

Task A45

Group 2

Task 45 | group no 2.
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Team Members and Work Distribution

Abimathi Siva Subramanian	403592	(Member 1)
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Pre-processing

- Reading data and Frequency estimation : Members 1, 2,3 ,4
- Filters : Members 1,2
- Cropping data : Member 1
- Rotation : Members 1,3
- Segmentation : Members 4,3
- Resampling : Members 4,2
- Removing malicious sequences : Member 4

Neural Networks

- Optimizing parameters : Members 1,2,3,4
- Code Unification and Structuring : Members 1,4
- Code Comments : Member 1
- Presentation slide preparation : Member 2,3,4

Project Description

Data source: Smartphone 3 and sex and age

Sensor signal: Acceleration and Gyroscope Data

Validation: 5 fold subject-wise

Compare the Results obtained based on different anthropometric parameters (sex & age)

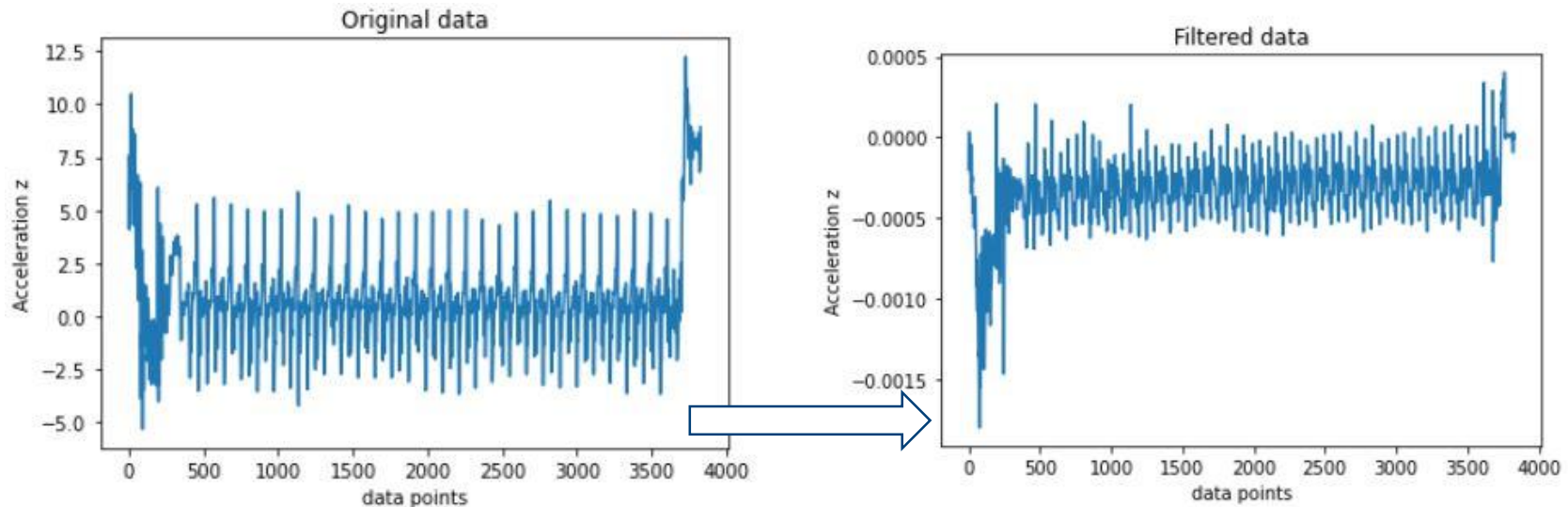
Step 1&2: Reading Files and passing them into functions

Read the CSV file to numpy array. This data is passed as parameters into function to perform specific preprocessing tasks (filtering, cropping, rotation, segmentation and resampling).

Data Preprocessing

Step 3: Implementation of Filter

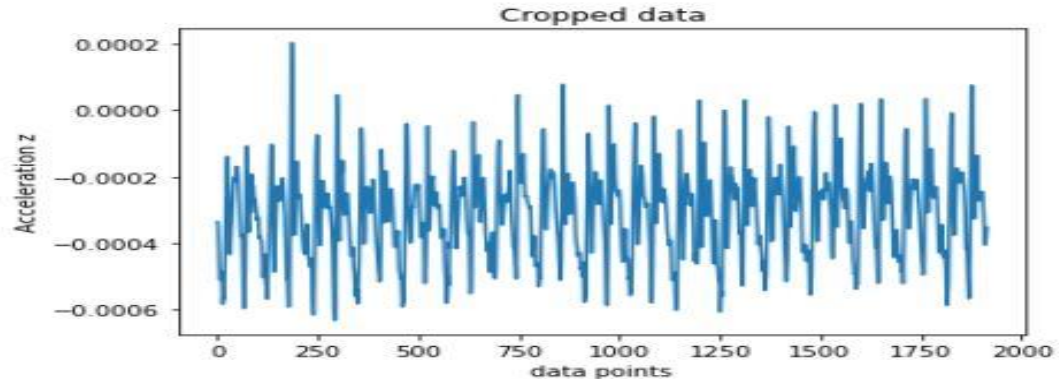
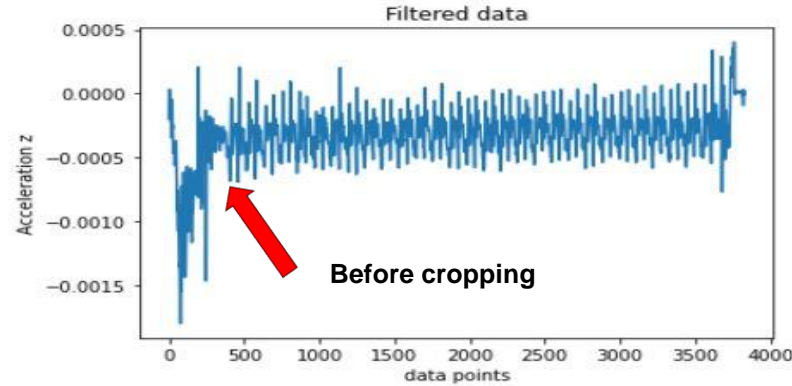
Butterworth filter is used to filter the high frequency noise present in the data.



Data Preprocessing

Step 4: Cropping

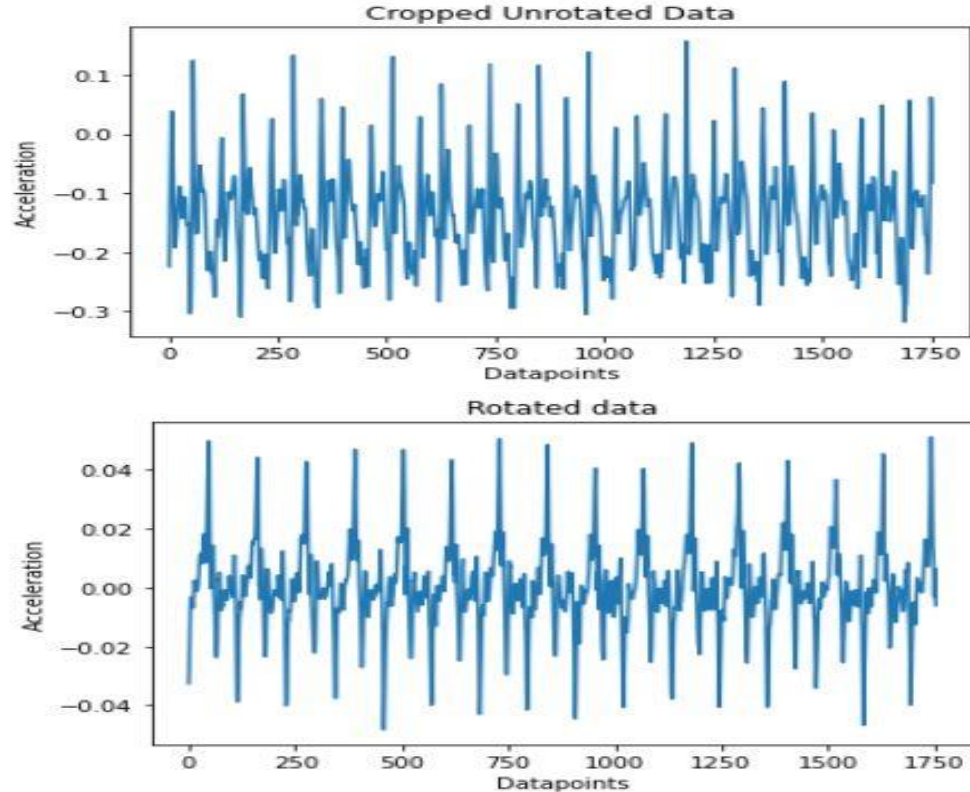
Elimination of undesirable data, to obtain the starting and ending points of the trail.



Data Preprocessing

Step 5: Rotation

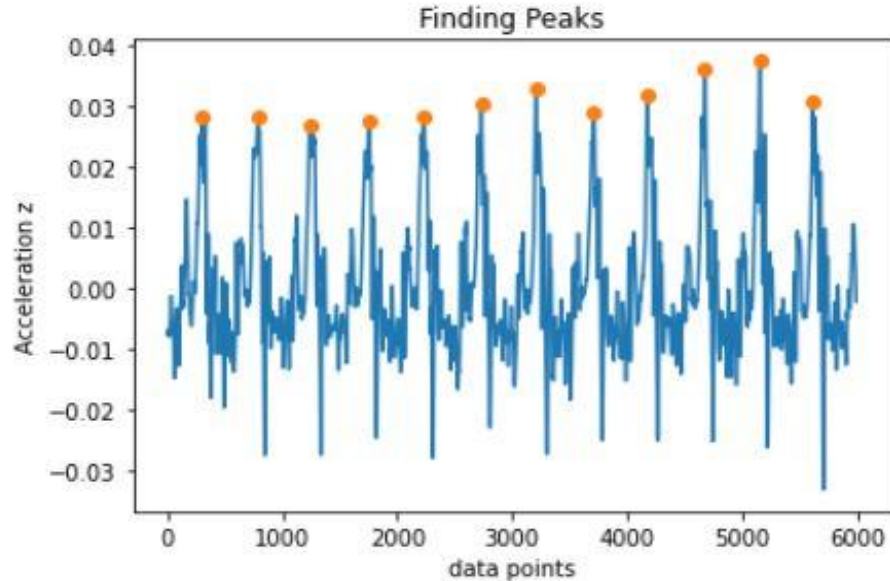
The scaled data is centered and then the data is rotated such that the acceleration is maximum along one axis.



Data Preprocessing

Step 6: Segmentation

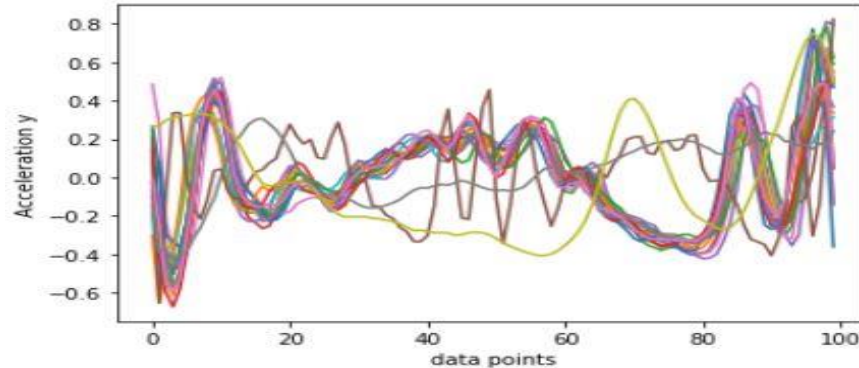
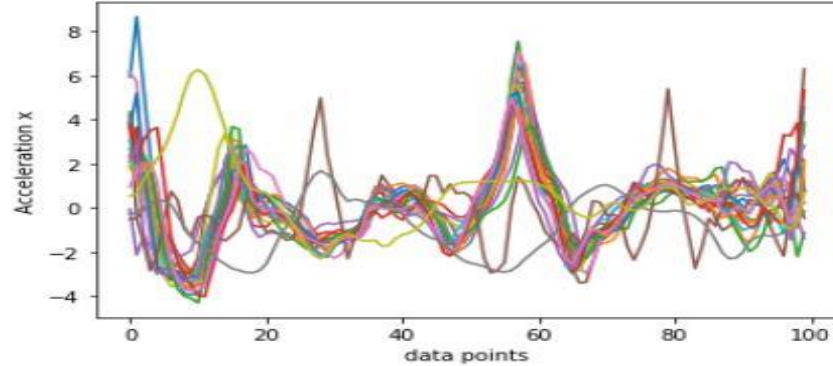
The peaks in the data are identified so that the whole motion sequence is segmented into different steps.



Data Preprocessing

Step 7: Resampling

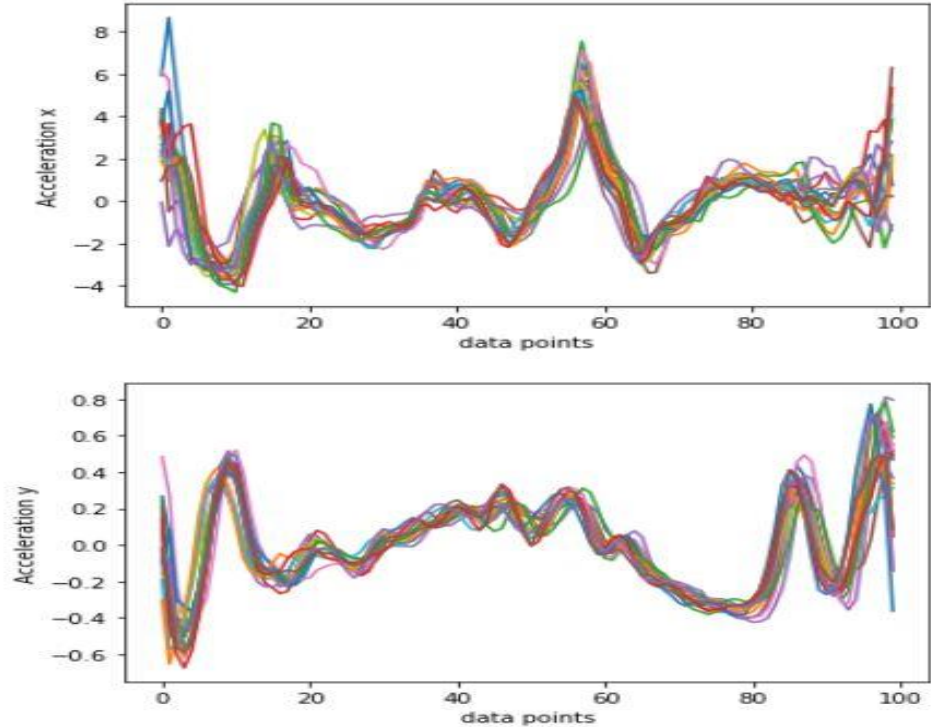
The different samples have different number of data points, so resample them such that all the samples have equal number of data points.



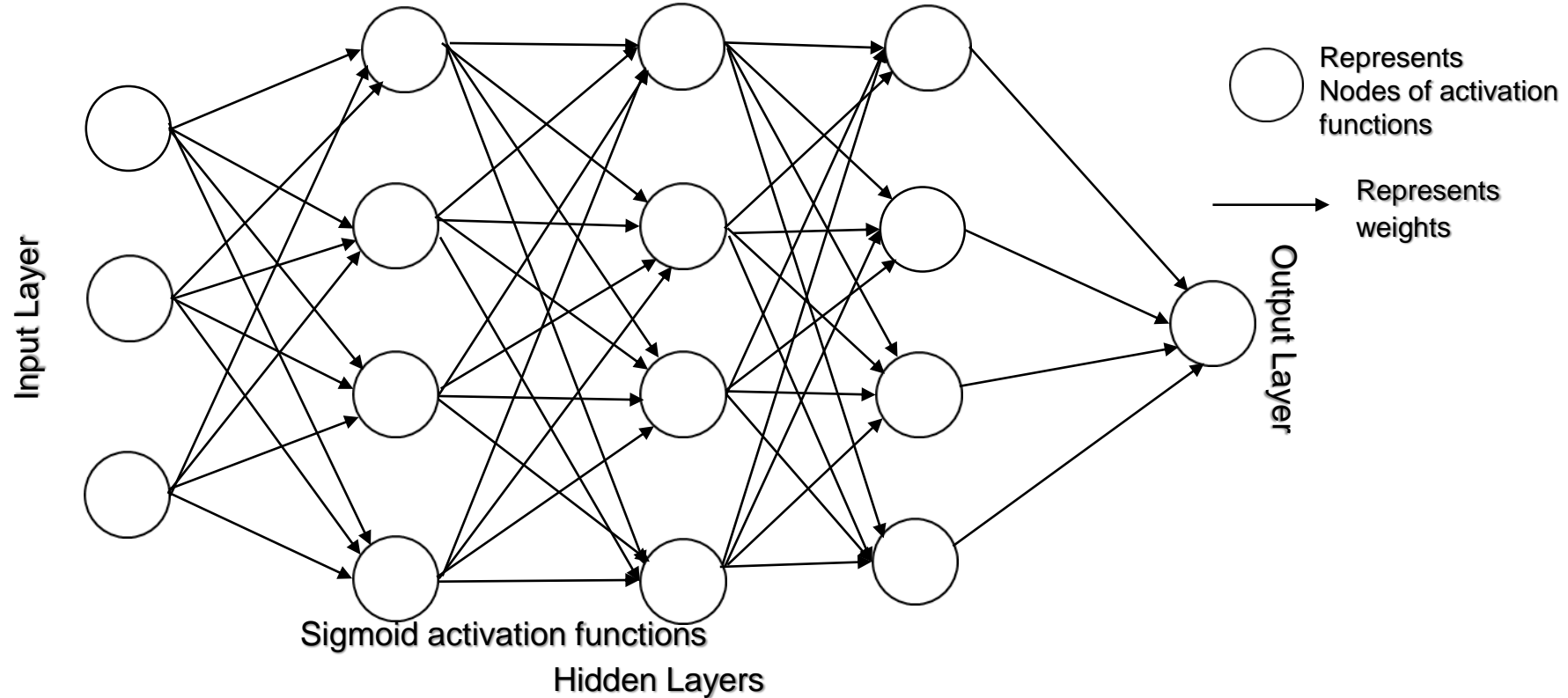
Data Preprocessing

Step 8: Elimination of Malicious Sequences

The mean and standard deviation of all the data at each point is calculated. If the points in the sample lie outside the threshold (mean + or - std) then they are removed as outliers.



Neural Networks (1/2)



Results

Age		Sex	
Accuracy (in %)	Loss	Accuracy (in %)	Loss
56.14	0.683	51.42	0.698
57.23	0.674	56.12	0.686
51.42	0.698	51.74	0.705
56.45	0.673	57.23	0.683
63.24	0.632	63.25	0.676

Average Loss Based on Sex : 0.682
Average Accuracy Based on Sex: **56.89 %**
Average Loss Based on Age : 0.692
Average Accuracy Based on Age: **55.97 %**

Note: Accuracy represents the fraction (percentage) of correct classification of predicted data to label data (i.e., Normal or Impaired)

Conclusion

Observations and Conclusion:

- Quality of Data and Pre-processing has significant influence on performance of Neural Network
- Influence of Anthropometric data is less significant in classification
- Structure of Neural network, activation functions and other parameters had very limited influence on results
- **We can predict whether the subject walking has Normal or Impaired gait using motion data with a probability of just over 55% irrespective of his age or sex.**

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Thank You

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