Activity Classification using MHI

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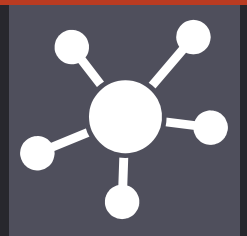


Introduction

Video Activity Recognition using MHI

Dataset:

http://www.nada.kth.se/

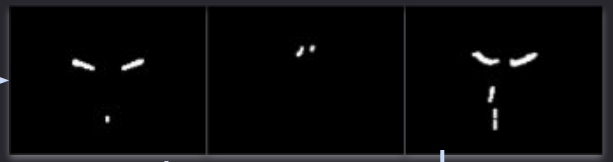
Image source: http://www.nada.kth.se/cvap/actions/

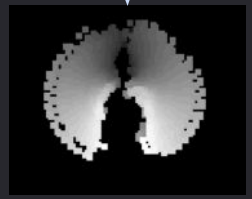
IMAGE PROCESSING PIPELINE

MHI and MEI

Video frames

Binary images (*after Gaussian blur*)





MHI

MEI

Motion-History Images(MHI) is similar to MEI and is a pixel intensity function, where brighter values correspond to most recent motion.

Motion-Energy Images (MEI) highlight regions in the image where any form of motion is present.

Hu Moments

The **Seven Hu moments** provide reasonable shape discrimination in a **translation**, **rotation** and **scale invariant** manner.

The Eight Hu moment ensures independence and completeness.

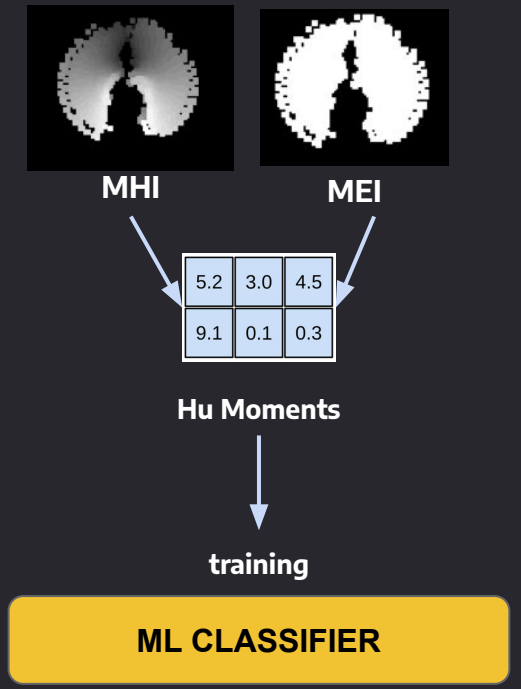
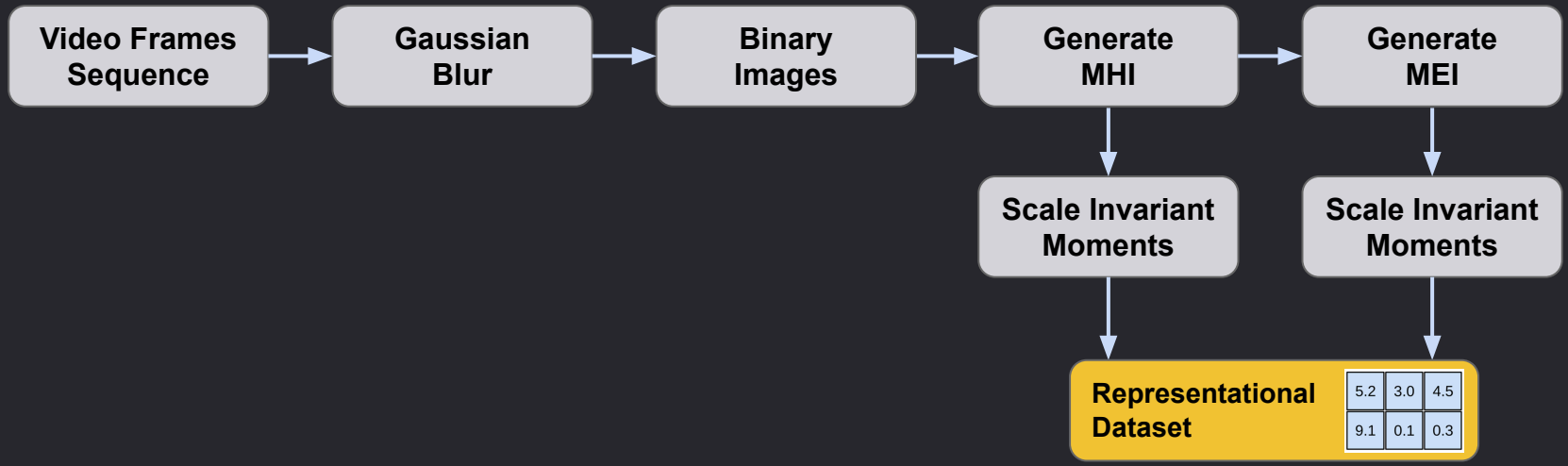
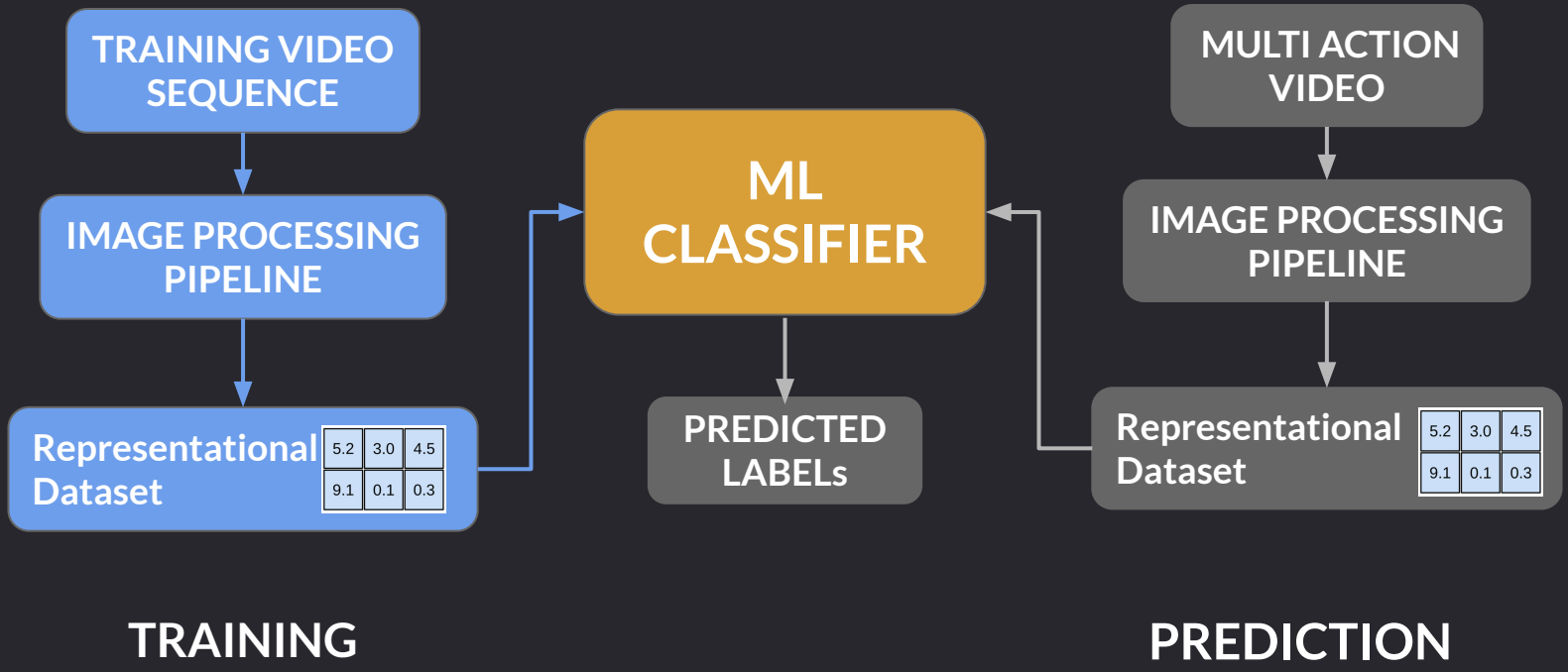


Image Processing Pipeline



CLASSIFIERS

TYPICAL CLASSIFIER

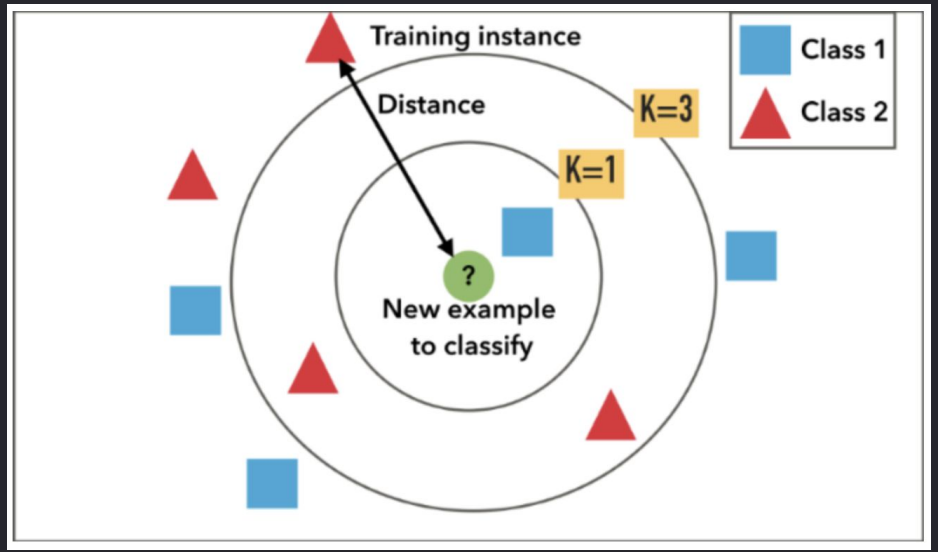


KNN CLASSIFIER

KNN Algorithm classifies based on **feature similarity**

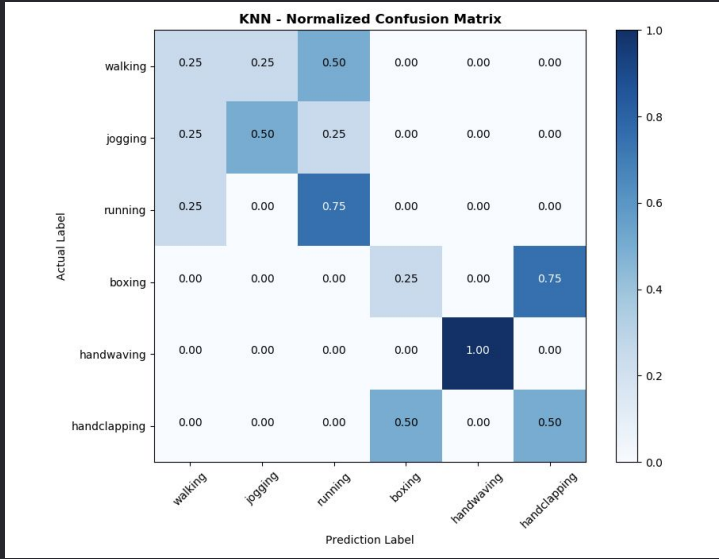
How close does the out-of-sample features resemble the training set

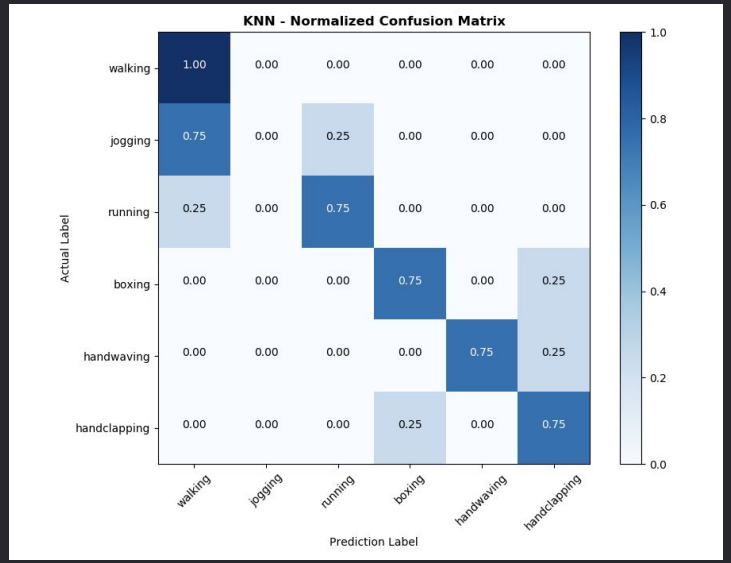
Nearest K-Neighbors determine the classification.



https://blog.usejournal.com/a-quick-introduction-to-k-nearest-neighbors-algorithm-62214cea29c7

KNN CLASSIFIER – RESULTS





Validation Accuracy - 54.17%

Testing Accuracy - 66.67%

MLP CLASSIFIER

Multi-layer Perceptron (MLP) Classifier uses **neural network like structure** to train.

Uses hidden layers to capture subtle differences and garner **better accuracy**.

Back-Propagation to continuously adjusts the weights of the network connections to minimize error

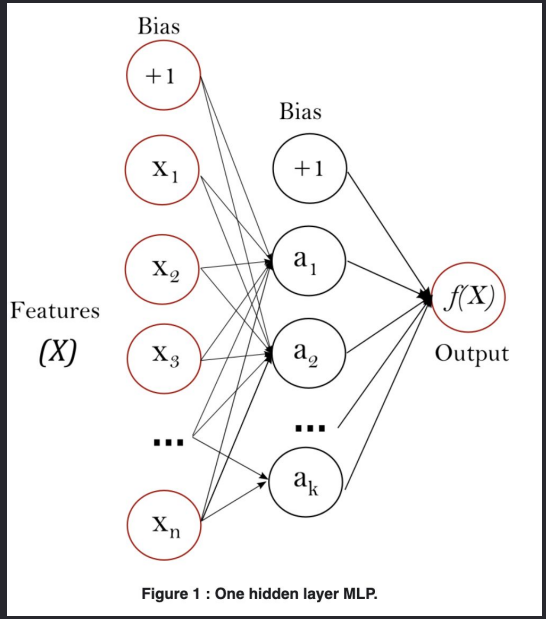
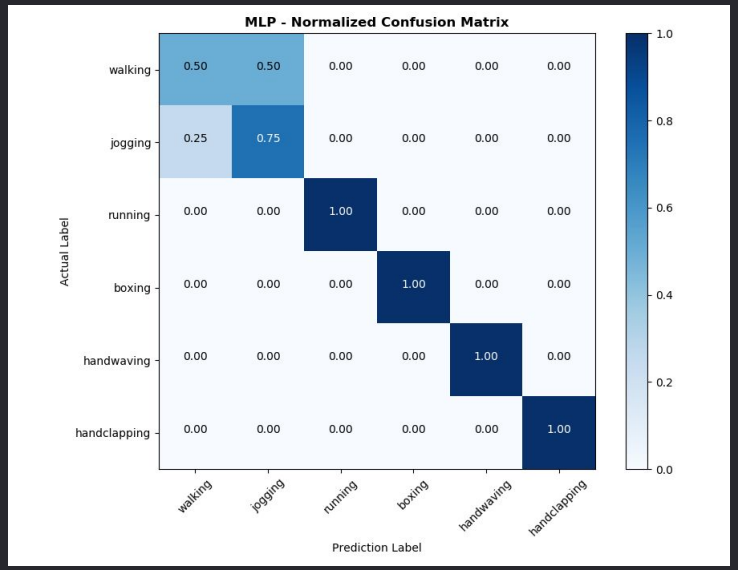
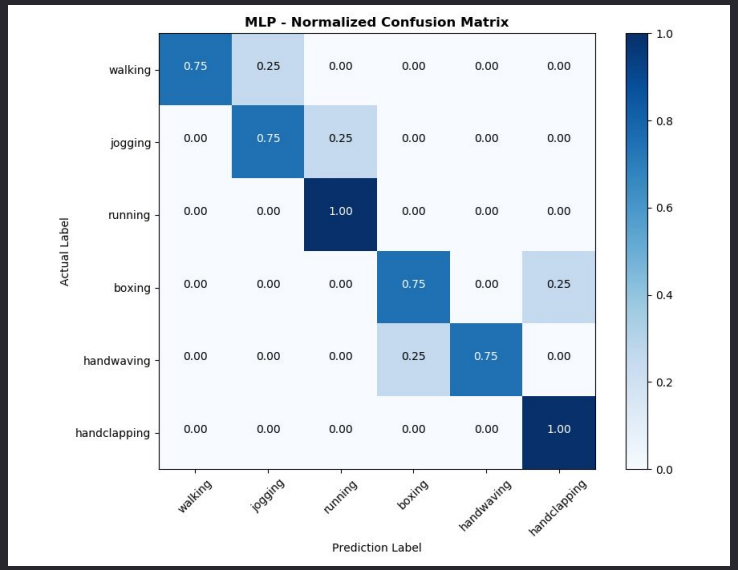


Figure 1 : One hidden layer MLP.

https://scikit-learn.org/stable/modules/neural_networks_supervised.html

MLP CLASSIFIER – RESULTS





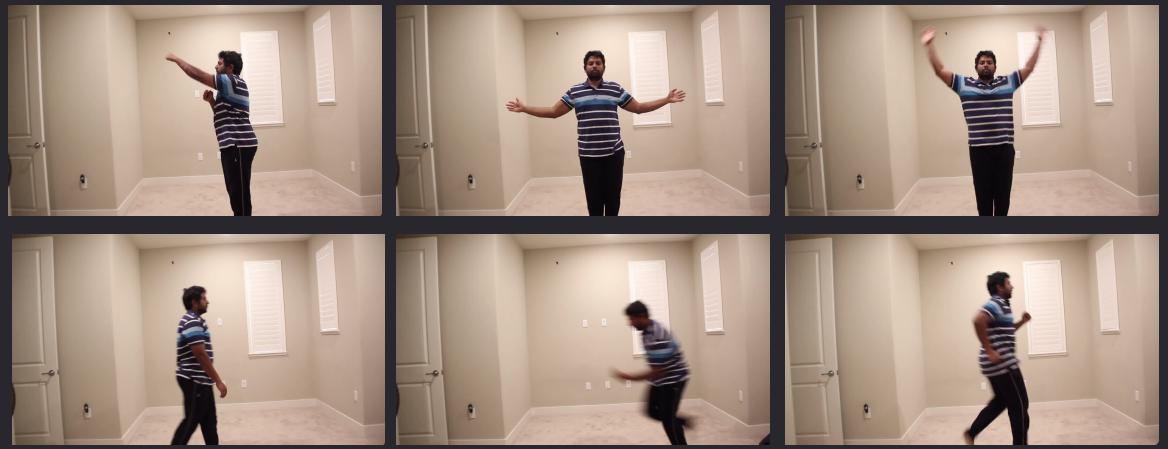
Validation Accuracy - 87.50%

Testing Accuracy - 83.33%

MULTI ACTION VIDEO

MULTI ACTION VIDEO

A multi action video was recorded using the same subject performing all of the trained actions in sequence.



Few sample frames from the video

MULTI ACTION VIDEO - PROCESSING

Video is processed using the **Image Processing Pipeline** and MHI/MEI are generated.

Their **Hu Moments** are used to predict the action using the trained MLP Classifier.

MHIs generated from the multi-action video

MULTI ACTION VIDEO - RESULTS

Using the MHI/MEI based **Hu Moments, the** trained MLP Classifier was able to **predict all the actions accurately.**

boxing clapping waving

walking jogging running

Video frames with prediction

Thanks to all the TAs and students of Spring 2019 for your guidance and help.