FACULTY OF ENGINEERING AND ARCHITECTURE

FFW 2023
Fracture Fatigue and Wear

The 11th International Conference on Fracture Fatigue and Wear
August 29th-31th, 2023, Ghent, Belgium

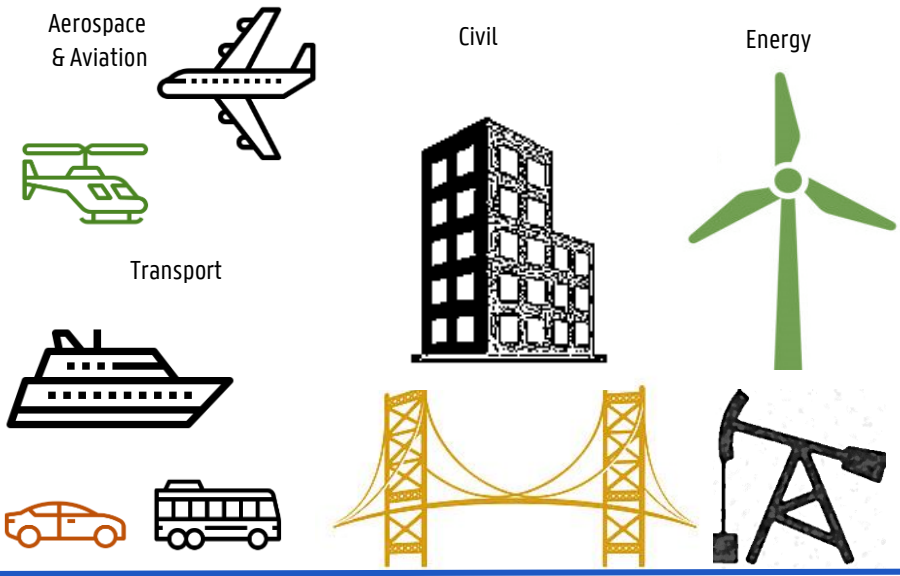
Crack quantification by extracting information from vibration data using 1D-CNN

Muhammad Irfan Shirazi, Samir Khatir, Magd Abdel Wahab

Introduction: Structural Health Monitoring (SHM) is broad field with application in aerospace and automotive industries, civil engineering structures and both renewable energy structures and conventional fossil fuel pipelines.

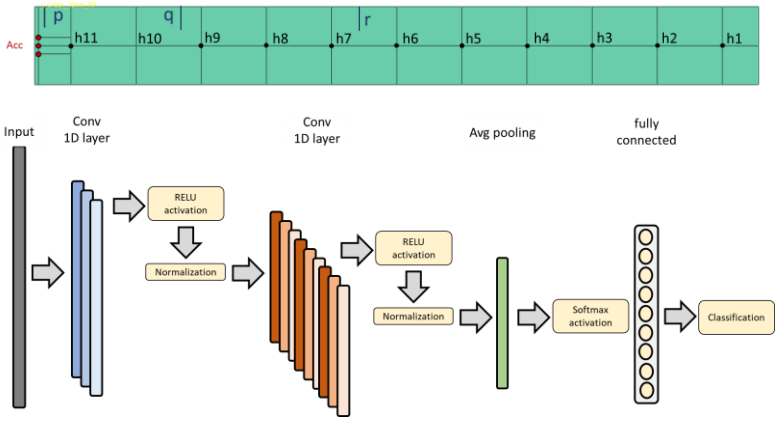
Artificial intelligence is a rapidly growing field of research. It has become an important tool in SHM as it allows

1. Greater resolution of damage features
2. Higher accuracy in determining damage
3. Improved efficiency as near-real-time detection is possible

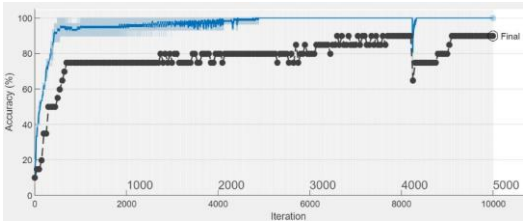


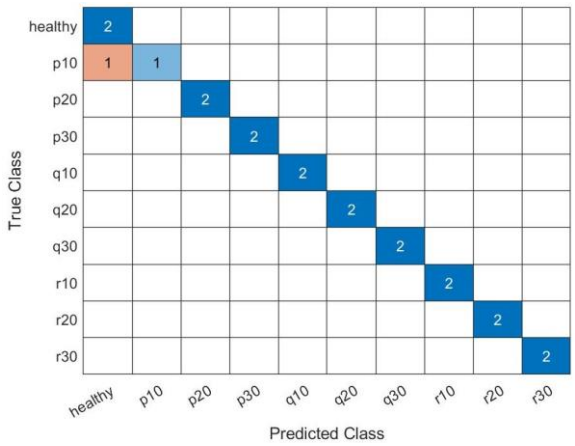
Methodology: An FE model of a simple beam is generated that simulates the impact of a hammer causing vibrations to be detected at the accelerometer.

Crack depth	Crack location		
	5 mm	100 mm	184 mm
10mm	p10	q10	r10
20mm	p20	q20	r20
30mm	p30	q30	r30



Results: The 1D-CNN is capable of classifying the different damages efficiently





Conclusions: Vibration data has enough features to quantify 3 cracks when using deep 1D-CNNs.