Abstract of proposed student project

Proposal title: AI-Driven Interpretation of Postoperative Pain Patterns in Horses

Proposal

i. Veterinary medicine recognizes behavioral change as a critical indicator of animal pain. But accurate identification of pain-related behaviors in horses who underwent general anesthesia remains a critical challenge in veterinary medicine, as postanesthetic effects and stress often confound traditional behavioral assessments.

ii. Advances in artificial intelligence, particularly deep learning–based video analysis, provide an objective framework for detecting subtle, stereotypical movement patterns that may differentiate stress-related coping behaviors from those driven by surgery-related pain. Building on prior work demonstrating the feasibility of AI-based pain recognition, this study will extend these approaches to the systematic analysis of equine post-surgical pain.

iii. The objective of this proposal is to compare behavioral patterns in horses before and after surgery with those in horses undergoing diagnostic procedures under general anesthesia, to distinguish pain-related stereotypies from confinement-associated behaviors or residual anesthesia. Using artificial neural network models, we will identify differences in the patterns, frequency, and clustering of behaviors that may serve as indicators of pain, enabling earlier recognition and more targeted pain management strategies in hospitalized horses. We will develop and validate customized artificial neural network models using self-supervised pre-training on large-scale unlabeled video data with unsupervised movement clustering architectures (e.g., SlowFast or TimeSformer).

iv. Timed video recordings were collected from 30 horses admitted at the University of Florida Large Animal Hospital before anesthesia and during the first five postanesthetic hours following either surgical or diagnostic procedures. The pre-trained models will be semi-supervised and fine-tuned using a limited labeled subset of data (10–20%) to enhance classification and differentiation of pain-related versus non-pain-related behaviors across individuals and perioperative contexts. Model performance will be validated through expert veterinary review and quantitative performance metrics. By defining objective, automated behavioral markers of pain, this research aims to advance early pain recognition, improve welfare strategies, and inform targeted perioperative management in hospitalized horses.

Role of the Veterinary Student: The veterinary student will support the collection and management of final video-recording data by performing preliminary quality control, ensuring consistent lighting, camera angles, and environmental conditions, maintaining detailed logs of video sessions including time, animal ID, and experimental conditions, and systematically backing up and organizing video files. The student will also assist in identifying and annotating abnormal behavioral patterns for algorithm training, categorizing behaviors using predefined labels (e.g., pain vs. normal, specific postures or movements), marking the start and end times of relevant events, and flagging ambiguous or low-quality video segments for review. During the algorithm development phase, the student will help run the artificial neural network (ANN) on labeled datasets using pre-prepared scripts, record outputs while noting instances of misclassification, and compare ANN predictions to annotated labels to support accuracy assessments.