

Audio Analysis In Aviation Using Deep Learning

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Summary



- Acoustics - a branch of physics that deals with the study of mechanical waves in gases, liquids, and solids including topics such as vibration, sound, ultrasound and infrasound.
- Before radar image
- The field of acoustics continues to expand
 - Smart homes “Hey siri”
 - Apple watch
- Deep Learning

Deep Learning



- What is Deep Learning?
- Using deep learning, audio analysis has become as simple as converting sound into pictures.

Business Problem

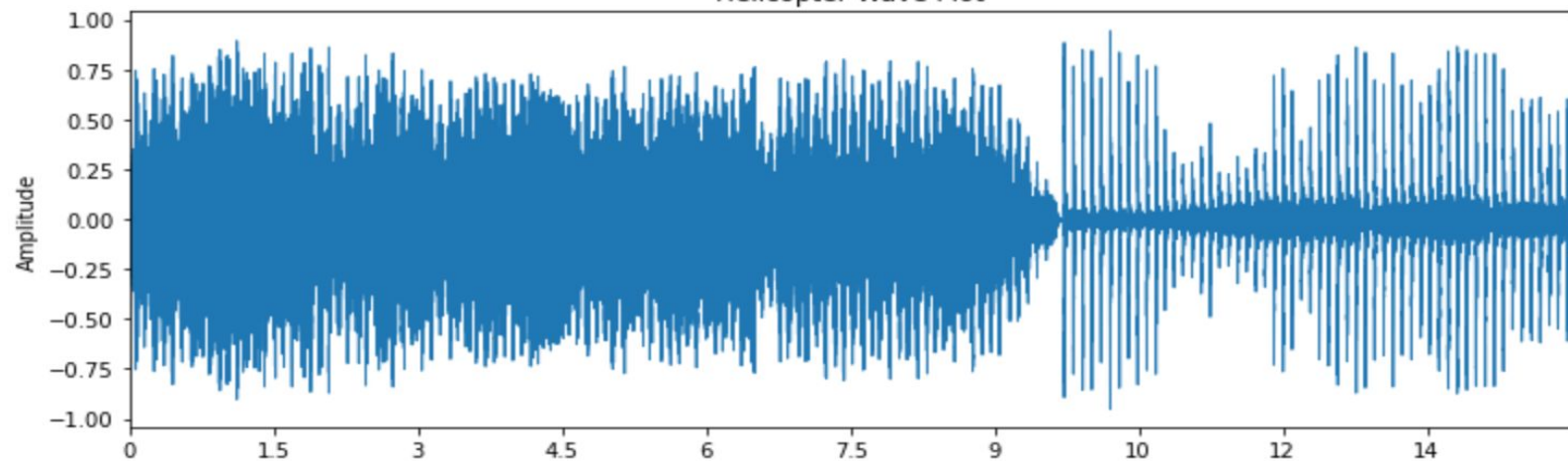
In the field of aviation, can we use deep learning to classify a helicopter/ fixed wing aircraft and to what degree of accuracy?

Data

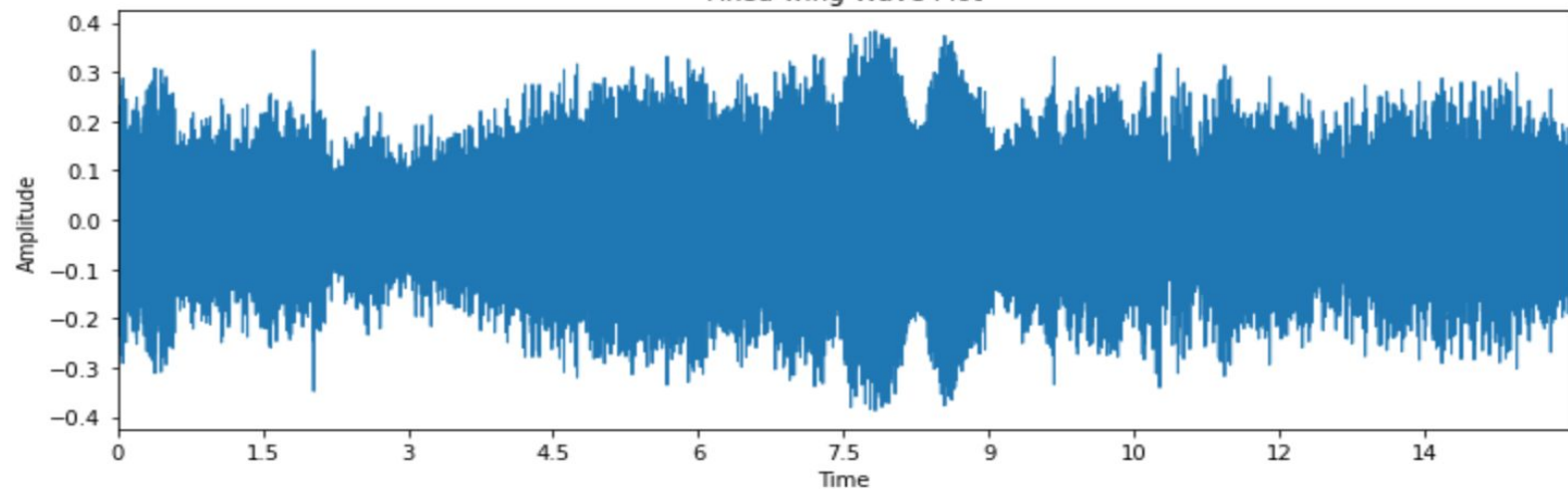


- The problem asks for helicopter and fixed-wing aircraft
- Sourced through multiple YouTube videos
 - Downloaded and converted from mp3 to wav files (wav files have less compression)
 - Split each video into 15 sec clips
 - Sort into 2 classes (Helo/fixed)

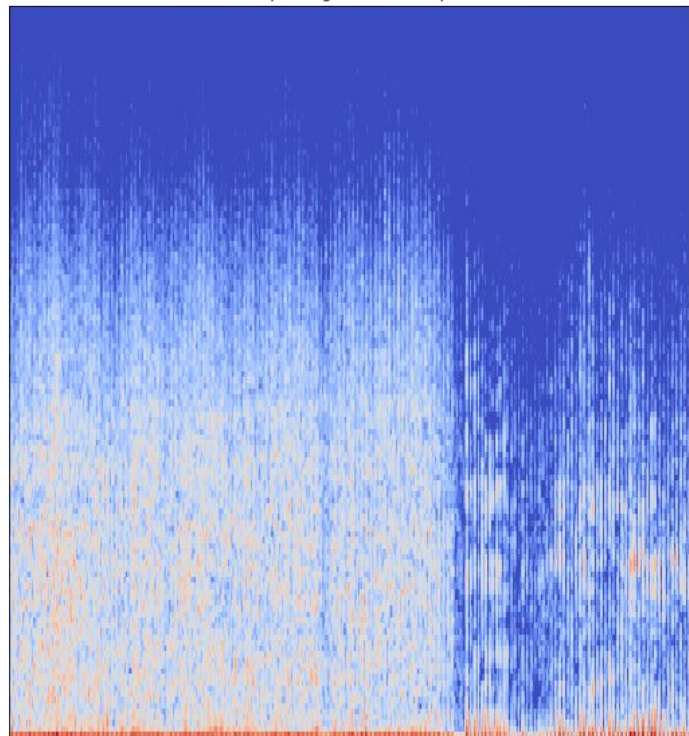
Helicopter Wave Plot



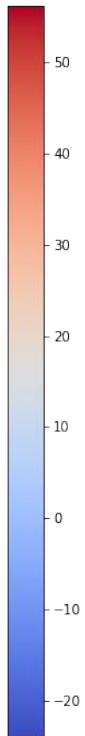
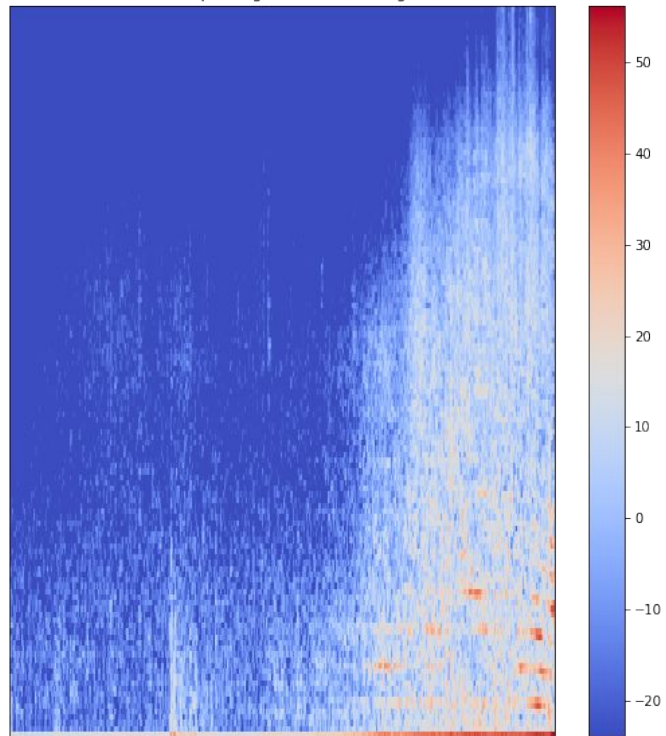
Fixed-wing Wave Plot



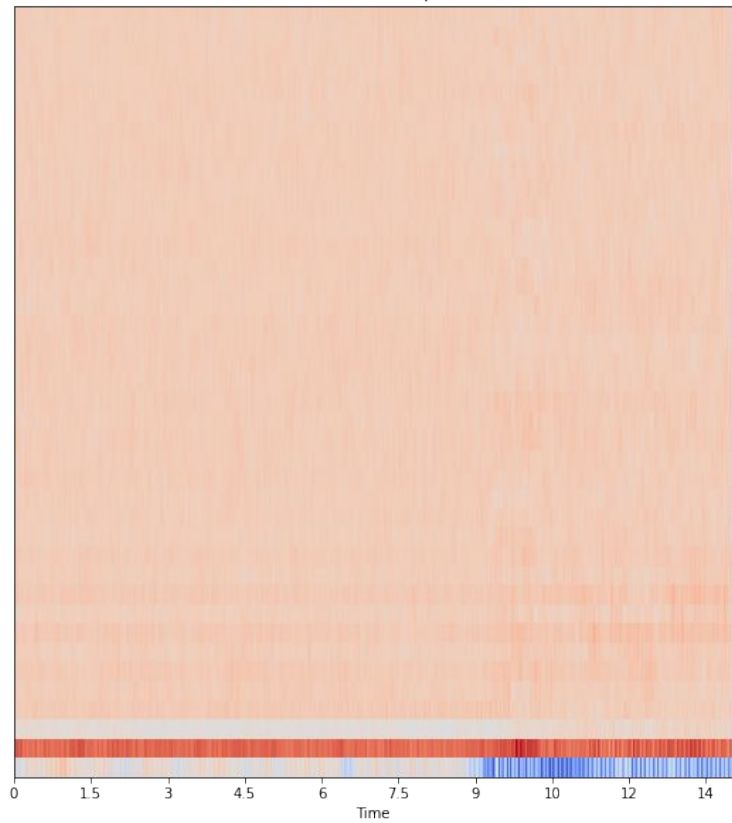
Mel Spectrogram of Helicopter



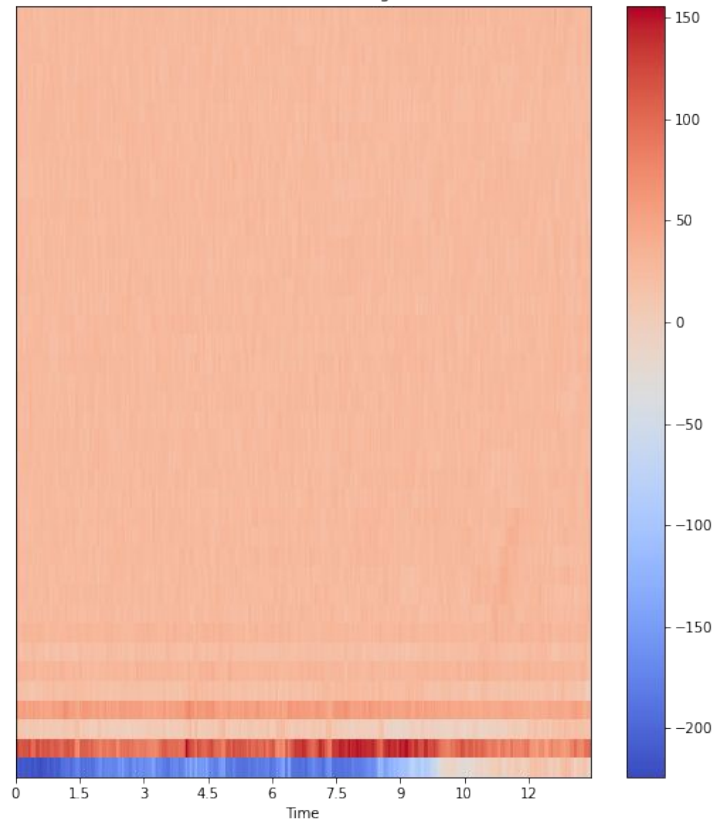
Mel Spectrogram of Fixed-wing



MFCCs of Helicopter

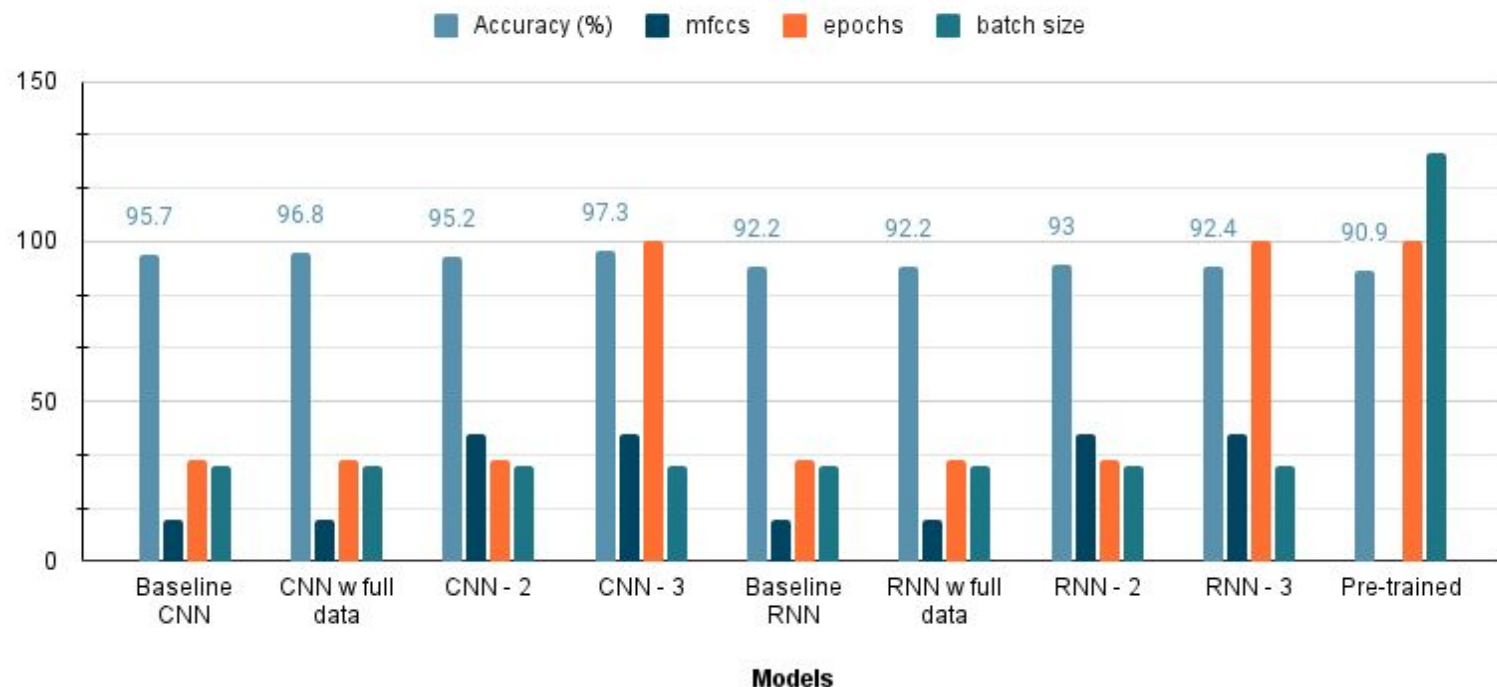


MFCCs of Fixed-wing



Initial Results

Model Summary



Conclusions

1. We learned that it is possible to classify a helicopter or a fixed-wing aircraft with a high degree of accuracy
 2. A simple CNN model with more mfccs performed the best at 97.3 % accuracy
 3. Confidence in applying in a real world situation
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Next Steps

1. Data augmentation on audio
2. Use spectrograms instead of mfccs
3. Test in real world conditions

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Thank You!
