

# Table of Contents

<b>1. Introduction</b>	<b>1</b>
1.1. Motivation . . . . .	1
1.2. Hypothesis . . . . .	2
1.3. General objective . . . . .	2
1.4. Specific objectives . . . . .	2
1.5. Contributions . . . . .	3
<b>2. Background</b>	<b>4</b>
2.1. Problem statement . . . . .	4
2.2. Bayesian methods . . . . .	4
2.2.1. Bayesian online change point detection (BOCPD) . . . . .	5
2.2.2. Practical consequences of BOCPD . . . . .	6
2.3. Improvements and extensions of BOCPD . . . . .	7
2.3.1. Gaussian process change point detection (GPCPD) . . . . .	8
2.3.2. Robust Bayesian online change point detection with model selection (RBOCPDMS) . . . . .	9
2.3.3. Restarted Bayesian online change point detection (R-BOCPD) . . . . .	10
2.3.4. Other variants of BOCPD . . . . .	11
2.4. Non-Bayesian methods . . . . .	12
2.4.1. Cumulative sum (CUSUM) . . . . .	12
2.4.2. Likelihood-ratio-based methods . . . . .	13
2.4.3. No-prior-knowledge exponential weighted moving average (NEWMA) . . . . .	13
<b>3. Greedy Online Change Point Detection</b>	<b>15</b>
3.1. Notation . . . . .	16
3.2. Criterion for the candidate change point location . . . . .	16
3.3. Efficient greedy search of the optimal change point . . . . .	17
3.4. Criterion for the change point approval . . . . .	21
3.5. Online implementation . . . . .	22
<b>4. Experiments</b>	<b>27</b>
4.1. Synthetic data . . . . .	27
4.2. Real world data . . . . .	29
4.2.1. EEG dataset . . . . .	32
4.2.2. Human Activity dataset . . . . .	32
4.2.3. Respiration dataset . . . . .	34
4.2.4. Well-log dataset . . . . .	35

<b>5. Deeper insights</b>	<b>38</b>
5.1. Time complexity . . . . .	38
5.2. Effectively evaluated timestamps . . . . .	39
5.3. Limitations . . . . .	40
<b>6. Conclusions</b>	<b>42</b>
<b>Bibliography</b>	<b>43</b>
<b>Appendix A. Synthetic datasets</b>	<b>47</b>
<b>Appendix B. Implementation details</b>	<b>48</b>
B.1. Data preprocessing and hyperparameters . . . . .	48
B.2. Hardware setup . . . . .	48
<b>Appendix C. Effectively evaluated timestamps</b>	<b>49</b>