

## **Comparison of machine learning methods for the vocal identification of meerkats (*Suricata suricatta*)**

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### **Abstract (max 300 words)**

The topic of individuality in animals has long been at the forefront of animal behaviour research (Clark & Ehlinger, 1987). Individuality can serve many functions and is particularly crucial in cooperation (Beecher, 1982; Charrier et al., 2002). One of the widespread modalities of signalling and recognizing individual signatures is through vocal communication (Owings et al., 1998). Vocal individuality signalling is thought to be the basis of complex communication systems in which repeated interactions occur between numerous individuals (Beecher, 1982; Cheney & Seyfarth, 2018). Meerkats are a cooperatively breeding mongoose species which use a large vocal repertoire to coordinate activities with group members (Clutton-Brock & Manser, 2016). Due to their sociality, cooperative system, and common usage of vocal communication, meerkats are an ideal species to investigate vocal individuality and automatic individual recognition. Here, I compare how several machine learning algorithms perform on the task of identifying individual meerkats from their vocalizations, based on two different types of acoustic features. The best classification performance is obtained by using mel-spectrogram images with a random forest classifier. In addition, context may have an influence on the classification performance. The individuals' age at which the data was gathered instead did not influence the performance significantly in a train-on-one-age-class and test-separately-on-all-age-classes paradigm, indicating that the individual signature is stable throughout lifetime. Automatic individual identification through vocalizations can have many practical applications in conservation, such as accurate passive monitoring and tracking at the individual level (Terry et al., 2005; Wijers et al., 2020). My results support the possibility of using a machine learning approach for passive acoustic monitoring of meerkats, but to achieve such a generalized framework more analyses investigating the influence of biological and technical factors on the classification performance are needed.

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