HIKNet: A Neural Network for Detecting Head Impacts from Kinematic Data

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BACKGROUND and MOTIVATION

- Mild Traumatic Brain Injury (mTBI) is a serious health concern, especially in contact sports such as football, and can cause acute and long term debilitating symptoms.
- The Camarillo Lab at Stanford has developed and deployed an instrumented mouthguard that records linear acceleration and angular velocity of head impacts.
- Device must be able to accurately classify between real impacts or false positives (e.g. spitting, chewing, etc.) to be useful.
- In previous work, sequential feature selection was used to determine the most important classifier features, and these were used to train a SVM classifier.
- We propose to use a neural net, which will automatically extract important features to distinguish between real and false impacts to a high degree of accuracy.

1. DATASET

Stanford Instrumented Mouthguard

527 examples of 6 time traces (linear acceleration and angular velocity in x, y, z axes) each of length 199
- 264 real impacts and 263 false impacts
- Each impact has 100ms of data sampled at 1000 Hz
- Dataset was randomly split 70%/30% into a training and evaluation set

A representative example of a real and false impact:

FUTURE WORK

- Develop a neural network that classifies between multiple classes such as head impacts, body impacts, and no impact.
- Apply neural net to a larger mouthguard dataset as more data is collected.
- Analyze positive head impacts and classify them as resulting in concussion vs. no concussion (KOCNet)

REFERENCES