***Machine Learning Identification of the Haast Tokoeka Kiwi Bird from Acoustic Readings***

Tom Grubb - **09029648**

# Introduction

The Haast tokoeka kiwi bird (HTK) stands as one of New Zealand's rarest avian species, with an estimated population of merely 400 individuals in 2015. Indigenous to the challenging mountainous terrains of Haast, Fiordland, and Rakiura in the South Island of New Zealand (Aotearoa), the Haast tokoeka kiwi's elusive nature poses a unique challenge for conservationists. In an effort to safeguard the species, preserving genetic diversity within the existing population is paramount.

Given the difficulty of navigating the bird's habitat, acoustic recorders have become invaluable tools in the identification of the size of current populations and the discovery of new breeding pairs. These devices capture audio data, offering a potential means to identify the Haast tokoeka kiwi bird within the vast and challenging landscapes. Accurate identification is pivotal for determining population sizes and confirming the existence of new populations, crucial aspects in the species preservation strategy.

In collaboration with the Department of Conservation, I am eager to contribute to the analysis of this data. The objective is to employ machine learning methods to enhance the accuracy of identifying the Haast tokoeka kiwi bird in these sound recordings. This initiative aims to provide conservationists with a robust and efficient tool for monitoring and safeguarding this critically endangered species.

# Literature review

Cakmamk et al. used spectrographic analysis to classify Rose-crested pipits in their paper “Interactive Classification Using Spectrograms and Audio Glyphs”, this included extracting the spectral centroid, spectral bandwidth and the spectral roll-off. They displayed their results in audio glyphs which they used to classify the birds.

Ludena-Choez et al. proposes the use of non-negative spectrogram decomposition as a more effective way of extracting features from acoustic data. In their study they found that this outperformed more traditional approaches such as Mel frequency cepstral coefficients.

Nani et al. achieved 97% accuracy in their deep learning classifier on a bird dataset using a convolutional neural network (CNN) . They concluded that the best standalone CNNs are VGG16 and VGG19 although they stated that a big draw back of CNNs is that they require a very large data set which will not be provided for my project.

Mortimer and Greene discuss in their paper the uncertainty of classification of bird song by professors with audio recordings of the Tui bird only being agreed upon 50% of the time. This highlights the need for robust scrutiny of the data I am provided.

Ghoraani and Krishnan used a three stage process to extract features from an audio signal which comprises of constructing a time-frequency matrix they found that this method gave more accurate results compared with the results gained from features extracted by spectrogram analysis.

# Objectives and Hypotheses

# Methodology

# Experiments and Results

# Discussion

# Conclusion

# References