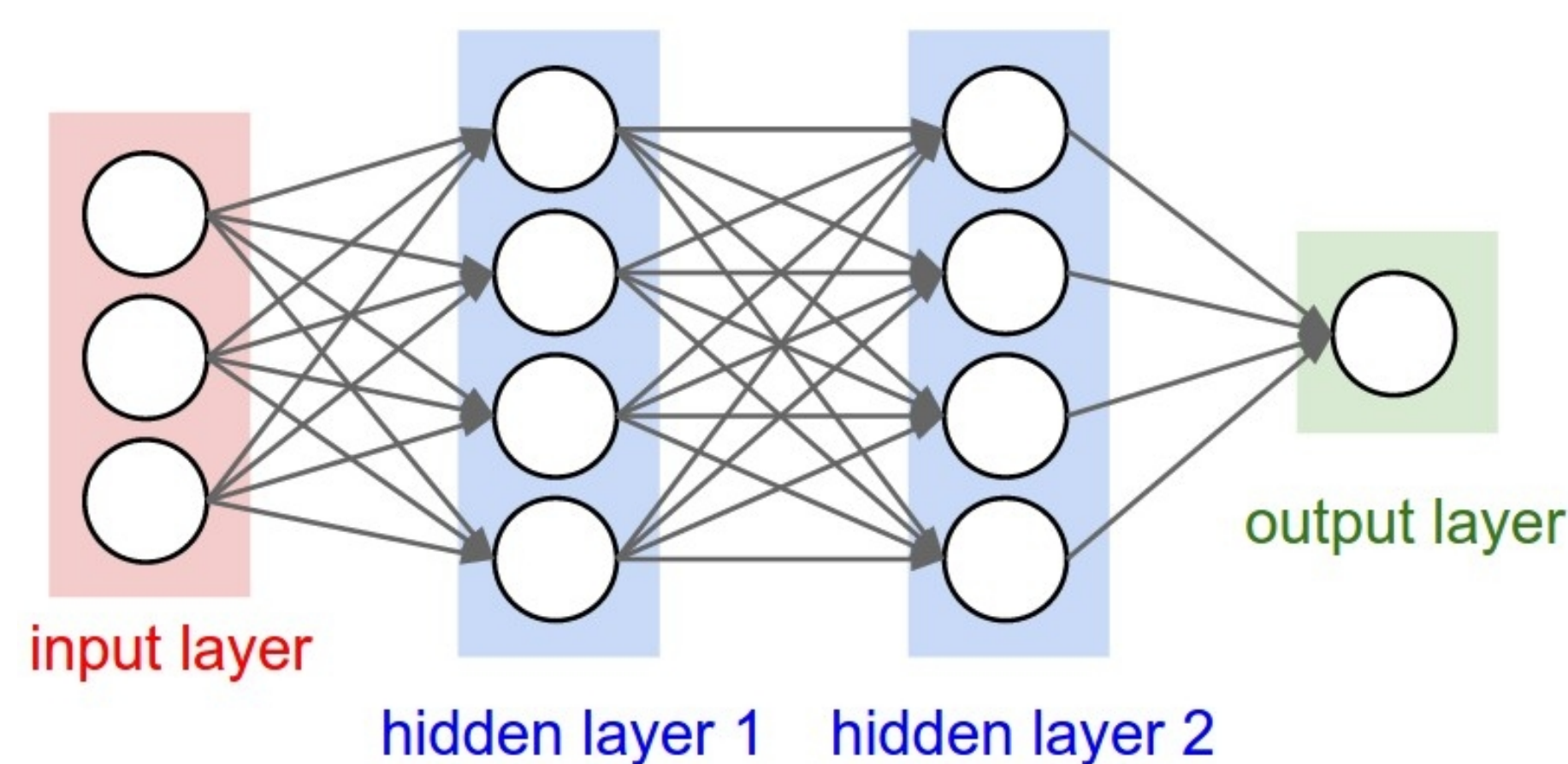


Multiview Deep Transfer Learning for Activity Recognition

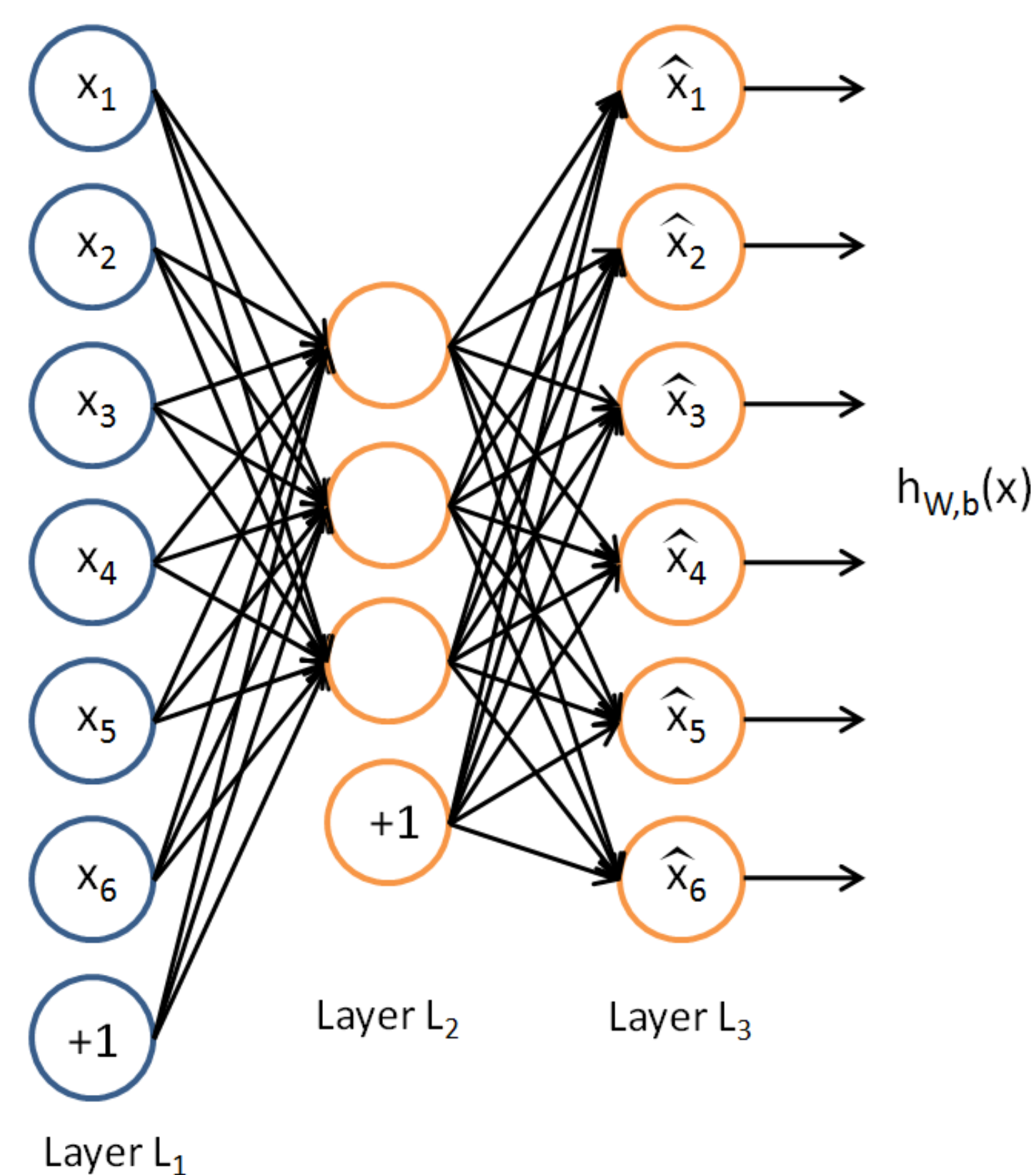
Kyle Kippen, Kyle Feuz, GSUR.

Introduction:

Machine learning can come in various forms. A Multilayer Perceptron (MLP) is a neural network which is a type of supervised machine learning algorithm. It consists of an input layer, one to many hidden layers, and an output layer. Each layer can have one to many nodes. The size of the input layer will match the number of attributes in the dataset. The output layer will have one node per class label. For instance, if you are testing a dataset that is resulting in 5 different outcomes, the output layer should have 5 nodes in it.

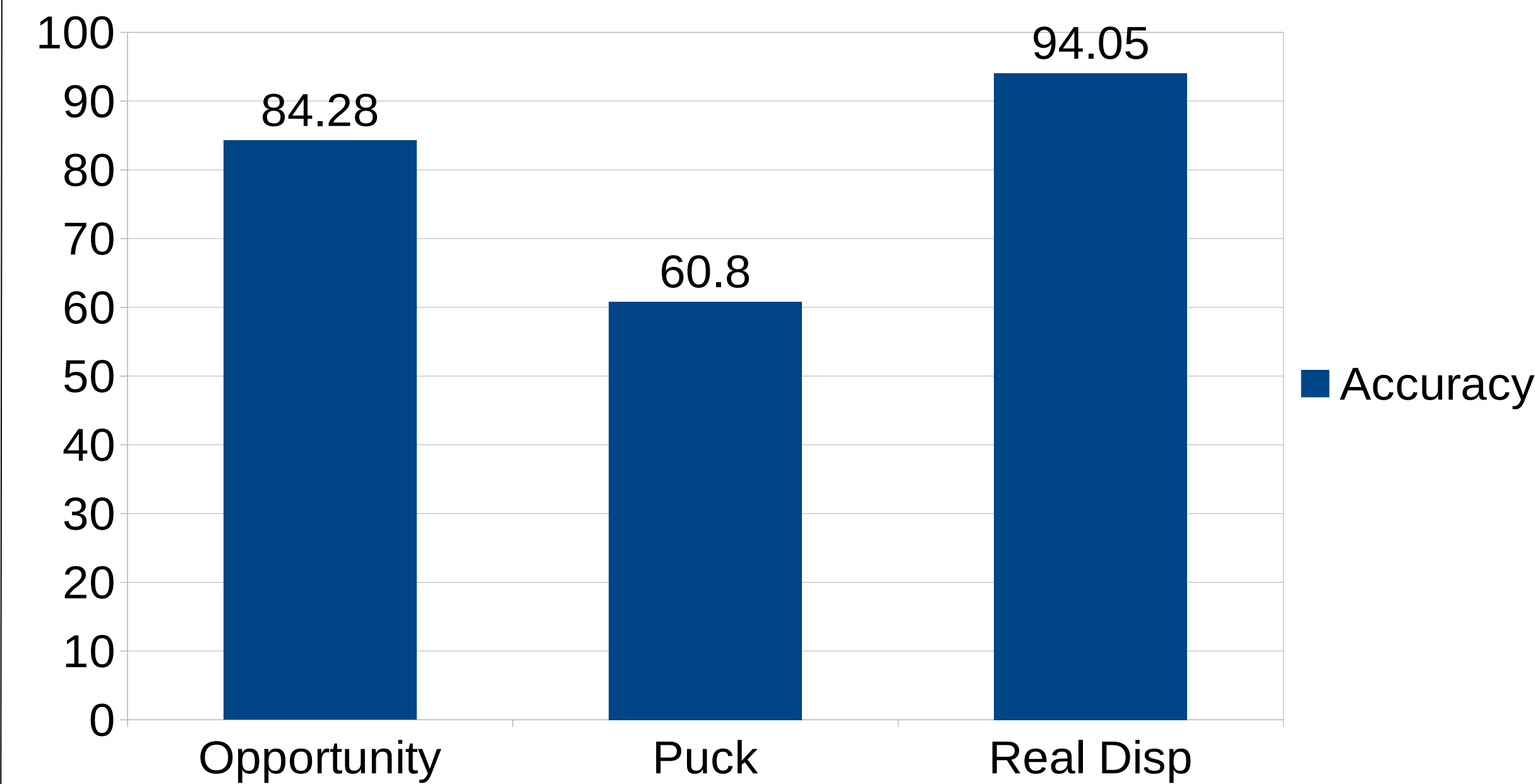


Auto-encoding is another type of neural network. This is an unsupervised machine learning algorithm. The auto-encoder will try to learn a function in which the input will equal the output. A narrowing in the amount of nodes within a hidden layer can help to improve the generalization of the model. This will require the algorithm to find commonalities between the input values and the output values.

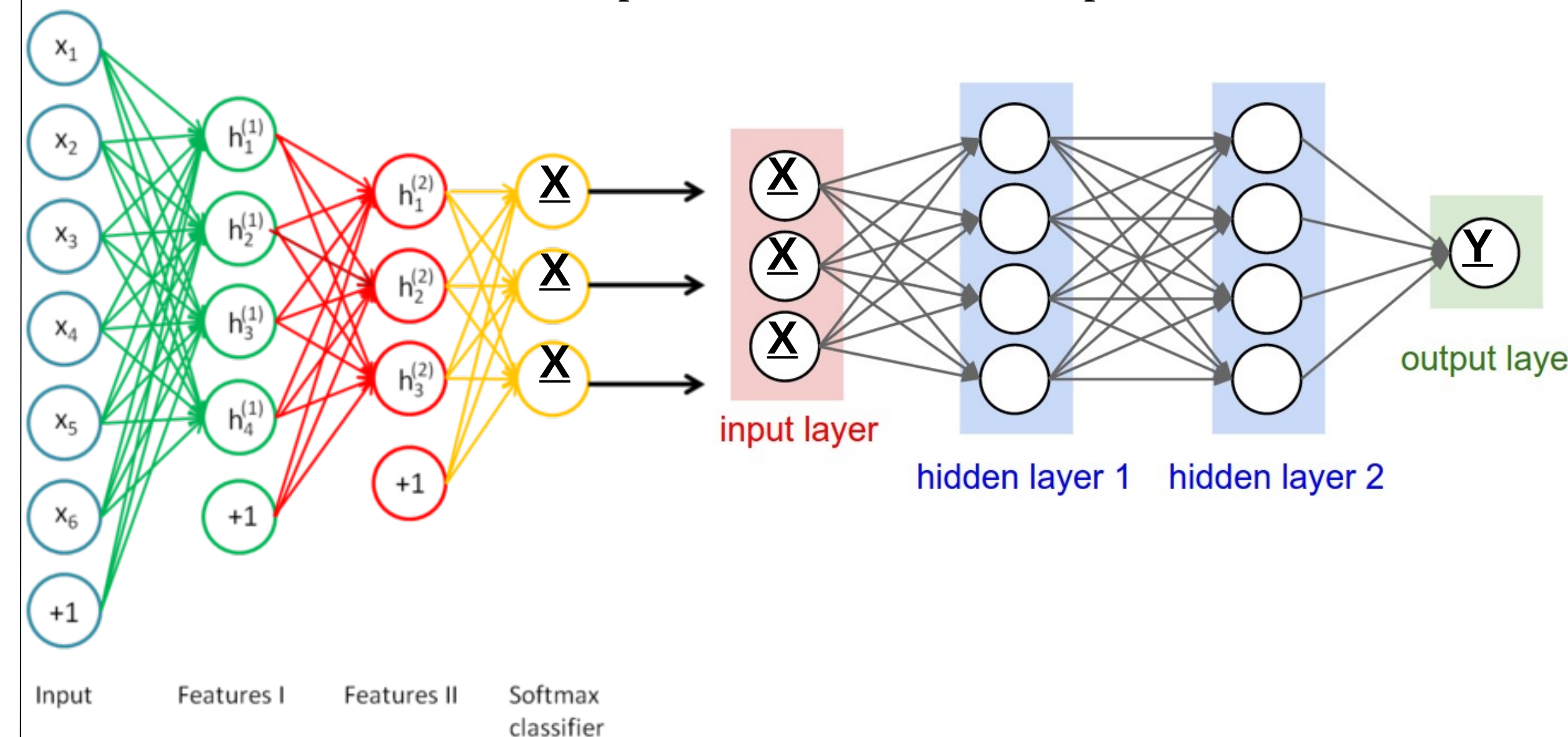


Results:

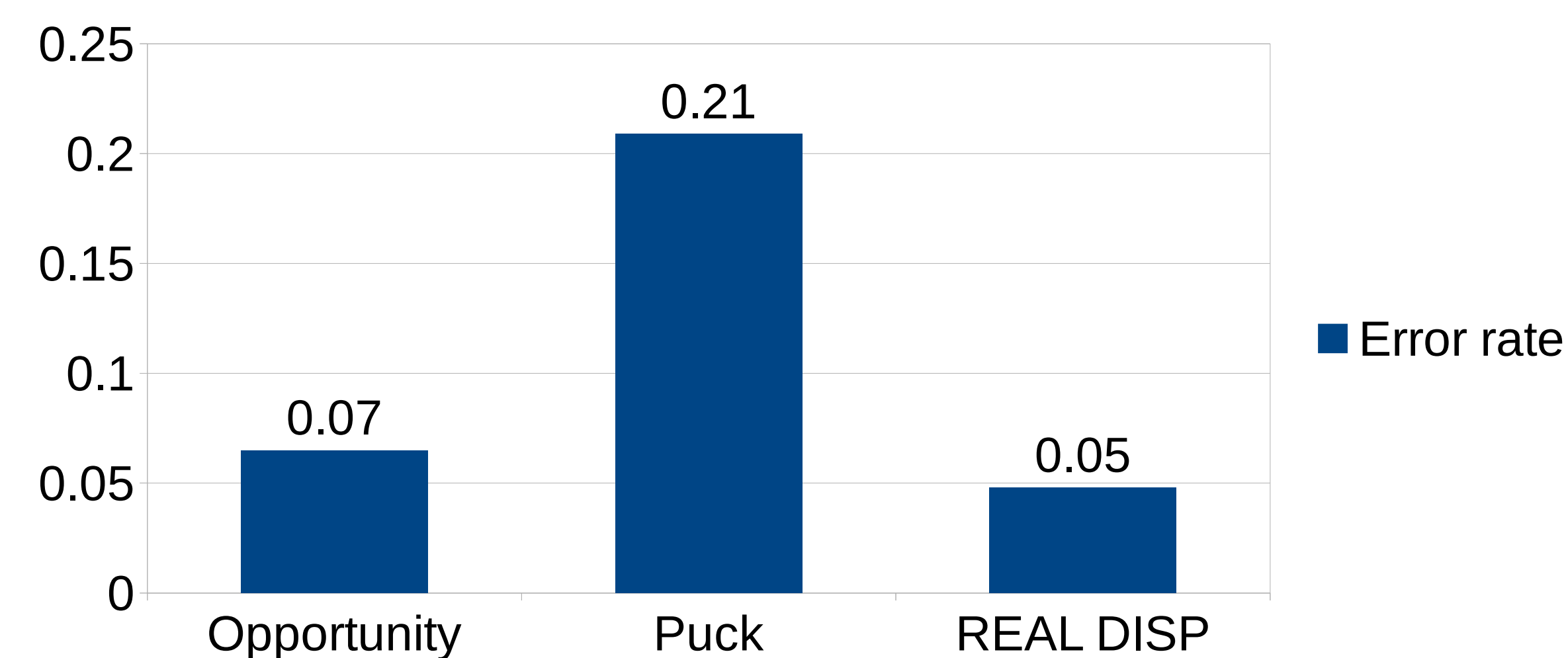
Results from the neural networks of each dataset.



This takes the auto-encoder output and has that be the input to the neural network.

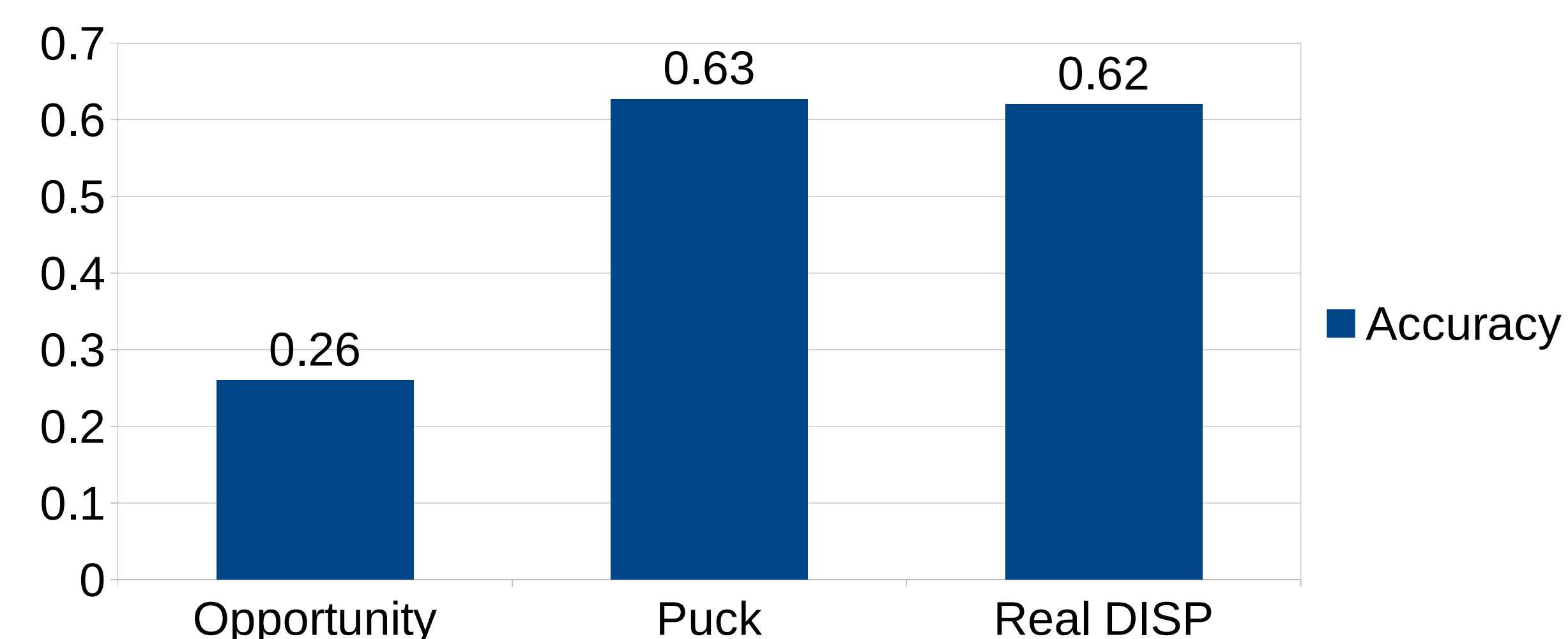


Error rate of the auto-encoder.



Results for the opportunity dataset with the auto-encoder and Neural network.

This number could be improved with more time and more knowledge with Keras.



Hypothesis:

My hypothesis is that a deep neural network can accurately learn from the results of the auto-encoder which has been trained on a dataset that consists of unlabeled data.

Methods:

- Using one form of auto-encoding to convert one input (view 2) space to another (view 1) because view 1 has labeled data and view 2 does not.
- The Neural network is a deep neural network with an input layer, and many hidden layers.
- Keras is a deep learning framework that helps to alleviate some of the common pitfalls of machine learning.
 - This is using the python language and Google's tensorflow.
- The sensors that were used in the datasets are sensors that measure movement along an x, y, z axis. It also uses motion sensors that detect movement that is within range.
- The sensor data is the results of multiple types of sensors. We created the dataset that we used by using a 5 second window. We took the information in half second increments and took the mean average of each row. This allowed us to be able to train the auto-encoder and neural networks.

Conclusion:

- Supervised Deep Learning using a MLP resulted in an accurate classification of the data.
- Unsupervised Auto-encoder also closely mapped the input data from one set of sensor to another set of sensor data.
- Combining the two techniques resulted in lower than expected accuracy.
 - Given more time I believe that the results could be improved.

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