Deep Learning: Predicting Length of Hospital Stay

HOOD COLLEGE

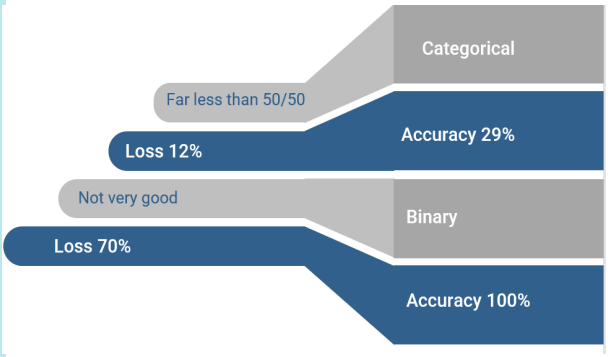
Abstract

To investigate if a simple deep learning model could accurately predict the Length of Stay of patient if trained on the Healthcare Analytics II dataset found on Kaggle. Specifically, if a simple three-layer model using multiclass classification, or a four-layer model geared for binary classification, would be viable.

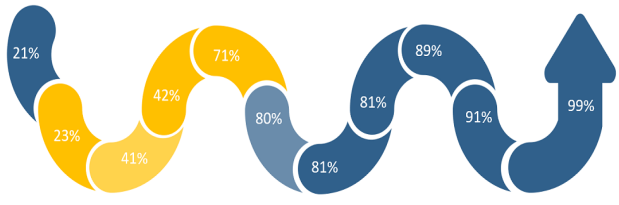
Objectives

- Determine if a simple three-layer neural network could make predictions with accuracy of 51% or better.
- To determine if a neural network with a focus on binary classification layers would improve prediction accuracy for the task.

Accuracy Results of Models



MULTICLASS: ELEVEN CLASSES



LONG VS SHORT

Multi-class model

```
def get_basic_model():
    model = tf.keras.Sequential([
    normalizer,
    tf.keras.layers.Dense(128, activation='relu'),
    tf.keras.layers.Dense(128, activation='relu'),
    tf.keras.layers.Dense(64, activation='relu'),
    tf.keras.layers.Dense(2, activation='relu' )
  ])
    model.compile(loss='binary_crossentropy', optimizer='rmsprop', metri
cs=['accuracy'])
    return model
```

Binary model

```
# define model to tackle this single-label, binary classification problem
model = Sequential()
model.add(Dense(128, input_dim = X_train.shape[1] , activation = 'relu'))
model.add(Dense(128, activation = 'relu'))
model.add(Dense(128, activation = 'relu'))
model.add(Dense(128, activation = 'relu'))
model.add(Dense(11, activation='softmax'))

model.summary()
model.compile(loss='categorical_crossentropy', optimizer='rmsprop', metrics=['accuracy'])
```

Conclusion

Both simple models failed. More robust with more dense layer, and possibly hidden layers, should be used to continue the endeavor to find a model with better than 50/50 prediction capability

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