Assessing the Use of Artificial Intelligence Systems for the Protection of Agroforestry Plots on Cotswold Soils

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Summary

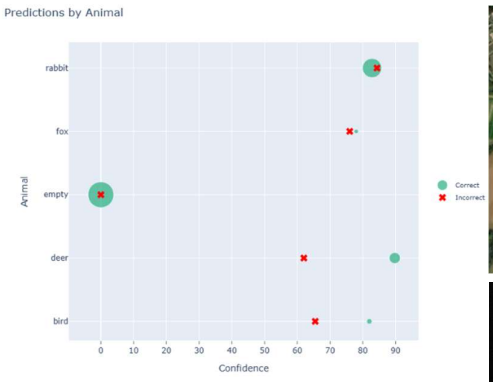
The recent widespread adoption of artificial intelligence has brought about unique opportunities and challenges to the agricultural sector. Although it has been incorporated broadly for farm management tools, there is a distinct gap in its potential for reducing human-wildlife conflict. By investigating the research question, to what extent can the development of an artificial intelligence-based system help to recognize and protect against the predation of agroforestry plots, the findings of this study intend to positively shift attitudes toward artificial intelligence and its practical usage.

Two methods are tested on the Sapperton Wilder estate: animal classification using a smart device called “Sentinel” and a machine learning model (MLM) for animal prediction based on weather patterns. The results suggest that artificial intelligence smart devices are competitive with human classification abilities, which may be useful in commercial agricultural settings. This research contributes to a deeper understanding of how artificial intelligence can be exploited and aims to guide future empirical efforts for the design of artificial intelligence software for agriculture. Moreover, it is intended for the findings of this research to contribute to aid wildlife surveying efforts to create better frameworks for human-wildlife conflict management.

Methods

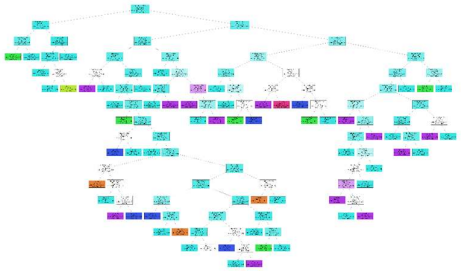
The Sentinel device was placed in the middle of the badger plot, alongside 4 camera traps for 1 month to capture images of passing animals.

Hourly weather forecast data was also downloaded to create an MLM. This was used to code a random forest and decision tree to identify patterns with animal appearances and weather type.



Results – Sentinel

The Sentinel took a total of 166 target photos, predicting the presence of 77 animals. Overall, the Sentinel correctly labelled 127 images out of 166, reflecting 76.5% of the data. Sentinel performed strongest when identifying rabbits and deer compared to other animals.



Results – Machine Learning Model

The four camera traps took approximately 1674 photos, where 1141 contained an animal.

Model 1 (random forest method) had an accuracy of 86%. Model 2 (decision tree method) had an accuracy of 77%.

However, due to the quality of the data, the model was deemed unfit for commercial use.

Conclusion

It is clear that ML offers a compelling alternative to human manual classification methods, especially when it comes to big datasets. Although proper training and technical knowledge of computer vision are required, the potential cost and time savings may outweigh the costs. As one of the first studies to apply AI-based camera trap technology in an agricultural setting, this paper makes a distinct contribution to the literature. Specific to deer management, the Sentinel’s high accuracy level in identifying deer may support national efforts in managing populations.

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