Thesis Defense

Computer Science Master's Program

"Generalized Detection of Animal Behavior Using Accelerometers"

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Abstract:
Animal mounted sensors are becoming increasingly used to passively monitor both domestic and wild animals. Advances in lightweight accelerometer and GPS technology have allowed many animals to be fitted with high accuracy sensors for extended periods of time. This leads to new opportunities to study animal behavior without direct observation. However, interpreting the raw data is difficult due to the high volume and missing context of the information. Machine learning techniques excel at extracting information from raw data streams and are excellent candidates for processing the sensor data. However, due to large variance in how different animals execute the same behavior, success in this task has largely been relegated to functionality on small groups of animals in similar environments. Additionally, the bottleneck of capturing enough high quality annotations of animal behavior with mounted sensors incurs too large a cost for many use cases outside of large agricultural operations.
This thesis tests a large variety of supervised machine learning techniques under a wide range of conditions and data to verify the highest performing setup. We also study transfer learning techniques to increase the generalizability of machine learning models without increasing the burden on field scientists to gather additional data for every desired animal. This work serves as a basis for modeling animal behavior that can apply to a broad range of future work.

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Location: 14-238b
Committee: Dr. Canaan, Dr. Dekhtyar, Dr. Ventura