

TimeNotes: A Study on Effective Chart Visualization and Interaction Techniques for Time-Series Data (User Study Extra Material)

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Visual representations for exploring large time-series data

USER STUDY TRAINING MATERIAL*

(*PLEASE CITE AUTHORS AND MANUSCRIPT IF RE-USING ANY OF THE FOLLOWING MATERIAL)



Introduction

- You should try to answer each question for **accuracy** and then **speed**.
- There is no time limit in answering each question, though the time used by you is recorded.



Introduction (continued)

- If possible please try to keep breaks to a minimum during a task.
- You can rest for as long as you like between tasks.
- The software will show how many questions are remaining for the current task in the **top left corner**.



Introduction (continued)

- Please do not discuss your answers with others during the experiment.
- Please **DO NOT** switch off the machine or log off at the end of the session.



HOW TO READ EACH VISUALISATION

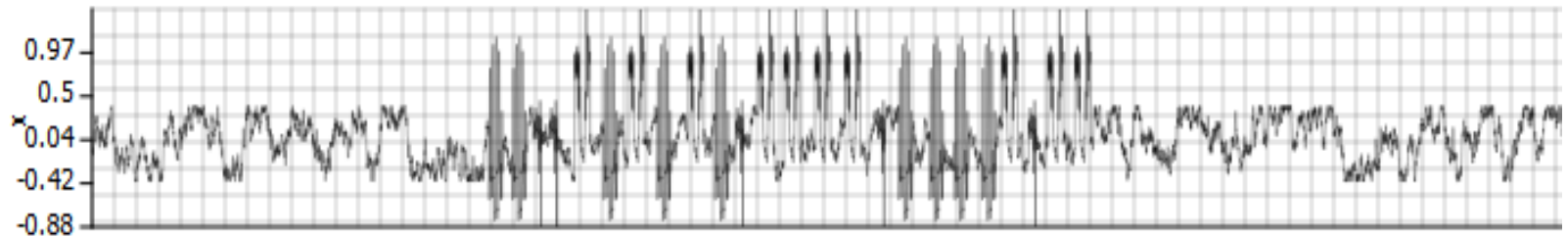


Hierarchical Zooming

- Method of navigating through large time-series graphs.
- Build a hierarchy of different zoom levels of regions in the data.
- Two visualisation techniques in the study:
 - Stack zoom
 - Bookmark zoom



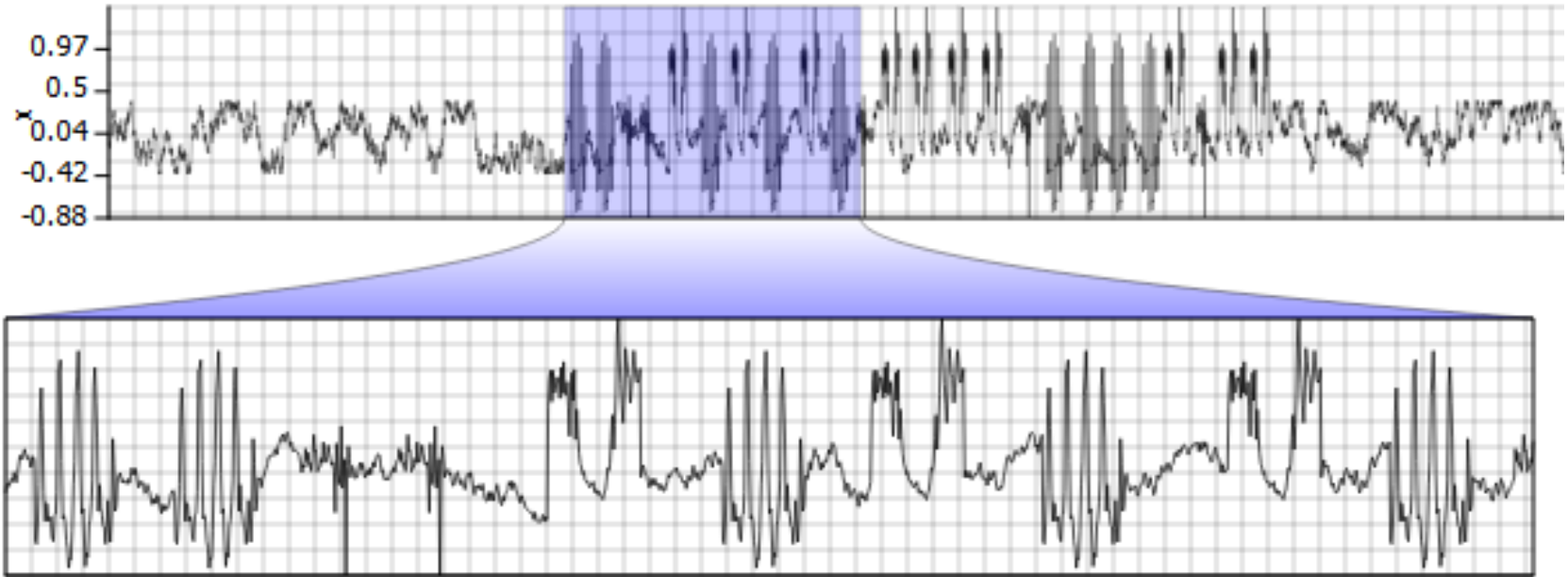
How to read a bookmark visualization



- Start off with the whole time-series graph plotted
- User can select regions of interest which are zoomed in...



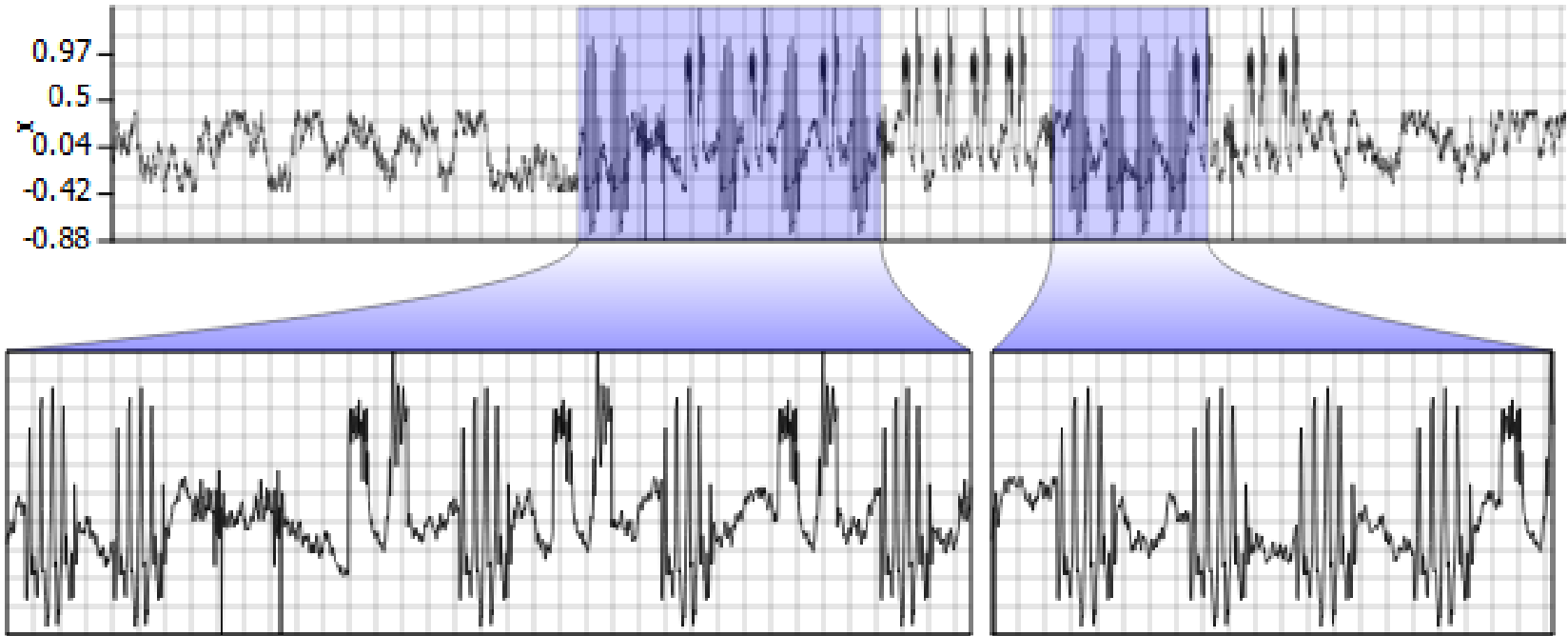
How to read a bookmark visualization



- Here the region of interest is focused in the lower view



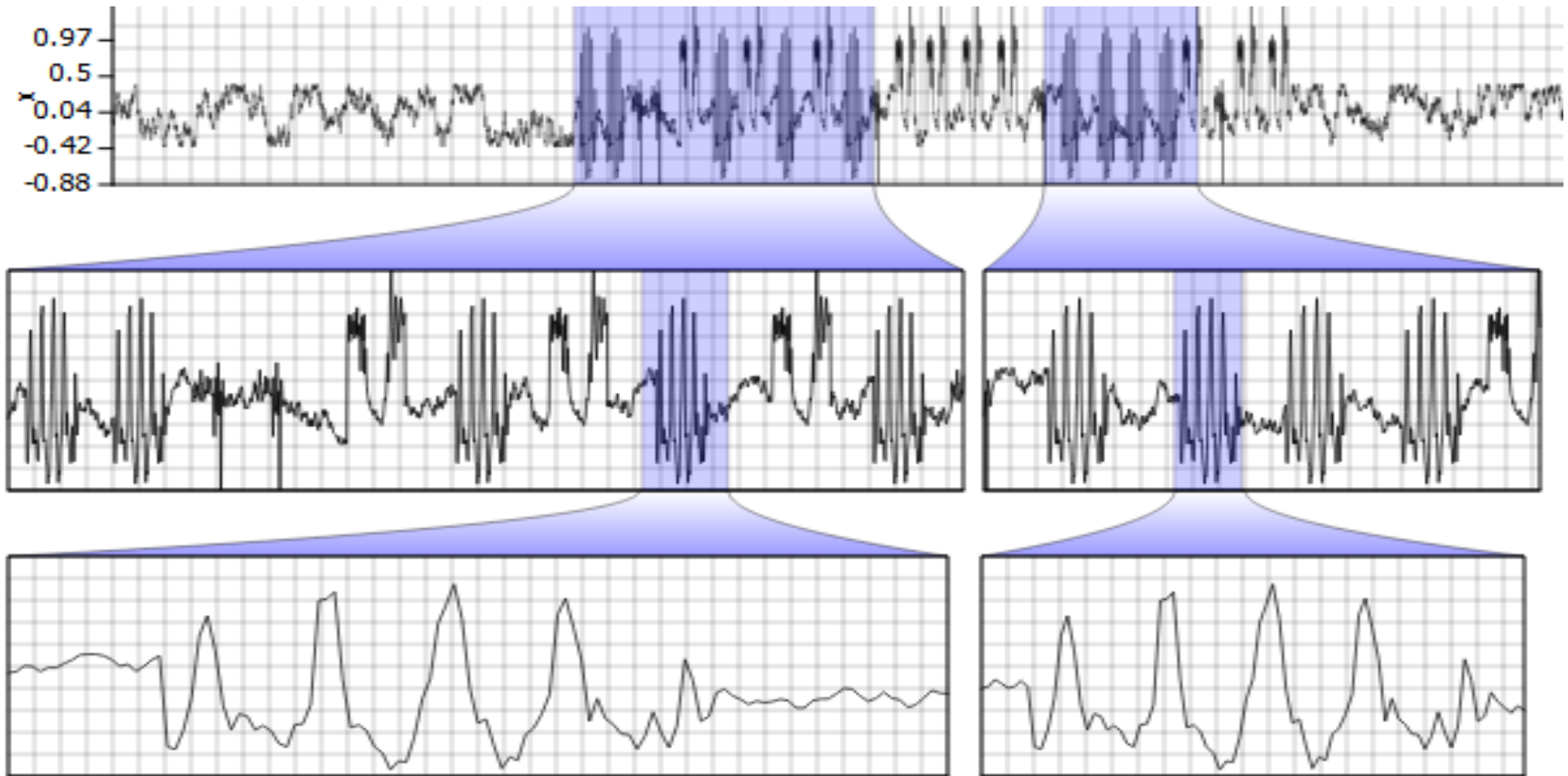
How to read a bookmark visualization



- A hierarchy of zoom levels is constructed by further selection.



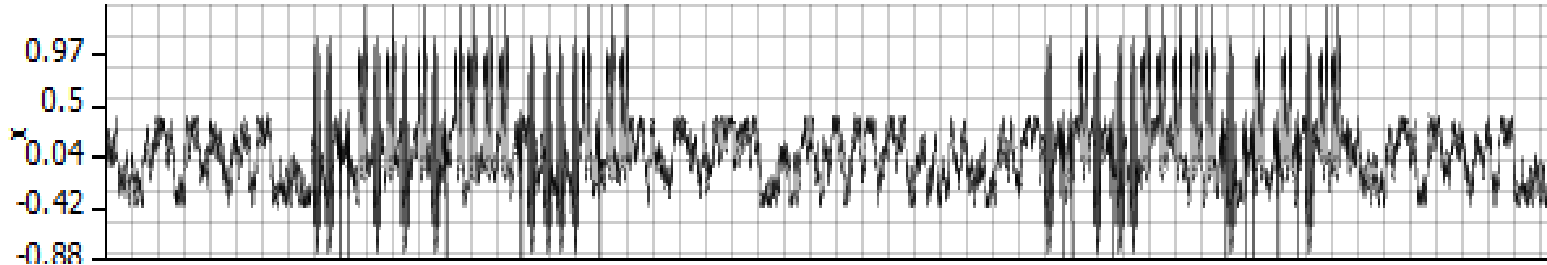
How to read a bookmark visualization



- Navigate through the hierarchy using the connections



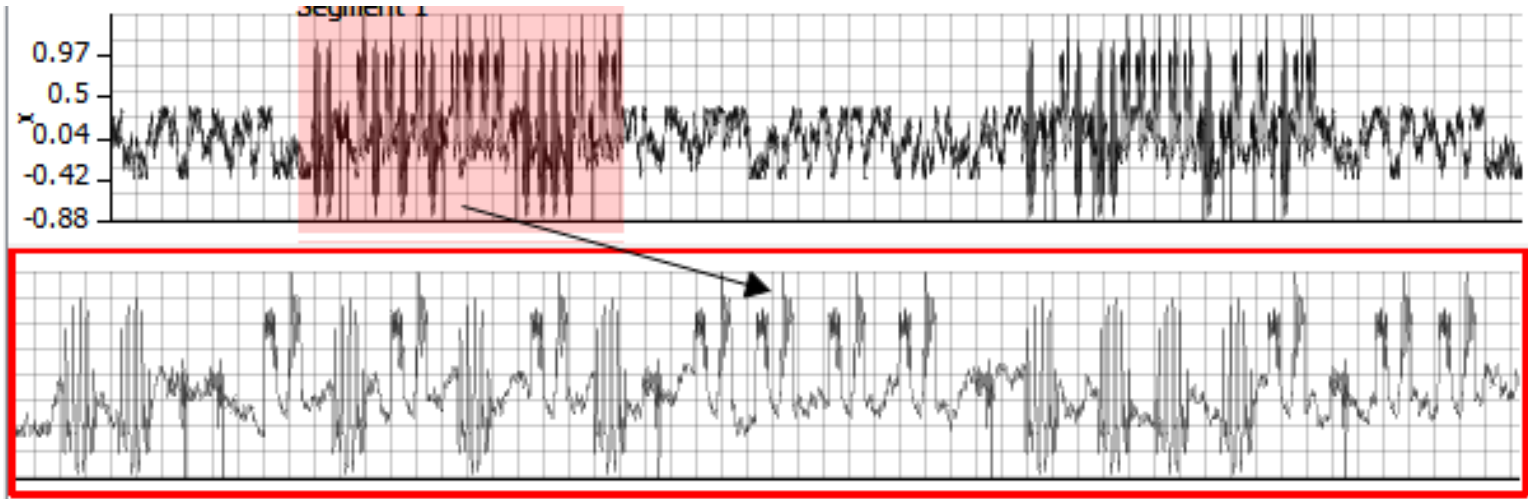
How to read a stack zoom visualization



- Again, the whole time-series graph is plotted
- User can select regions of interest which are zoomed in...



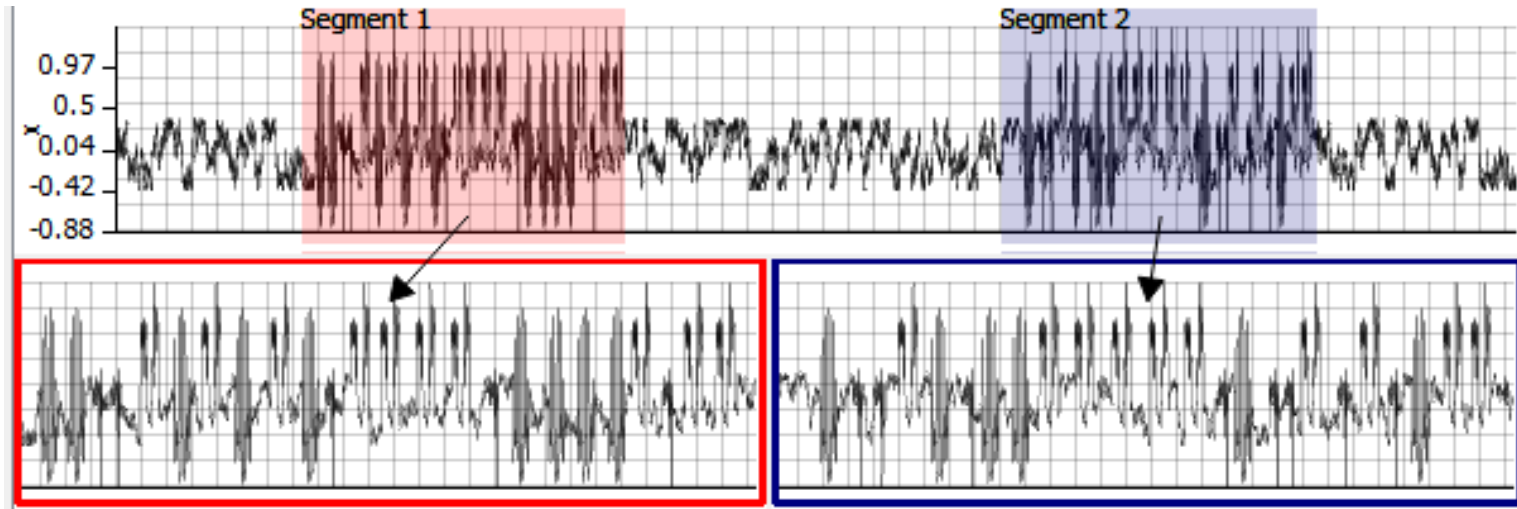
How to read a stack zoom visualization



- A region of interest is added which is shown below the root. Arrows show the connection between the parent location.

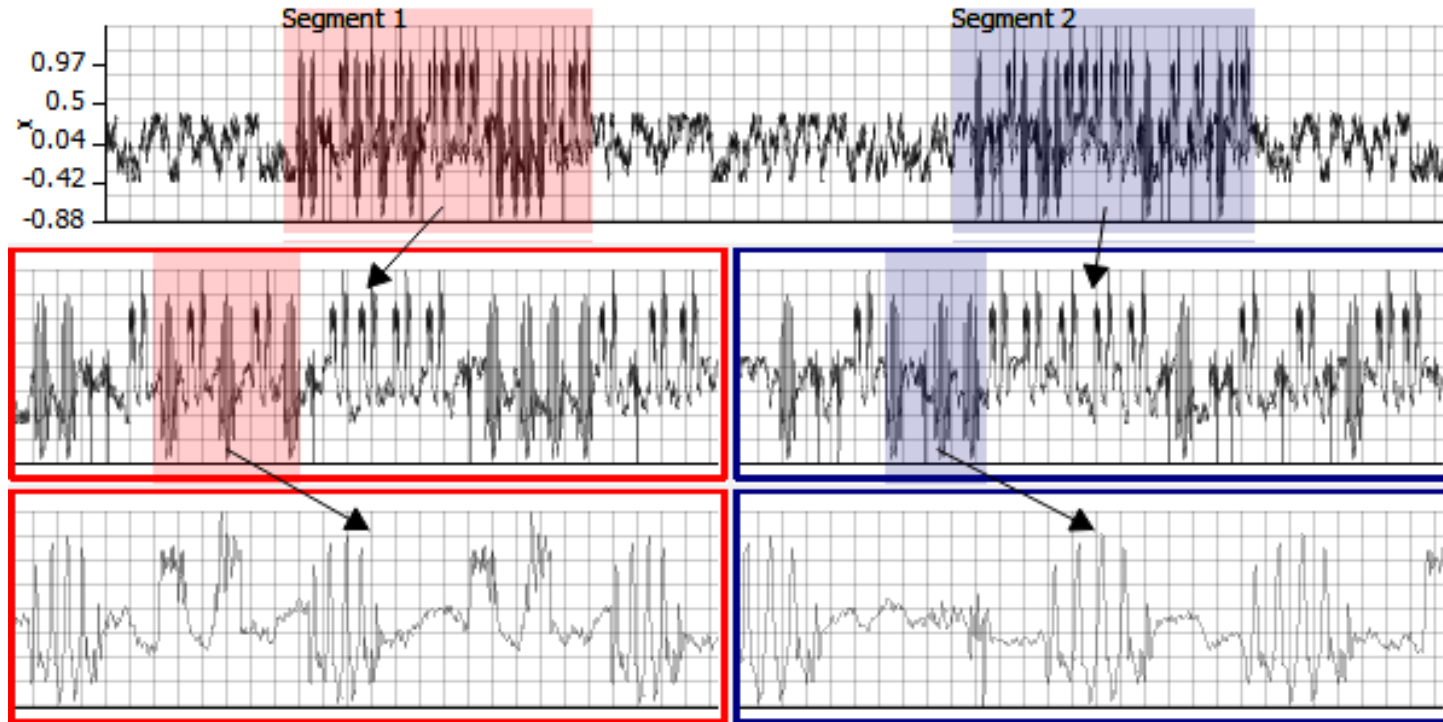


How to read a stack zoom visualization





How to read a stack zoom visualization



- Navigate through the hierarchy using the arrows.

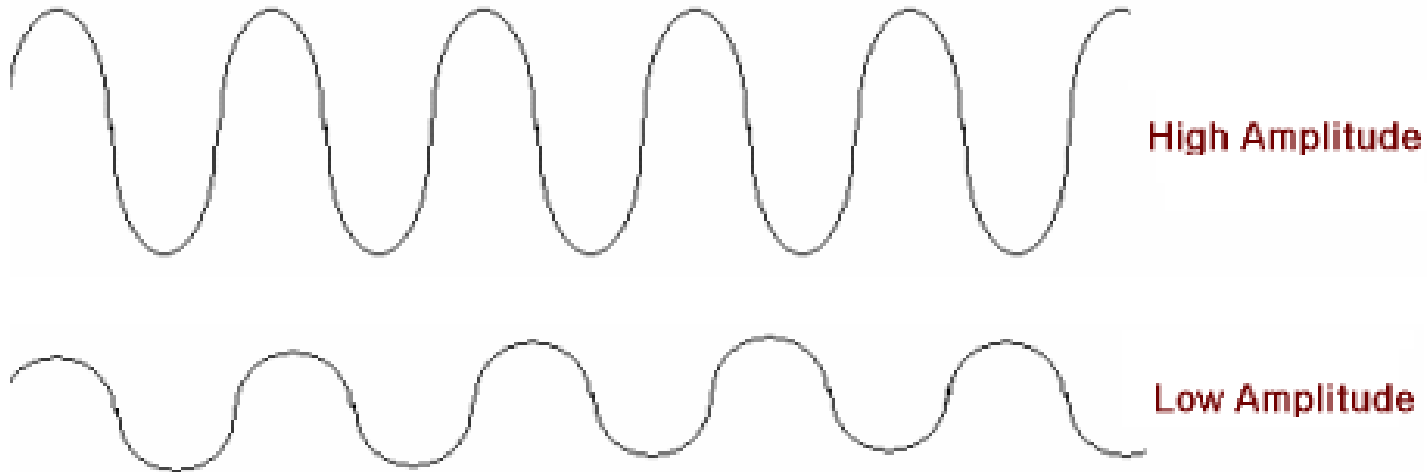


TERMINOLOGY



Signal Amplitude

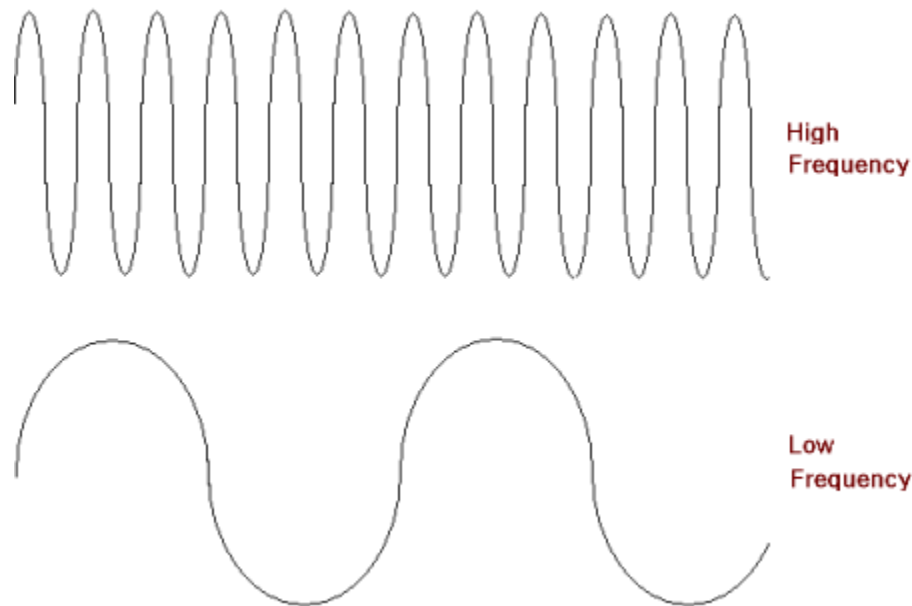
- Amplitude is a measure of the change between the highest value and lowest value.





Signal frequency

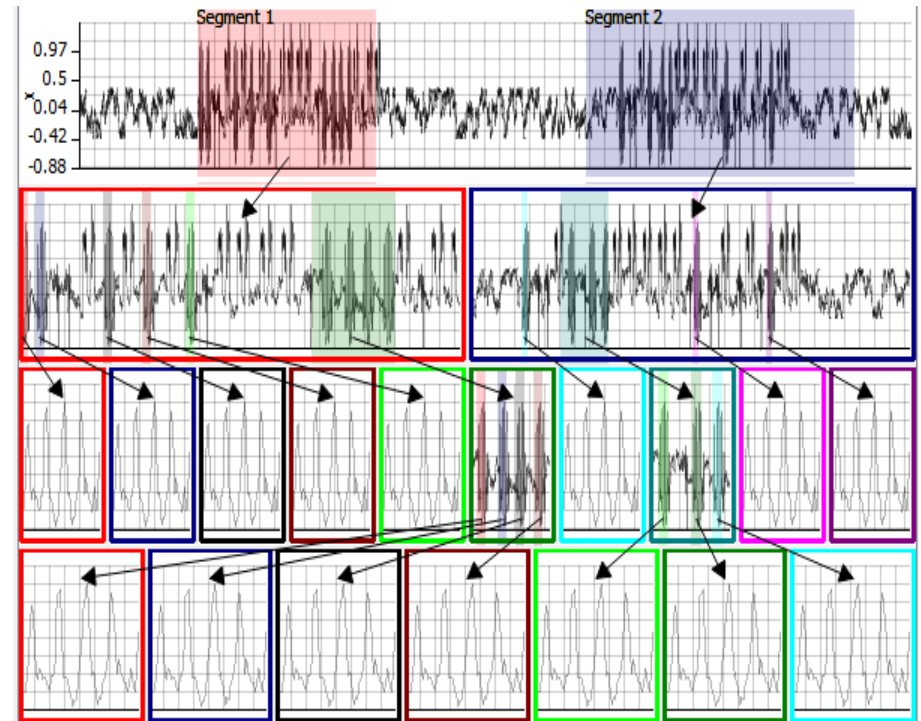
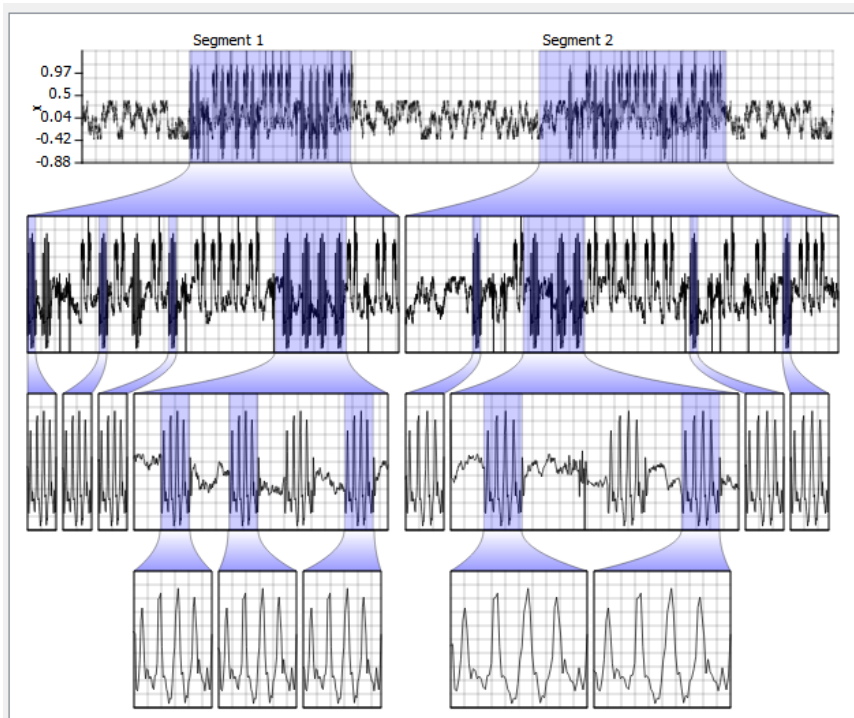
- Frequency is a measure to determine how quickly a signal goes through a cycle.





Leaf Node

- A leaf node is a level with no further child zoom levels attached.





TASKS



Task overview

- The user study comprises of five tasks:
 - **Task One:** Count the number of leaf nodes.
 - **Task Two:** Identify the signal with the largest amplitude.
 - **Task Three:** Identify the signal with the highest frequency.
 - **Task Four:** Label a series of signals in the data set.
 - **Task Five:** Count the number of labelled signals.



Task One: Count the number of leaf nodes

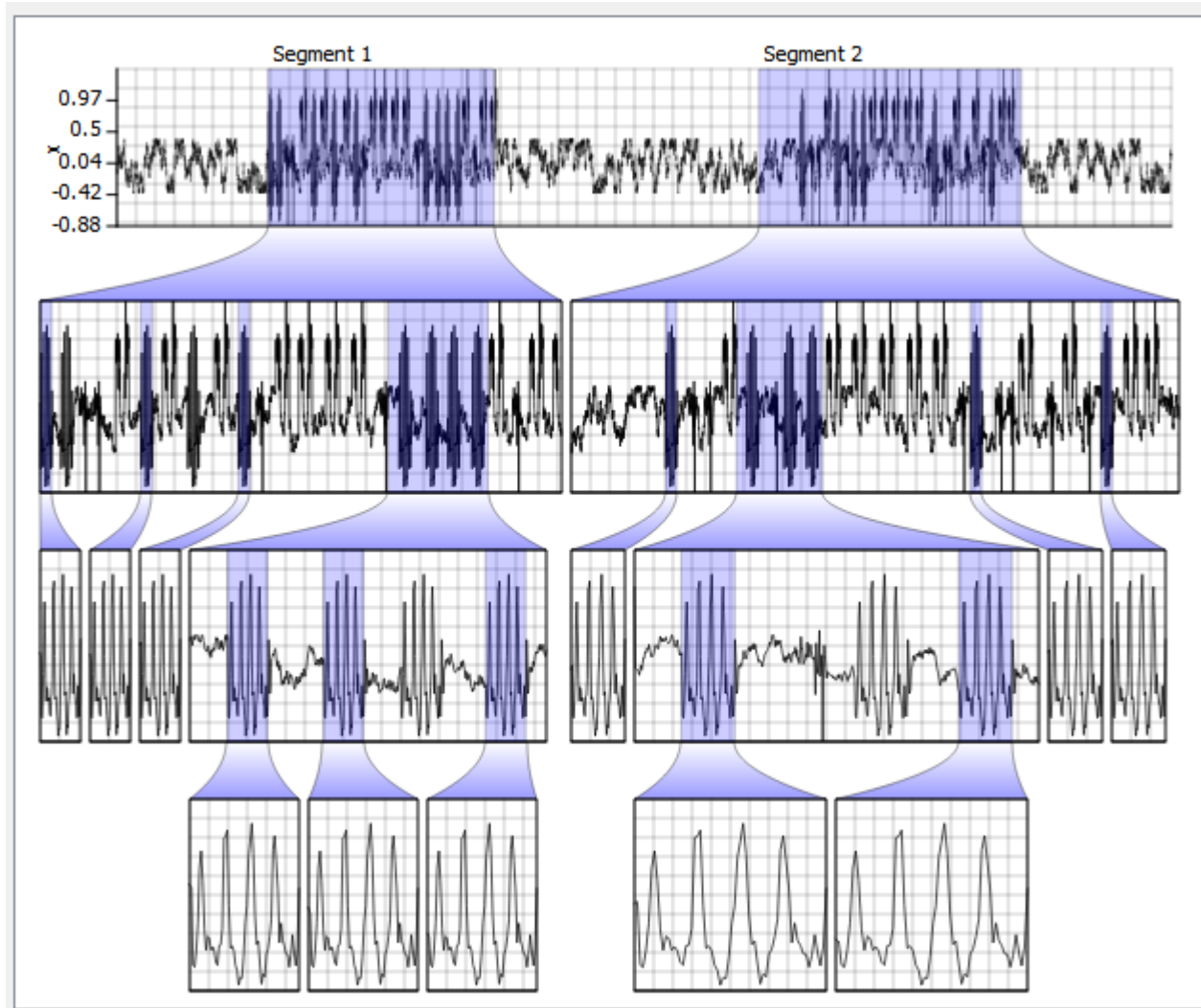


Task One

- Your screen will show you a box containing either a stack zoom or bookmark plot visualisation.
- Your task here is to identify the number of leaf nodes each highlighted segment contains for each visualisation. Once you have done this please enter your answer into the text box and then **click NEXT**.



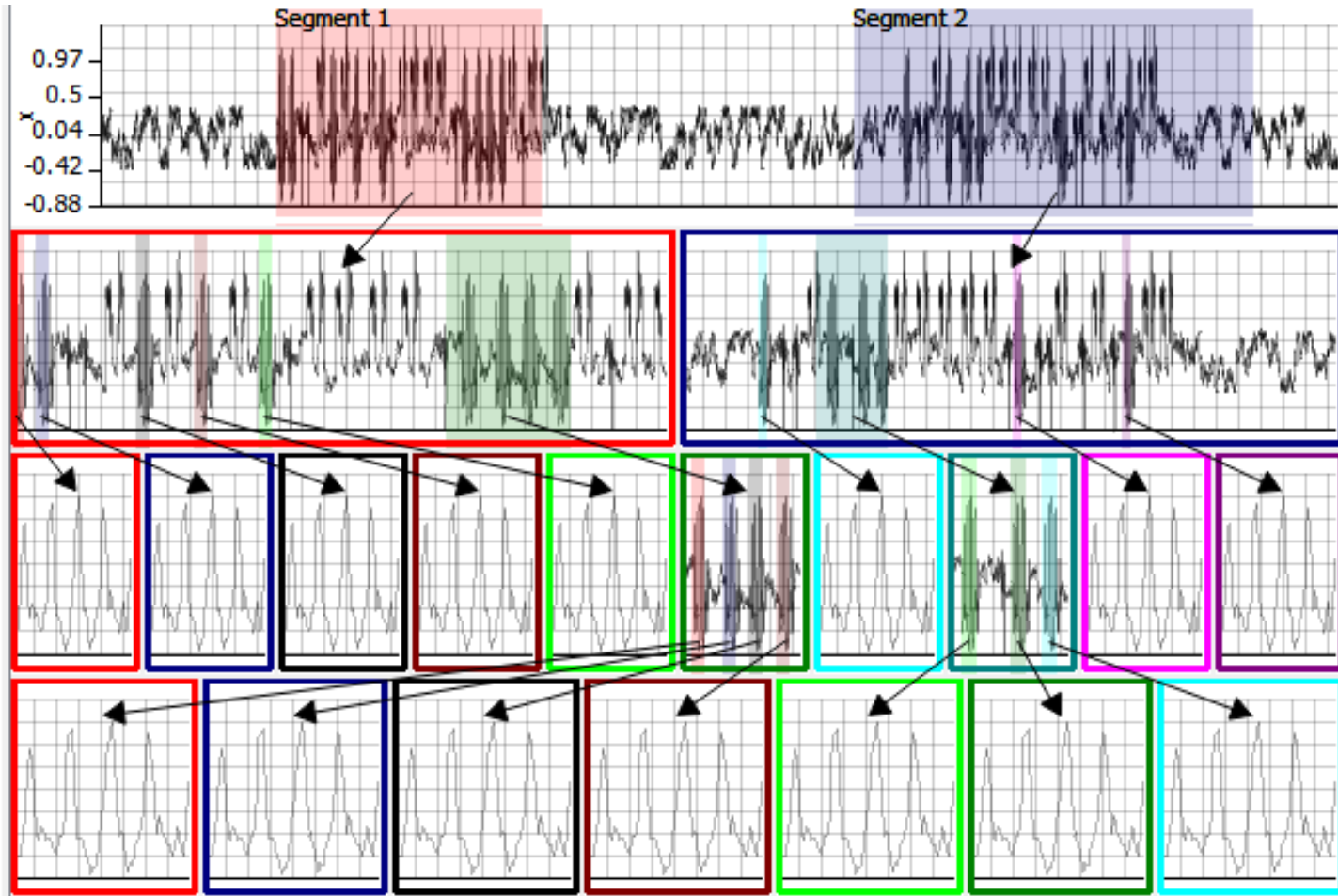
Bookmark Plot



- How many leaf nodes for segment 1? Segment 2?



Stack Zoom



- How many leaf nodes for segment 1? Segment 2?

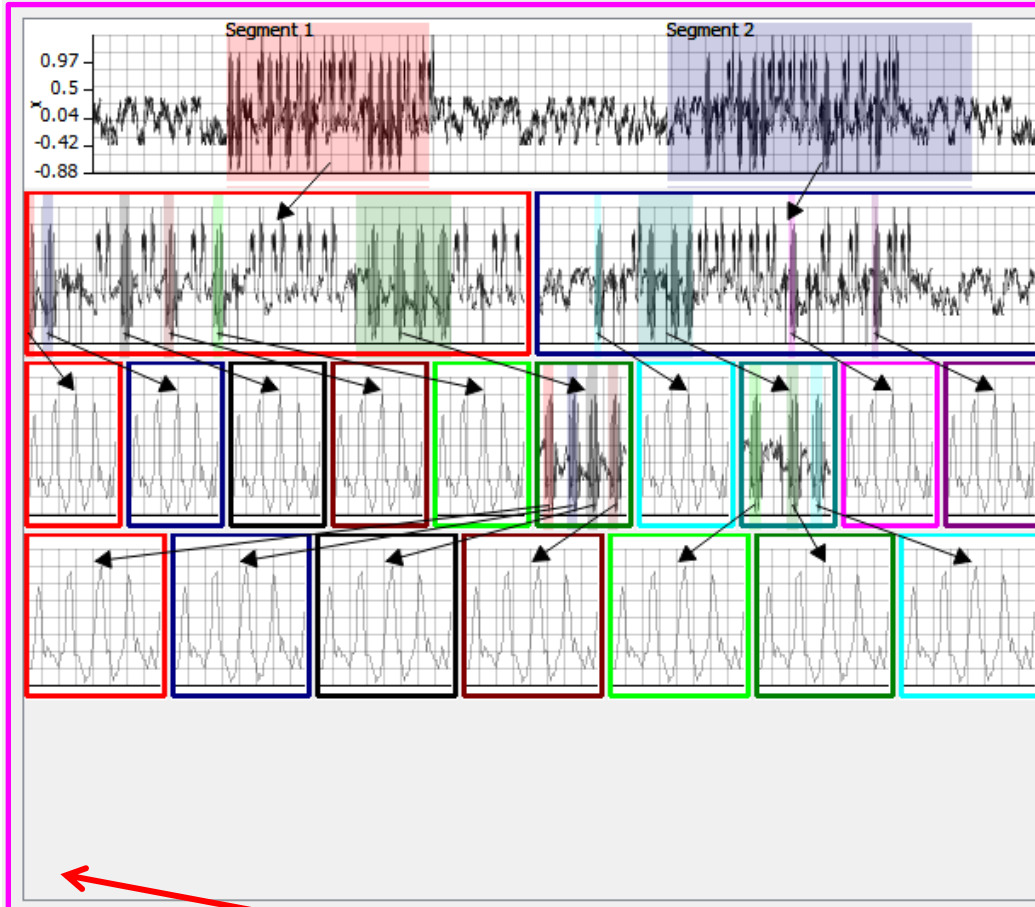


Interface Task One

Progress - 1.6 %

Task One Training - Question 1 of 2

Training - How many end (leaf) nodes does each segment contain?



Visualisation
to count leaf
nodes

Enter number
of leaf nodes
for each
segment here

Segment 1:

Segment 2:

Click Submit to
move on to the
next task

Submit



Task Two: Identify the signal with the largest amplitude

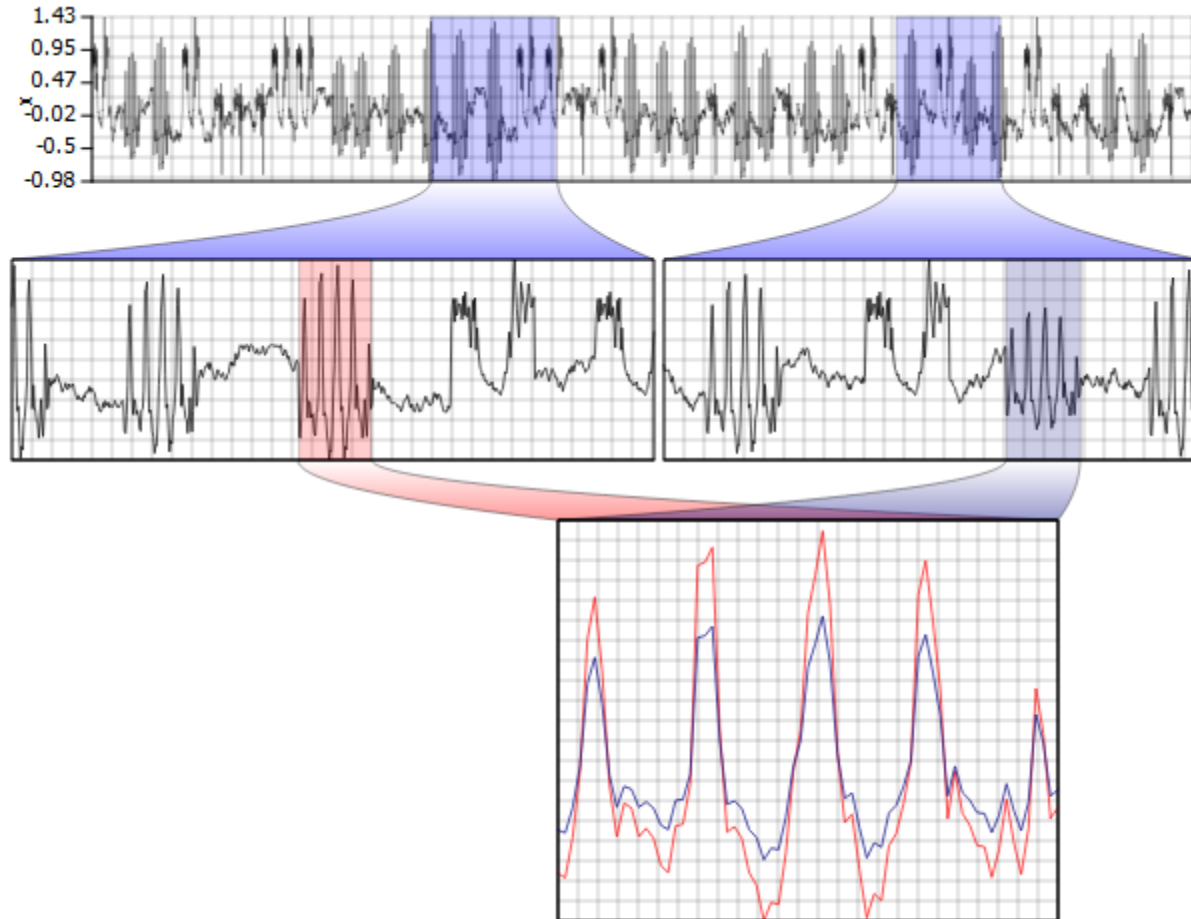


Task Two

- Your screen will show you a box containing either a stack zoom, bookmark plot or overlay visualisation.
- Your task here is to identify which of two signals has the larger amplitude. Once you have done this please select your answer and then **click NEXT**.



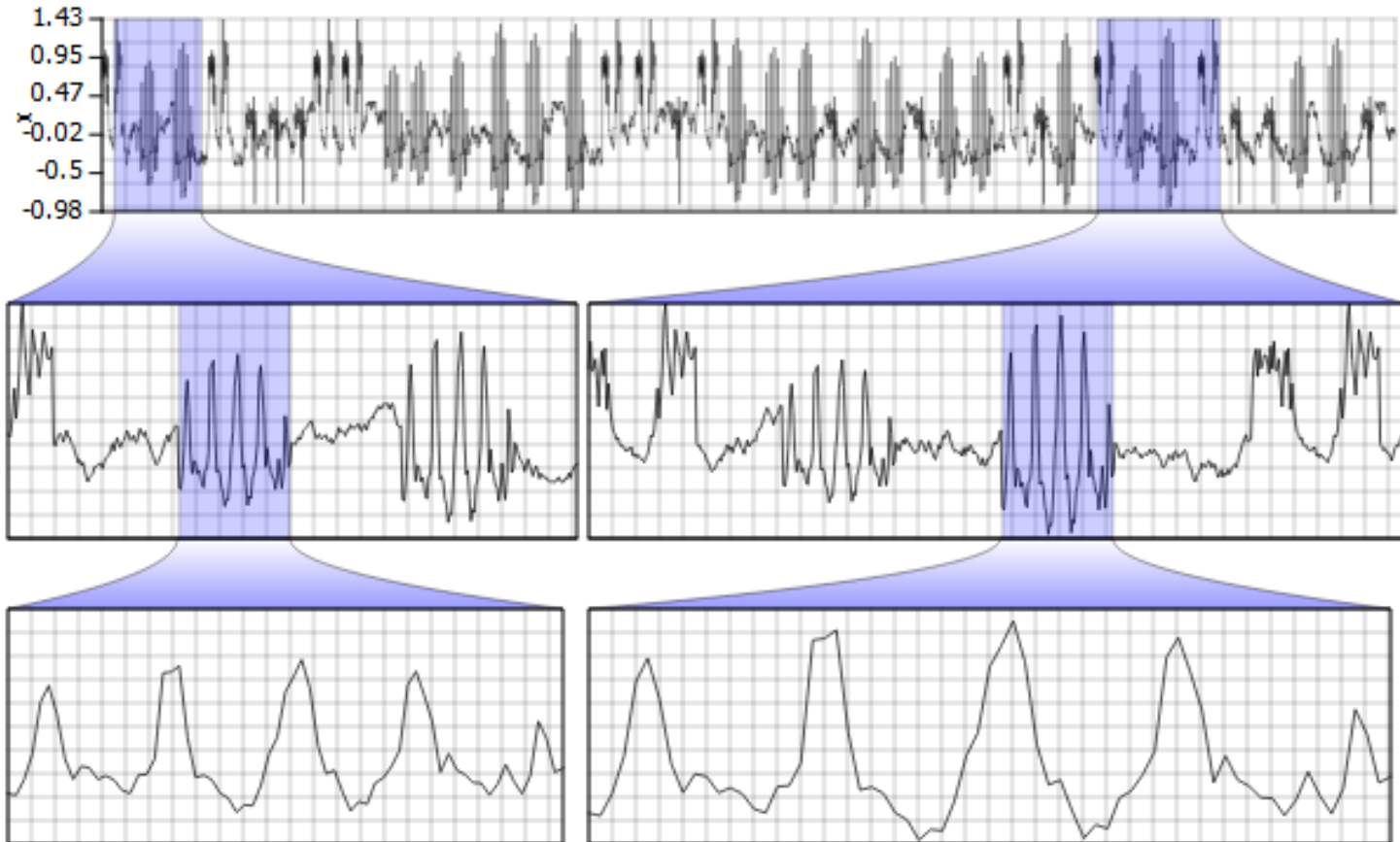
Bookmark Plot Overlay



- Which signal has the larger amplitude?



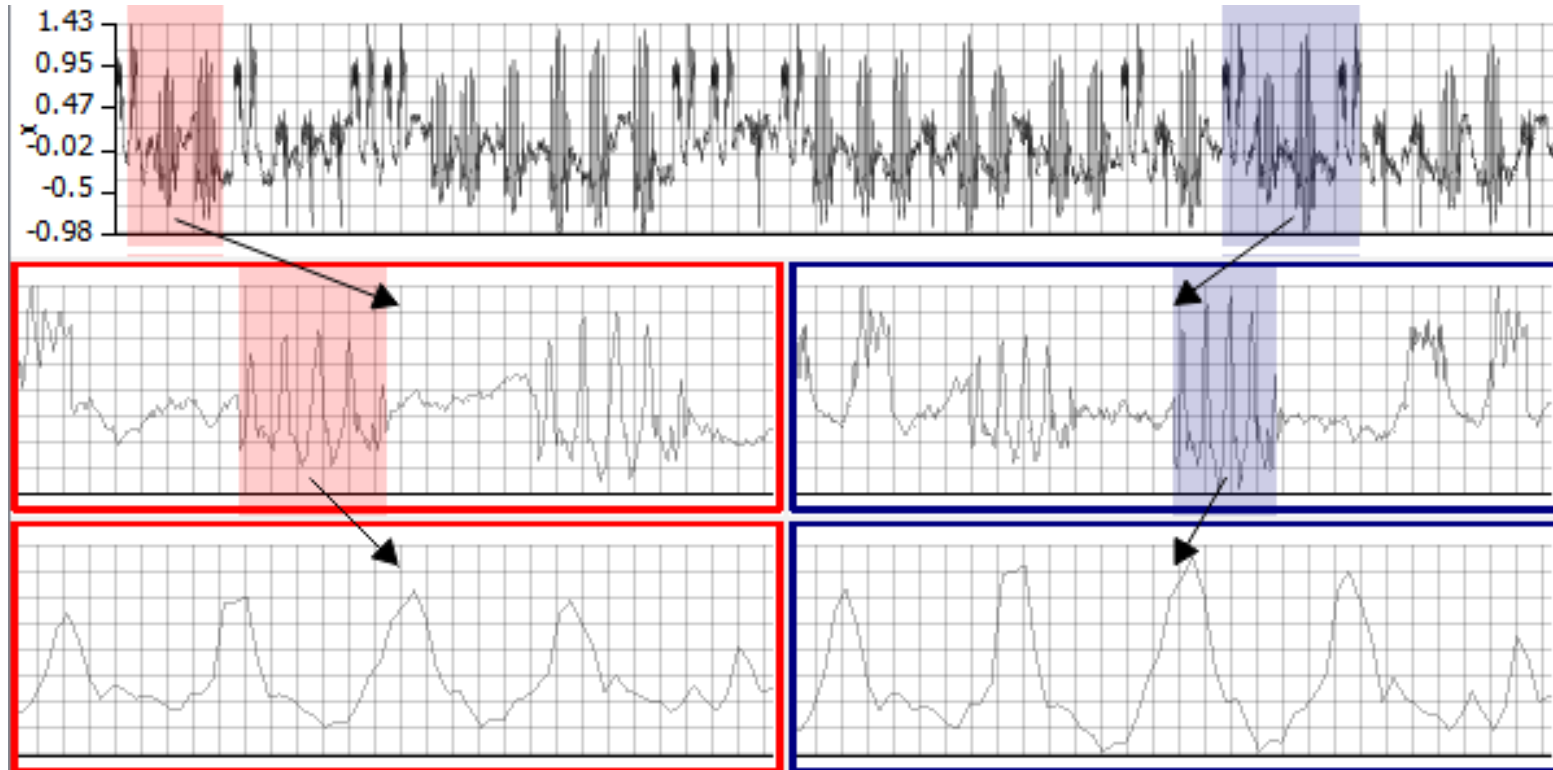
Bookmark Side-By-Side



- Which signal has the larger amplitude?



Stack Zoom



- Which signal has the larger amplitude?



Interface Task Two

Training - Which signal has a larger amplitude?

Left (Red)

Right (Blue)

Submit

Select signal with largest amplitude

Visualisation to identify signal with largest amplitude

Click Submit to move on to the next task



Task Three: Identify the signal with the highest frequency

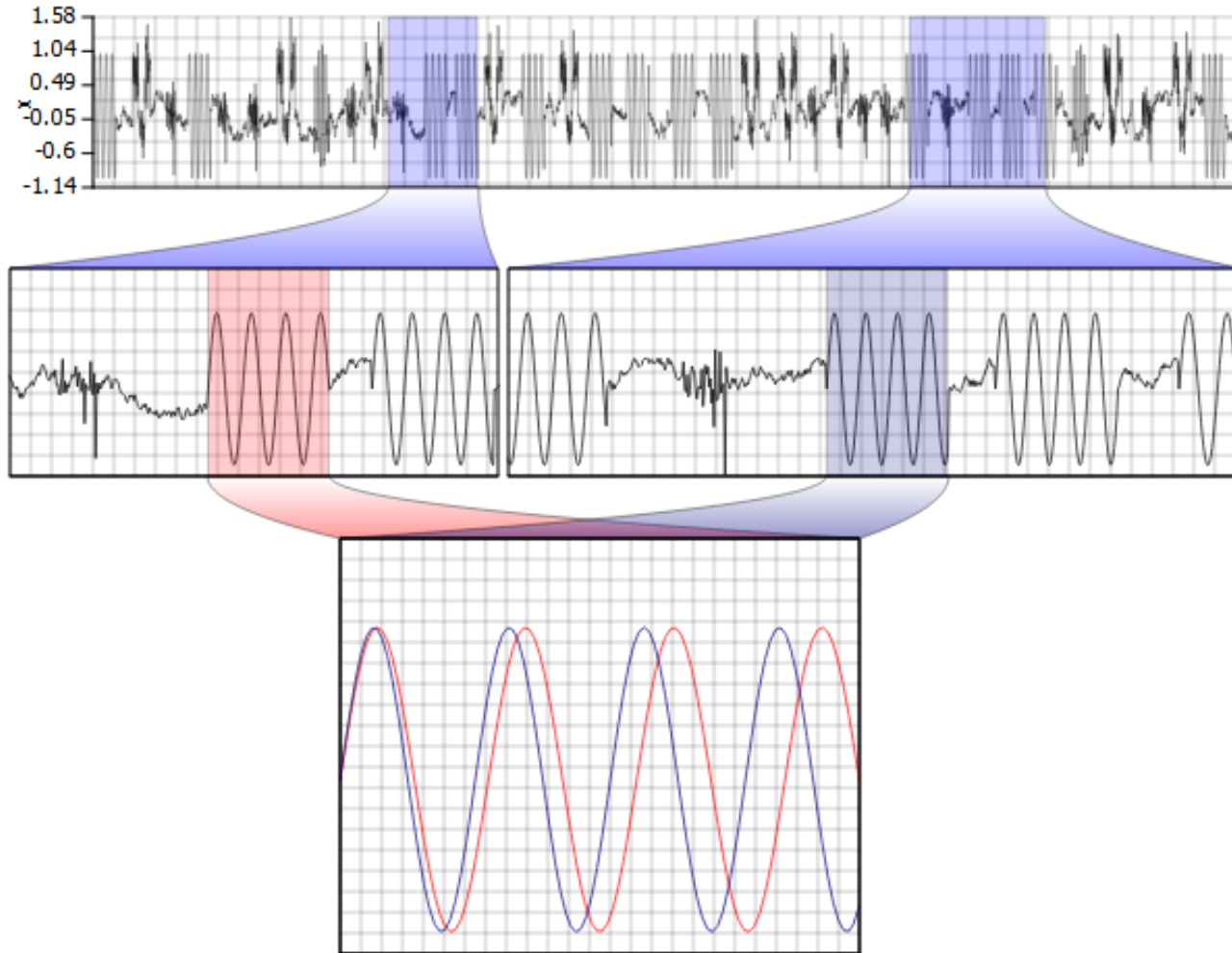


Task Three

- Your screen will show you a box containing either a stack zoom, bookmark plot or overlay visualisation.
- Your task here is to identify which of two signals has the larger frequency. Once you have done this please select your answer and then **click NEXT**.



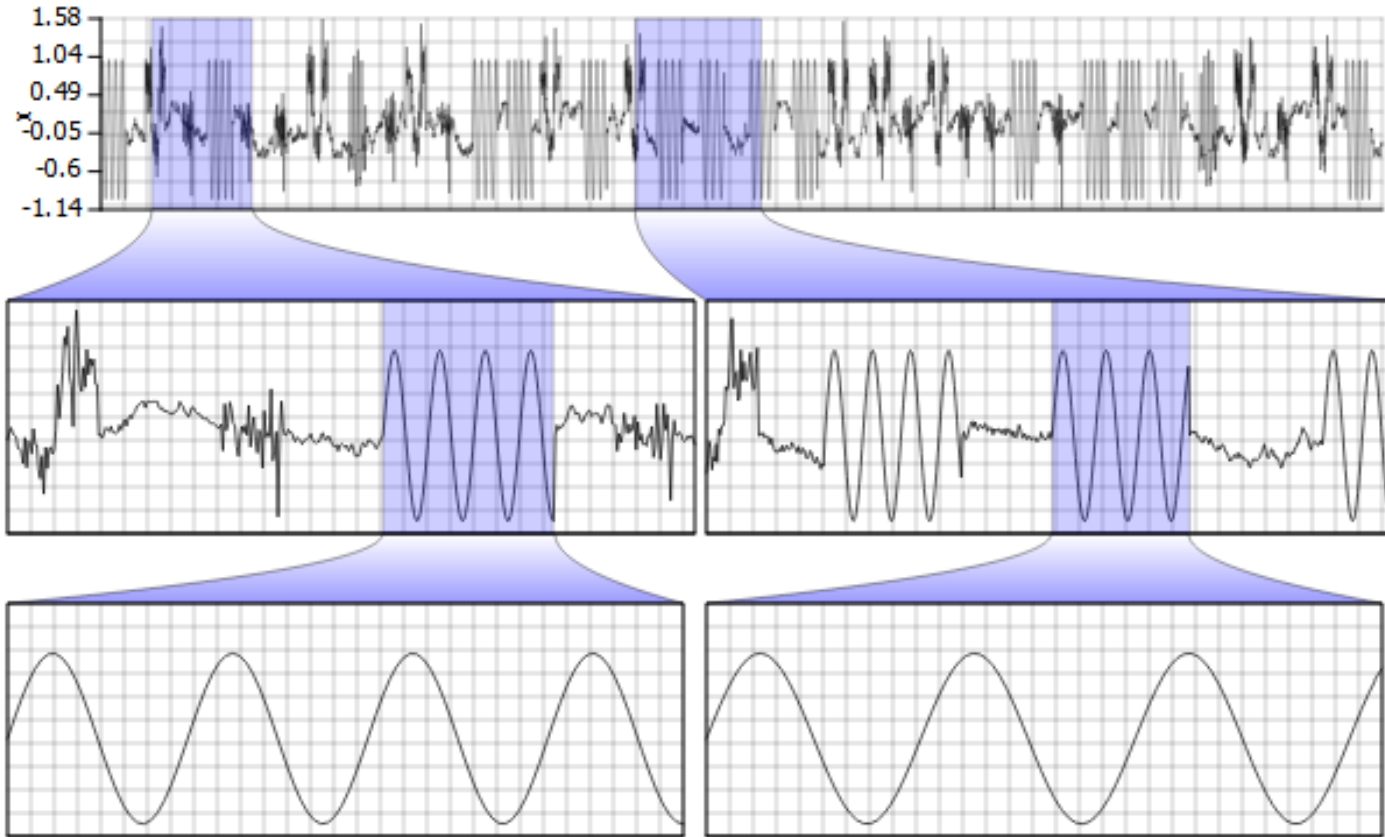
Bookmark Plot Overlay



- Which signal has the higher frequency?



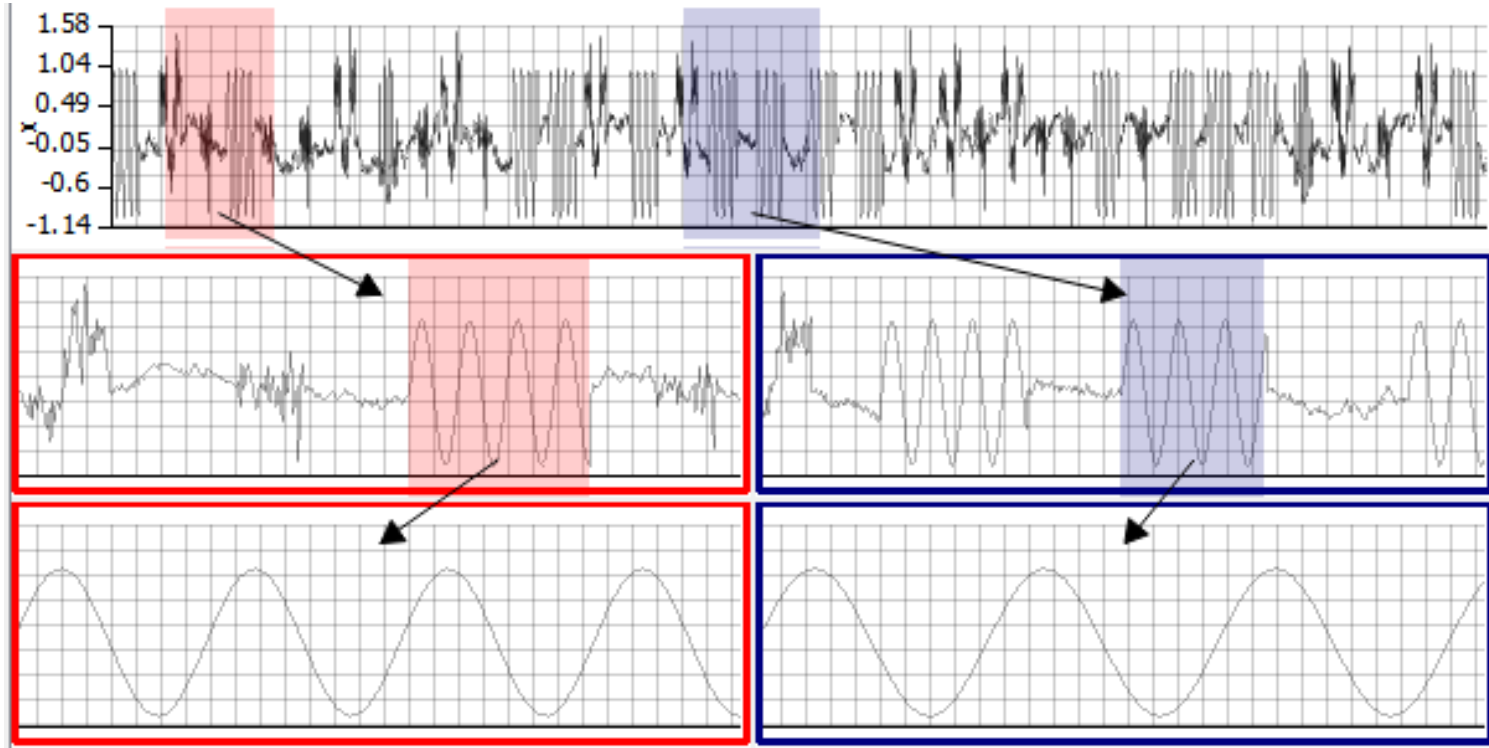
Bookmark Side-By-Side



- Which signal has the higher frequency?



Stack Zoom

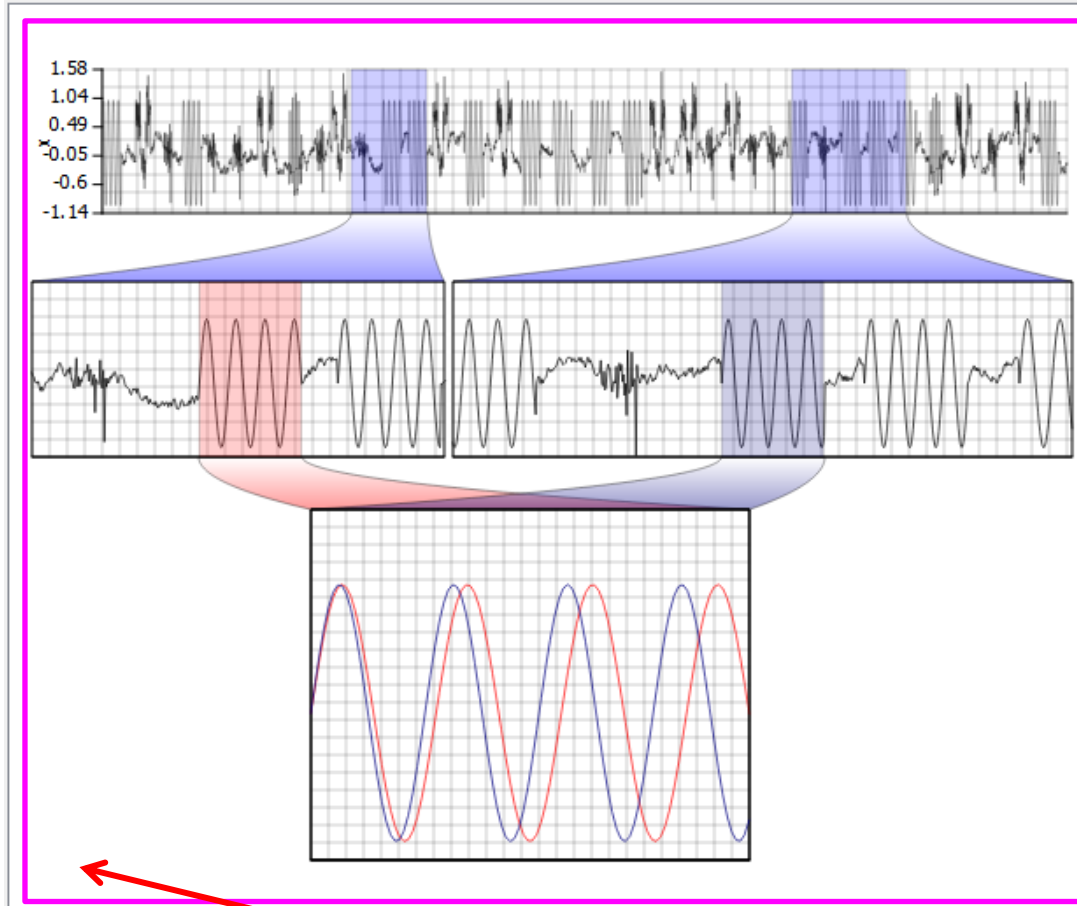


- Which signal has the higher frequency?



Interface Task Three

Training - Which signal has the higher frequency?



Select signal with largest frequency

Visualisation to identify signal with largest frequency

Left (Red)
 Right (Blue)

Click Submit to move on to the next task



Task Four: Label a series of signals in the data set



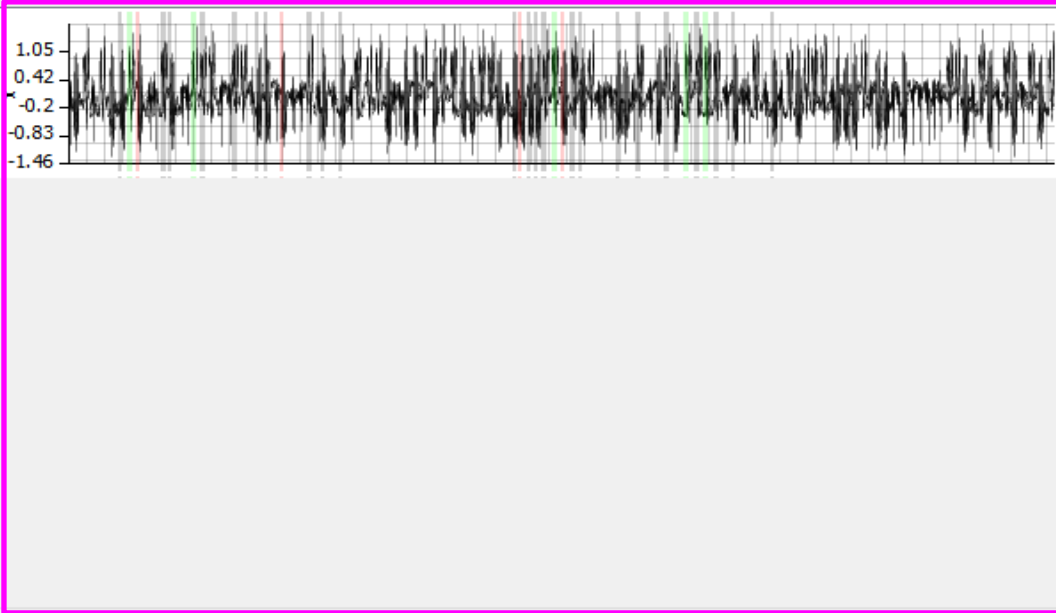
Task Four

- Your screen will show you a box containing either a stack zoom or bookmark plot visualisation containing a number of overlaid grey segments.
- Your task here is to find and assign a label to as many grey segment as possible. Once you have done this **click NEXT**.

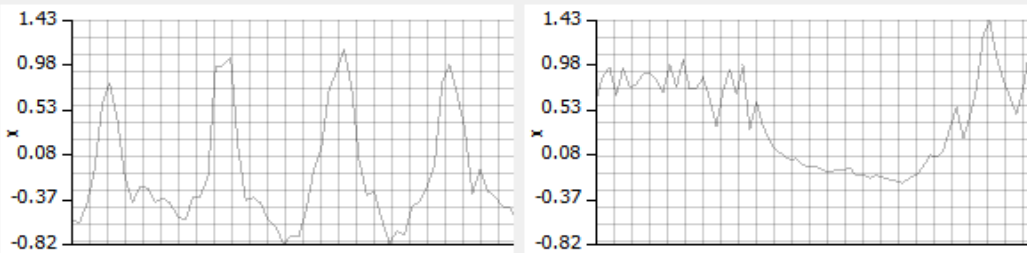


Interface Task Four

Training - Label the following patterns in the data



23 Unlabelled Segments Remain



Label A ■ Label B ■

Submit

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Signals to label
in the data

Visualisation
to label

Number of
remaining
segments to
label



Task Five: Count the number of labelled signals



Task Five

- Your screen will show you a box containing either a stack zoom or bookmark plot visualisation containing a number of leaf nodes that match label A or label B.
- Your task here is to read the question and count how many labels of one type are before the first occurrence of the second type. Once you have done this **click NEXT**.

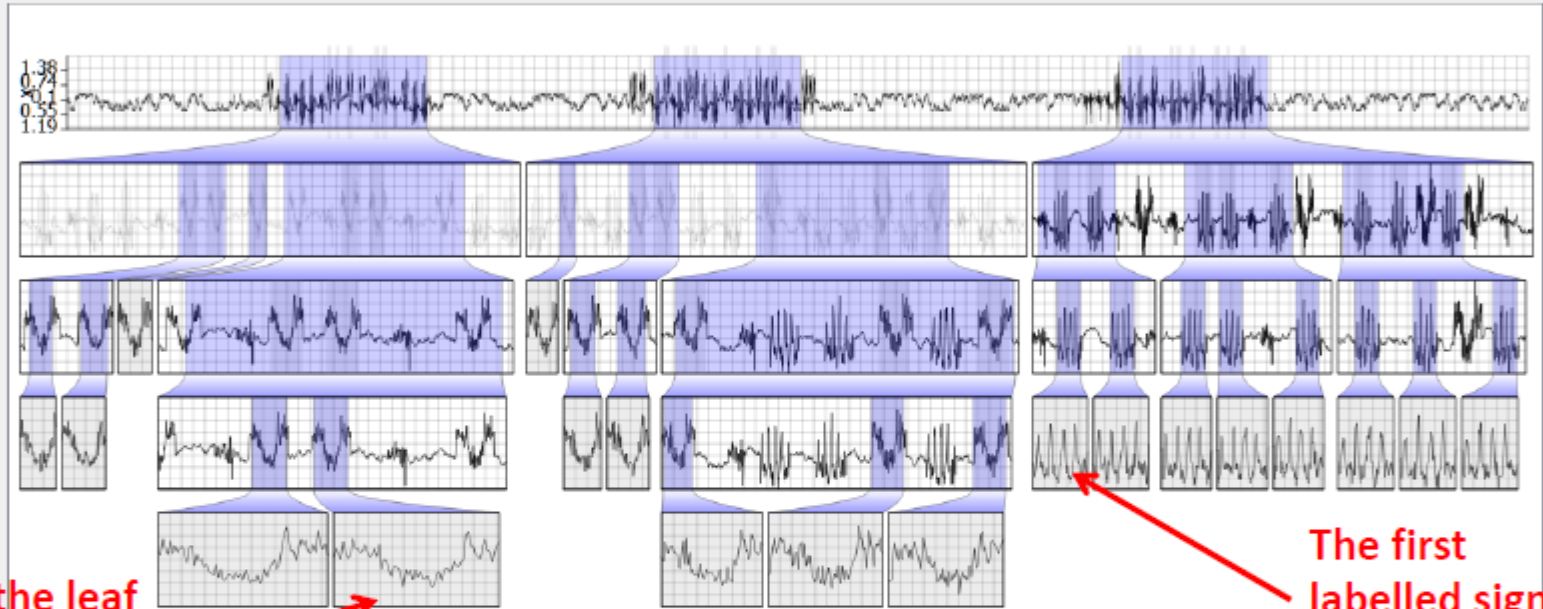


Interface Task Five

Read the question



How many instances of Label B occur before the first Label A



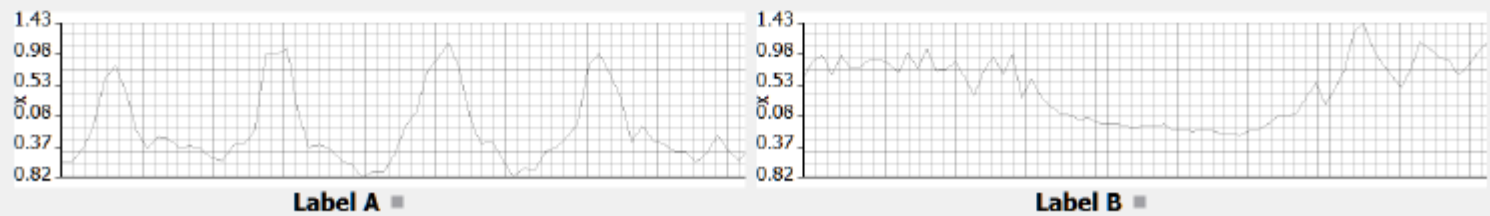
Count the leaf nodes matching signal B



The first labelled signal of type A



Answer:



Submit



Interface Task Five

How many instances of Label A occur before Label B

Count the leaf nodes matching signal A

The first labelled signal of type B

Answer:

Label A **Label B**

Submit