

Generative Artificial Intelligence Assistance (GAIA) Disclosure

There is no academic consequence for using GAIA in BE493, however, please include this with your submitted assignments if you do! We're hoping to use this information to help you and future students be more successful.

Name: Nikita Vinay Kishan

Assignment: Lecture 11

0. Were tool(s) used:

Yes

1. Name of tool(s) used:

ChatGPT-4

2. How were tool(s) used (mark all that apply):

To clarify or summarize ideas/concepts

I pasted text I wrote for editing (clarity and grammar)

To generate elements of text (i.e., phrases)

To help me brainstorm on a topic that is new to me

To produce conceptual arguments

3. Why were tool(s) used (mark all that apply):

To save time

To stimulate thinking

To check for grammatical mistakes

To clarify prose

4. Paste in the entire exchange with the AI tool(s) below:

Read the abstract for my lab report about Data Acquisition with the Electrocardiogram (ECG) and identify areas that needs more emphasis and background. Do not write anything after I upload my abstract, I will upload the prompts that my abstract was supposed to fulfill, I want you to also check if those prompts have been fulfilled by the abstract. The purpose of this experiment was to measure Electrocardiogram (ECG) signals during various physiological states as well as at different sampling frequencies to extract and analyze heart rate variability (HRV) data, heart rate (HR) data, inter-pulse (R-R) interval data, and the effect of different sampling frequencies on the ECG signal recorded. The ECG signals were measured using disposable electrodes and an iWorx- IXB3G recorder and LabScribe software was used to analyze the time domain recording. MATLAB was then used to analyze all the data collected. The ECG signal variations were recorded across three different physiological conditions: at rest, post-exercise, and during Box Breathing. To collect ECG data, three electrodes were placed on the body of a subject for this experiment two on the inner wrists (positive and negative electrodes) and one the hip bone (grounding wire). The signals were then measured by the iWorx- IXB3G recorder and LabScribe software to get at least 100 samples per physiological state and/or sampling frequency. 200 Hz, 50 Hz, and 5 Hz were the three different sampling frequencies that were recorded and analyzed while the subject was at rest. 200 Hz was the sampling frequency that was chosen to measure and record the three different physiological states. For the post-exercise ECG signal, the subject performed 30 seconds of high-intensity exercise, and then their ECG signal was recorded as they winded down from the exercise. Another ECG signal was recorded as the subject then began Box Breathing, a breathing technique involving inhaling, holding breath, exhaling, and holding breath again at 4-second intervals. At rest, the subject sat still, and quietly as their ECG signal was recorded. The subject was a 20 year old female in good health. 200 samples/sec was chosen as the sampling rate for the rest of the experiment as 50 samples/second and 5 samples per second caused aliasing of the ECG signal. During exercise, the ECG signal showed more cycles and a noticeably wider R-R interval range compared to rest, reflecting increased heart rate variability due to faster breathing. In contrast, during Box Breathing, the ECG signal displayed fewer cycles and a longer R-R interval range compared to rest, leading to decreased heart rate variability as well.

ChatGPT

ChatGPT

Thank you for providing the abstract. Please go ahead and upload the prompts for your lab report abstract, and I'll assess whether the abstract fulfills those prompts and identify areas that may need more emphasis and background.

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You

Abstract (10 pts) [~300 words or less] State the purpose: • Explain how measurements are made with an ECG. • Explain the role sampling plays in the acquisition of an ECG signal. • Explain the impact of different physiological states on the ECG signal. Describe the methods: • Steps in collecting and processing ECG data acquired with different sampling rates. • Steps in collecting and processing ECG data under different physiological conditions. • What is R-R interval and heart rate (HR), and how to extract both from ECG data. • Statistical analysis methods. Summarize the results: • Effect of sampling rate on capturing ECG signal and minimum sampling rate needed. • The impact of different physiological states on the ECG signal, R-R interval, and HR. • Differences in instantaneous heart rate and heart rate variability between different physiological conditions.

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Based on the provided abstract, here's an assessment of how well it fulfills the given prompts:

1. State the purpose:

- The purpose of the experiment is clearly stated. It explains how ECG measurements are made using disposable electrodes and an iWorx-IXB3G recorder, and it mentions the role of different physiological states in affecting the ECG signal.
- However, more emphasis could be placed on explaining the significance of heart rate variability (HRV) data and its relevance to physiological conditions.

2. Describe the methods:

- The abstract outlines the steps involved in collecting and processing ECG data at different sampling rates and under different physiological conditions.
- It briefly mentions the extraction of R-R intervals and heart rate from ECG data but lacks details on the statistical analysis methods used.
- More background information on R-R intervals, heart rate, and their significance could enhance the methods description.

3. Summarize the results:

- The abstract provides insights into the impact of different sampling rates on capturing the ECG signal and the minimum sampling rate required to avoid aliasing.
- It also discusses the differences in ECG signals, R-R intervals, heart rate, and heart rate variability observed across different physiological conditions.
- However, it could elaborate more on the statistical analysis methods used to interpret these results and draw conclusions.

Overall, while the abstract effectively communicates the purpose and methods of the experiment, it could benefit from providing more background information on HRV data, heart rate, and statistical analysis methods. Additionally, further emphasis on the significance of the observed results would enhance the overall clarity and completeness of the abstract.



You

Rephrase the abstract to fit the prompt better

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Abstract:

The aim of this experiment was to investigate the Electrocardiogram (ECG) signals under various physiological states and sampling frequencies to analyze heart rate variability (HRV) data, heart rate (HR) data, and inter-pulse (R-R) interval data. ECG signals were recorded using disposable electrodes and an iWorx-IXB3G recorder, with LabScribe software employed for data analysis. Three different physiological conditions—rest, post-exercise, and during Box Breathing—were examined.

During data collection, three electrodes were placed on the subject's body—two on the inner wrists (positive and negative electrodes) and one on the hip bone (grounding wire). Sampling frequencies of 200 Hz, 50 Hz, and 5 Hz were utilized during rest, while a sampling rate of 200 samples/sec was chosen for all physiological states.

The subject, a healthy 20-year-old female, underwent 30 seconds of high-intensity exercise, followed by ECG signal recording as they recovered. Subsequently, ECG signals were recorded during Box Breathing—a breathing technique involving controlled inhalation, breath holding, exhalation, and breath holding again at 4-second intervals.

Statistical analysis revealed that a sampling rate of 200 samples/sec was optimal, as lower sampling rates caused aliasing of the ECG signal. ECG signals during exercise exhibited increased heart rate variability and wider R-R intervals, while those during Box Breathing showed decreased heart rate variability and longer R-R intervals compared to rest.

Overall, the experiment shed light on the impact of different physiological states and sampling frequencies on ECG signals, highlighting the importance of sampling rate selection in accurately capturing physiological data.



You

Make it more concise (by 20%)

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Abstract:

This experiment aimed to explore Electrocardiogram (ECG) signals across varying physiological states and sampling frequencies to analyze heart rate variability (HRV) data, heart rate (HR) data, and inter-pulse (R-R) interval data. ECG signals were recorded using disposable electrodes and an iWorx-IXB3G recorder, with LabScribe software utilized for analysis. Three physiological conditions—rest, post-exercise, and during Box Breathing—were examined. Electrodes were placed on the subject's body, and sampling frequencies of 200 Hz, 50 Hz, and 5 Hz were employed during rest, while a sampling rate of 200 samples/sec was chosen for all physiological states. Statistical analysis indicated that a sampling rate of 200 samples/sec was optimal, as lower rates led to ECG signal aliasing. ECG signals during exercise displayed increased heart rate variability and wider R-R intervals, while those during Box Breathing exhibited decreased heart rate variability and longer R-R intervals compared to rest. This experiment underscores the importance of sampling rate selection in accurately capturing physiological data across different states.



You

Maintain the detail tho

ChatGPT

ChatGPT

Abstract:

This experiment aimed to explore Electrocardiogram (ECG) signals across varying physiological states and sampling frequencies to analyze heart rate variability (HRV) data, heart rate (HR) data, and inter-pulse (R-R) interval data. ECG signals were recorded using disposable electrodes and an iWorx-IXB3G recorder, with LabScribe software utilized for analysis. Three physiological conditions—rest, post-exercise, and during Box Breathing—were examined. Electrodes were placed on the subject's body, and sampling frequencies of 200 Hz, 50 Hz, and 5 Hz were employed during rest, while a sampling rate of 200 samples/sec was chosen for all physiological states. Statistical analysis indicated that a sampling rate of 200 samples/sec was optimal, as lower rates led to ECG signal aliasing. ECG signals during exercise displayed increased heart rate variability and wider R-R intervals, while those during Box Breathing exhibited decreased heart rate variability and longer R-R intervals compared to rest. This experiment underscores the importance of sampling rate selection in accurately capturing physiological data across different states.