

Madeleine Esther Robertson

Developing an Artificial Intelligence Model to Monitor Muntjac Populations Using Acoustics

Project Supervisor: Roy Sanderson
Modelling, Evidence & Policy Group, School of Natural & Environmental Science



Introduction

Muntjac deer are an invasive species in the UK, causing significant damage to woodlands and resulting in some losing their statuses as SSRIs. This project aimed to build an AI model that would be able to identify their calls, and therefore determine whether there were muntjacs present in an area. This is a form of passive acoustic monitoring, which enables a larger area to be covered than other methods of monitoring, such as camera traps. The AI model would remove the need for the audio to be reviewed manually, saving time and effort, and enabling the technology to be more widely employed.

Materials and Methods

Twenty AudioMoths (acoustic recorders) were attached to trees in two areas of woodland in Hertfordshire, and programmed to record for two hours before and after midnight every night for eight weeks between June and August. The recordings of muntjac calls were then manually extracted from the audio files, and used along with recordings of other noise (crows, tawny owls, aeroplanes, rain, fireworks etc.) to build an AI model that is able to accurately identify muntjac calls.

Results

ACCURACY **97.6%** LOSS **0.08**

Confusion matrix (validation set)

	AIRCRAFT	ANIMALS	MUNTJAC	NOISE	RAIN
AIRCRAFT	98.4%	0%	0%	0.2%	1.4%
ANIMALS	2.5%	93.2%	0%	4.3%	0%
MUNTJAC	0%	0.3%	99.7%	0%	0%
NOISE	0%	0.6%	0%	99.4%	0%
RAIN	5.9%	0%	0%	0%	94.1%
F1 SCORE	0.97	0.95	1.00	0.99	0.96

Fig. 1. Confusion Matrix Showing Model Performance

The performance of the model can be shown with a confusion matrix (fig. 1). The model correctly identified 99.7% of the muntjac audio, with an F1 score of 1. The F1 score indicates the reliability of the model and can range from 0 to 1, with 0 denoting the lowest possible reliability and 1 denoting complete reliability.

Discussion

The correct identification of 99.7% of the muntjac audio, as well as the F1 score of 1, suggests that the model is performing well. It was less accurate at identifying other sounds (e.g. rain), but as this was not the aim of the project, this is not considered to be a problem.

Conclusion

The aim of the project to build an AI model with the ability to accurately identify muntjac calls was fulfilled. Future research could focus on expanding the technology to encompass a range of species in order to produce an accurate assessment of the species present in an area. It could also employ triangulation to identify the locations of individuals, therefore enabling population sizes to be estimated.