Project Title: Web-based Pipeline Detection using Machine Learning

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Problem Statement

- Develop a web-based pipeline detection system that utilizes advanced machine learning techniques to:
- 1)Continuously monitor and analyze data from pipeline sensors.
- 2)Real-time detect and predict pig location through a user-friendly web interface.
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Brief Literature Review

- Techniques, such as reflectometry in the time domain, vibration-based techniques, pressure wave techniques, and acoustic emission (AE) technology, have been proposed in the past for Pig condition monitoring [1-3]. A significant amount of research has beenconducted on pig detection. AI was utilized to detect pig in this study.

Experimental Setup and Collection of Data

Impact hammer
Impacts
Audio signals
Pig

Web dictaphone
Record   Stop
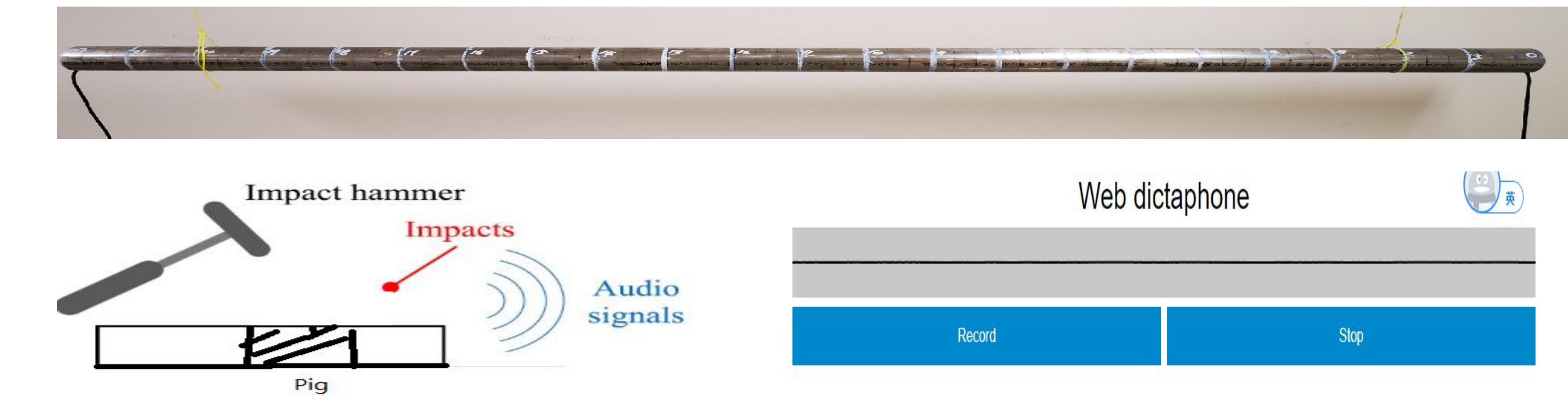
audio segmentation

```
function output=processing_cut(data, Fs, fw, bw, peakva,dis)
    [~,locs] = findpeaks(data,'minpeakprominence',peakva,'minpeakdistance',dis);
    num_hits=length(locs);
    for i=1:num_hits
        loc=locs(i);
        output(i,:)=data(loc-fw*Fs+1:loc+bw*Fs);
    end
end
```
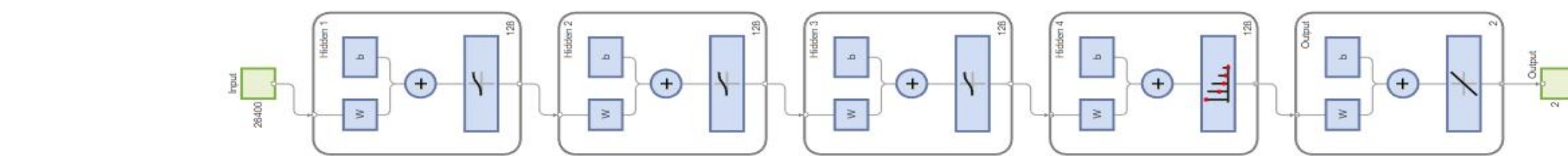
In the field of audio signal processing, the Mel-frequency cepstral coefficients(MFC) is a representation of the short-term power spectrum of an audio signal
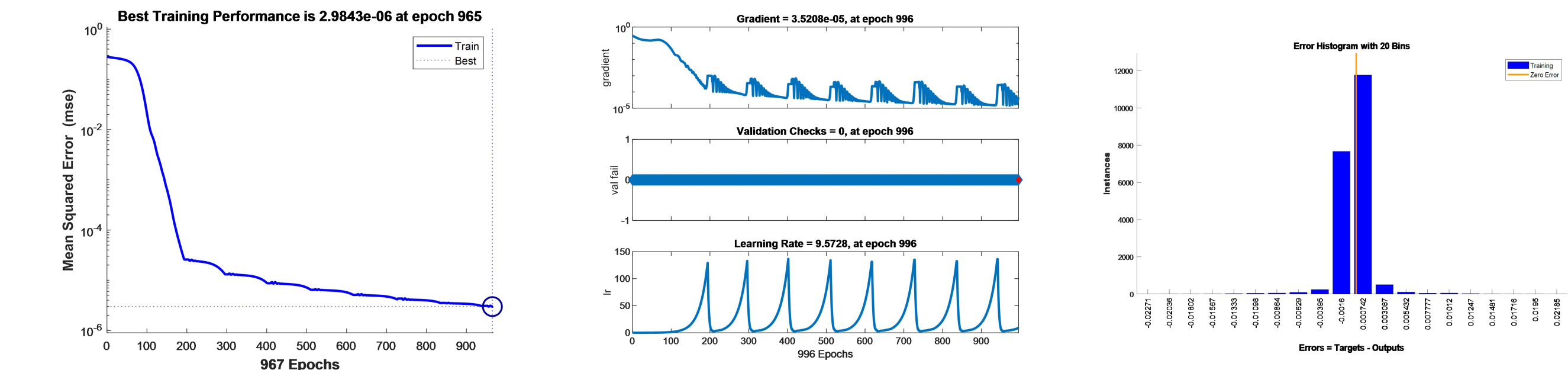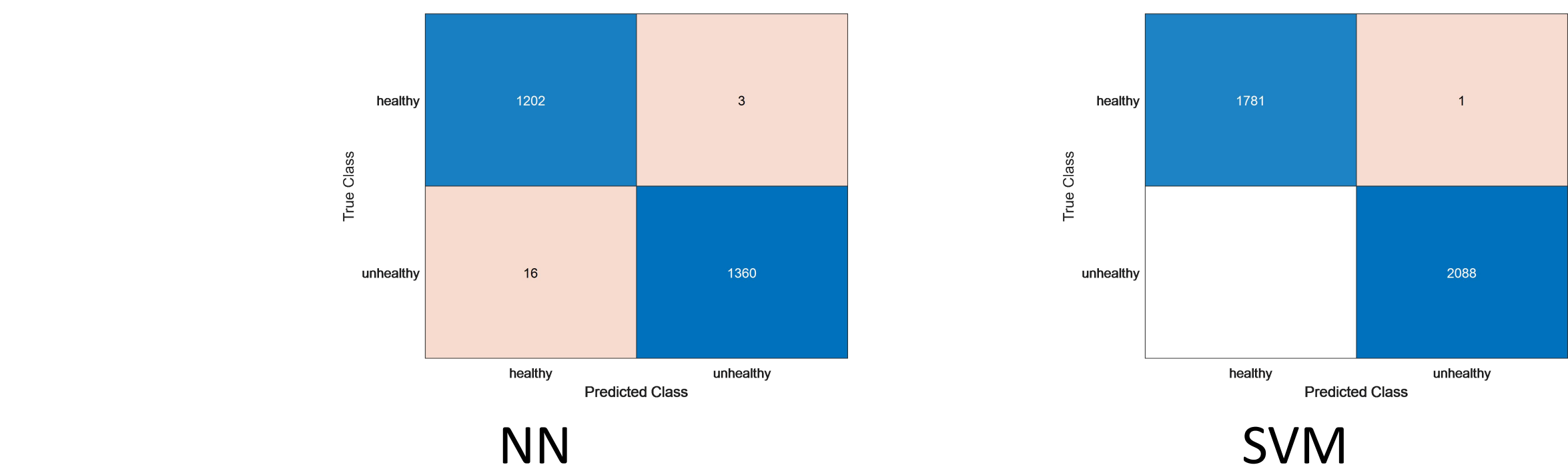

Method(s)

Basic Architecture Diagram
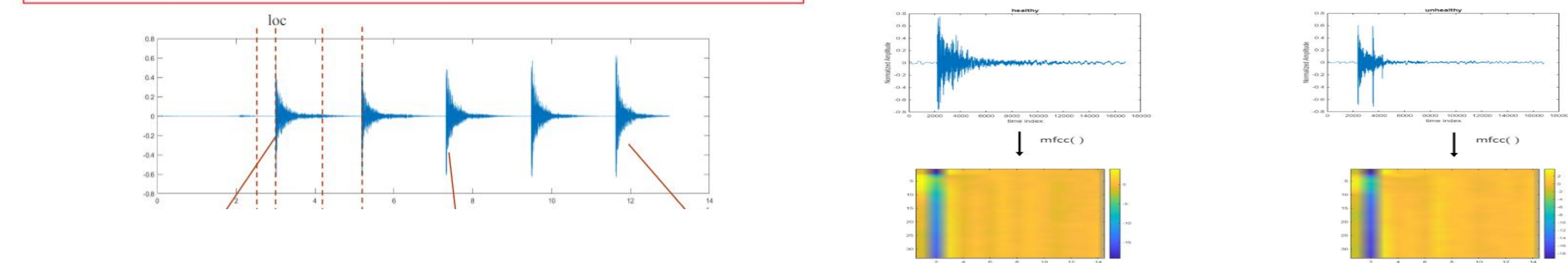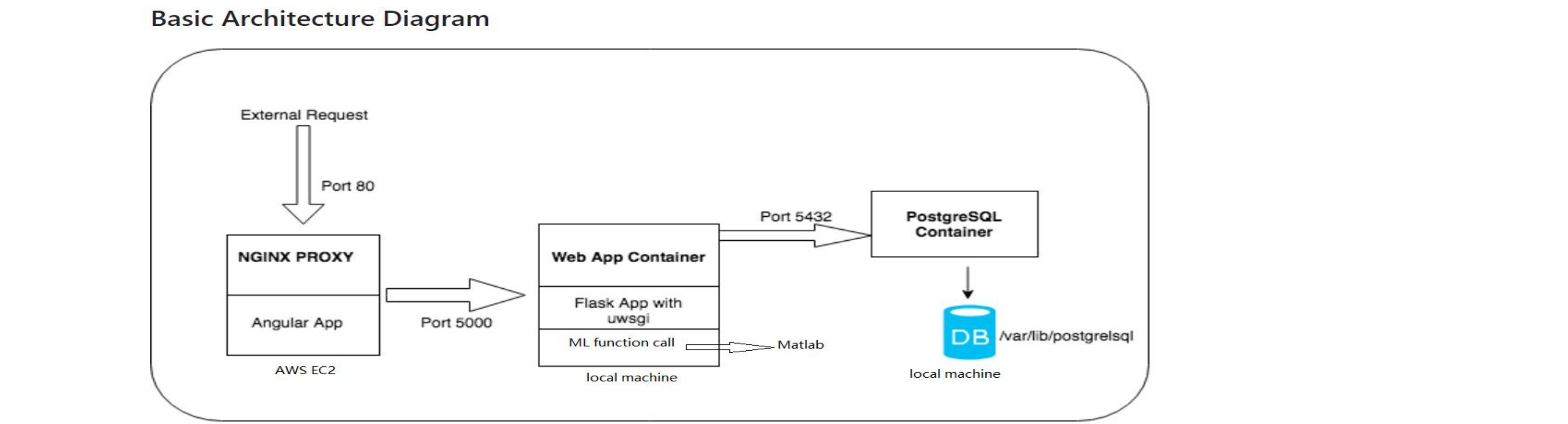
neuron network

Results, Analysis and Discussion

Neuron network training:

Confusion matrix

NN   SVM

Conclusion

- Real-time predict the location of Pig
- **the accuracy is not good when doing real-time prediction**
- may try other method for the training: such as CNN ,RNN.

Acknowledgements

References (brief)

1. Hu, Z.; Tariq, S.; Zayed, T. A comprehensive review of acoustic based leak localization method in pressurized pipelines. Mech. Syst. Signal Processing 2021, 161, 107994. [CrossRef]
2. Wang, L.; Narasimman, S.C.; Ravula, S.R.; Ukil, A. Water Ingress Detection in Low-Pressure Gas Pipelines Using Distributed Temperature Sensing System. IEEE Sens. J. 2017, 17, 3165–3173. [CrossRef]
3. Cataldo, A.; Cannazza, G.; de Benedetto, E.; Giaquinto, N. Underground Water Pipelines. IEEE Sens. J. 2012, 12, 1660–1667. [CrossRef]