system are the same ones detected by the reviewer

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**Sample #16**

Please refer to the image file: sample\_16.png

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1     2     3     4     5     6     7     8     9     10  
 P-onset   P-peak   PR/Q   R-onset   R-peak   S-wave   ST   T-onset   T-peak   T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match     Partial match     No match     N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful     Somewhat helpful     Not helpful     Misleading

Comments: Abnormalities detected by system are the same ones be reviewer for the P wave and T wave

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**Sample #17**

Please refer to the image file: *sample\_17.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal     Yes, mildly abnormal     Borderline     No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2  P-wave abnormality     ST segment abnormality  
 PR interval abnormality     T-wave abnormality  
 QRS complex abnormality     Other: \_\_\_\_\_

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2  1     2     3     4     5     6     7     8     9     10  
 P-onset   P-peak   PR/Q   R-onset   R-peak   S-wave   ST   T-onset   T-peak   T-end

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match     Partial match     No match     N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful     Somewhat helpful     Not helpful     Misleading

Comments: Abnormalities detected by system on ECG are almost the same one detected by reviewer.

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**Sample #18**

Please refer to the image file: *sample\_18.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2
- |                                                             |                                                        |
|-------------------------------------------------------------|--------------------------------------------------------|
| <input checked="" type="checkbox"/> P-wave abnormality      | <input type="checkbox"/> ST segment abnormality        |
| <input type="checkbox"/> PR interval abnormality            | <input checked="" type="checkbox"/> T-wave abnormality |
| <input checked="" type="checkbox"/> QRS complex abnormality | <input type="checkbox"/> Other: _____                  |

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2
- |                                       |                            |                                       |                                       |                            |                                       |                                       |                                       |                            |                             |
|---------------------------------------|----------------------------|---------------------------------------|---------------------------------------|----------------------------|---------------------------------------|---------------------------------------|---------------------------------------|----------------------------|-----------------------------|
| <input checked="" type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input checked="" type="checkbox"/> 3 | <input checked="" type="checkbox"/> 4 | <input type="checkbox"/> 5 | <input checked="" type="checkbox"/> 6 | <input checked="" type="checkbox"/> 7 | <input checked="" type="checkbox"/> 8 | <input type="checkbox"/> 9 | <input type="checkbox"/> 10 |
| P-onset                               | P-peak                     | PR/Q                                  | R-onset                               | R-peak                     | S-wave                                | ST                                    | T-onset                               | T-peak                     | T-end                       |

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

Comments: Abnormalities detected by the system and reviewer are the same.

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**Sample #19**

Please refer to the image file: *sample\_19.png*

**Q1. Overall Assessment**

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

**Q2. Type of Abnormality** (if applicable – check all that apply)

- 2
- |                                                             |                                                        |
|-------------------------------------------------------------|--------------------------------------------------------|
| <input checked="" type="checkbox"/> P-wave abnormality      | <input type="checkbox"/> ST segment abnormality        |
| <input checked="" type="checkbox"/> PR interval abnormality | <input checked="" type="checkbox"/> T-wave abnormality |
| <input checked="" type="checkbox"/> QRS complex abnormality | <input type="checkbox"/> Other: _____                  |

**Q3. Abnormal Regions** (mark the regions YOU identify as abnormal)

- 2
- |                                       |                                       |                                       |                                       |                                       |                                       |                                       |                                       |                                       |                                        |
|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|----------------------------------------|
| <input checked="" type="checkbox"/> 1 | <input checked="" type="checkbox"/> 2 | <input checked="" type="checkbox"/> 3 | <input checked="" type="checkbox"/> 4 | <input checked="" type="checkbox"/> 5 | <input checked="" type="checkbox"/> 6 | <input checked="" type="checkbox"/> 7 | <input checked="" type="checkbox"/> 8 | <input checked="" type="checkbox"/> 9 | <input checked="" type="checkbox"/> 10 |
| P-onset                               | P-peak                                | PR/Q                                  | R-onset                               | R-peak                                | S-wave                                | ST                                    | T-onset                               | T-peak                                | T-end                                  |

**Q4. System Agreement**

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

**Q5. Clinical Usefulness**

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

**Comments:** \_\_\_\_\_  
\_\_\_\_\_

## Sample #20

Please refer to the image file: *sample\_20.png*

### Q1. Overall Assessment

-2 Looking at this ECG heartbeat, do you consider it abnormal?

- Yes, clearly abnormal       Yes, mildly abnormal       Borderline       No, normal

### Q2. Type of Abnormality (if applicable – check all that apply)

- 2  P-wave abnormality       ST segment abnormality  
 PR interval abnormality       T-wave abnormality  
 QRS complex abnormality       Other: \_\_\_\_\_

### Q3. Abnormal Regions (mark the regions YOU identify as abnormal)

- 2  1       2       3       4       5       6       7       8       9       10  
P-onset    P-peak    PR/Q    R-onset    R-peak    S-wave    ST    T-onset    T-peak    T-end

### Q4. System Agreement

-2 Does the system's highlighted region(s) match your clinical assessment?

- Yes, exact match       Partial match       No match       N/A (normal)

### Q5. Clinical Usefulness

-2 Would the system's highlighting be helpful in clinical practice?

- Very helpful       Somewhat helpful       Not helpful       Misleading

**Comments:** Despite citing the type of abnormality the system highlighted everything which could mislead and mask the emergency

\_\_\_\_\_

## Summary Assessment

Please complete this section after reviewing all 20 samples.

### S1. Overall System Performance

How would you rate the system's ability to identify abnormal ECG regions?

- 2  Excellent (consistently accurate)
- Good (mostly accurate with minor issues)
- Fair (sometimes accurate, sometimes not)
- Poor (frequently inaccurate)

### S2. Clinical Utility

Would this type of automated highlighting be useful in clinical practice?

- 2  Yes, as a primary screening tool
- Yes, as a secondary check / quality assurance
- Maybe, with significant improvements
- No, not clinically useful

### S3. Key Strengths

What did the system do well?

- 2 the system didn't miss the blue-prints pathologies and was able to detect the emergencies such as ST-elevation

### S4. Key Weaknesses

What were the main problems or limitations?

- 2 In reviewing the images provided along with the file there were limitations that have impacted the review and that need to be corrected such as : absent leads ( the aspect of the waves change from lead to another what may appear pathological in a lead could be considered very much normal in another and same goes for normal patterns that may be interpreted as abnormalities ) ;artefacts ; one heart cycle is not enough to interpret the rhythm which is crucial in the reading of an ECG; no measurement units ;the index in the x-axis is not conditioned to each heart rhythm

### S5. Suggestions for Improvement

- In reviewing the images provided along with the file there were limitations that have impacted the review and that need to be corrected such as : absent leads ( the aspect of the waves change from lead to another what may appear pathological in a lead could be considered very much normal in another and same goes for normal patterns that may be interpreted as abnormalities ) ;adding a filter to the ECG samples to smooth the artefacts would make the probability of misinterpretation lower than the raw samples ; there must be at least 2 heart cycles as to interpret the rhythm which is crucial in the reading of an ECG(and preferably providing the entire ECG graph would be ideal); measurement units must be added to the graphs ; the index in the x-axis must be conditioned to each heart rhythm

## Reviewer Information

Name: EL AJI Aya

Title/Position: student doctor

Institution: faculté de médecine pharmacie et dentaire de Fes

Specialty: extern

Years of ECG interpretation experience: 1 year

Date of review: 12th December 2025

### Consent Statement

I understand that my responses will be used for academic research purposes to validate the performance of an ECG anomaly detection system developed as a student project at Mohammed VI Polytechnic University. My name may be acknowledged in the research paper.

I agree to participate in this validation study

Signature: 

Date: 12th December 2025

## Thank You

Thank you for your valuable time and expertise in reviewing these ECG samples. Your feedback is essential for validating our automated anomaly detection system.

### Contact Information:

For questions about this study, please contact:

**Aya Benjelloun, Nour El Houda El Iamani & Houda Toudali**

College of Computing, UM6P

Email: [aya.benjelloun@um6p.ma](mailto:aya.benjelloun@um6p.ma), [houda.toudali@um6p.ma](mailto:houda.toudali@um6p.ma), [nourelhouda.elyamani@um6p.ma](mailto:nourelhouda.elyamani@um6p.ma)

### For Research Team Use Only:

Date Received	Data Entered By	Verified By