2023 Annual Research Day Poster Sessions – April 19th, 2023

Session/Poster#	Presenter
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Whisking in Rats as a Function of Body Temperature Measured with a Machine-Learning Approach

Whisker (vibrissae) movement in rodents is controlled by the facial nerve and easy to observe. The rat thus provides an excellent animal model for developing treatments of unilateral facial paralysis in humans. To be scalable, however, rat studies of facial-nerve regeneration after injury and repair require methods to monitor whisking repeatedly and efficiently. We explored heat as a non-invasive stimulus to elicit whisking under anesthesia and used machine learning as a high-throughput approach to measure the resulting whisker movements.
Rats were anesthetized with urethane (1.5 g/kg ip). After anesthesia, microtubes (approximately 1 cm length) were threaded onto three whiskers on each side to enhance their visibility. The rat was then warmed gently over 10 min to normal body temperature with a desk lamp while internal body temperature was recorded with a rectal thermometer. Vibrissae movements were captured on video at 240 fps. The videos were analyzed by locating the six whiskers frame-by-frame with machine-learning software (DeepLabCut). Whisker trajectories were correlated with body temperature by using custom R scripts.
Machine learning accelerated whisker detection and localization by almost two orders of magnitude over manual processing and with comparable accuracy. The mean of the maximum whisking amplitude increased almost two-fold as the rat was warmed from ~32Â°C to ~38Â°C. After removing the heat source, the whisking amplitude rapidly returned to baseline levels even though the internal body temperature remained normal.
Our results demonstrate first that whisking can be stimulated non- invasively in anesthetized rats with gentle warming. Second, detailed whisking trajectories can be extracted efficiently from large amounts of high-speed video with machine-learning software. The combination of these two approaches will allow us to track functional recovery after facial-nerve injury and repair and test novel treatments for unilateral facial paralysis.