Automated Tracking of the Muscle Tendon Junction Using Modern Deep Learning

Uddin, Hassam (School: Niles North High School)

The purpose of this project is to develop and compare a set of various neural network architectures to track the location of Muscle Tendon Junction in ultrasound footage. An accurate and efficient neural network that can track the Muscle Tendon Junction with good accuracy can assist researchers and medical professionals in determining the characteristics of a given subject's muscles and tendons. This will significantly speed up prosthetic research and allow practitioners to design proper prosthetic limbs for patients with disabilities. Using modern innovations in Computer Vision and Deep Learning, like self-attention and recurrent convolutions, we develop a series of neural networks that we train and evaluate on a dataset of ultrasound images that contain the Muscle Tendon Junction. The results show that modern deep learning techniques significantly outperform standard, non-deep learning techniques. This gives insight into the capabilities of deep learning techniques and their applications on medical imaging tasks. As computer vision and deep learning become more powerful, medical researchers will be able to utilize them to assist in their diagnoses and designs.

Awards Won: