**Results:**

Dataset used: Balance scale dataset -

<http://archive.ics.uci.edu/ml/datasets/balance+scale> from UCI Repository for experimenting with different classifiers.

Evaluation Metric used: ‘Precision’, ‘Accuracy’

Number of instances in dataset: 625  
Number of attributes in dataset: 4  
How many fold cross-validation performed: 10

age7image14600

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| --- | --- | --- | --- |
| age7image15144age7image15728Classifier | Best Parameters Used | age7image17824age7image18144Accuracy | age7image19368Precision |
| age7image20632age7image20952Decision Tree | criterion="entropy",  splitter="best",  max\_depth=40,  min\_samples\_split=3,  min\_samples\_leaf=5,  min\_weight\_fraction\_leaf=0.,  max\_features=None,  random\_state=None,  max\_leaf\_nodes=None,  min\_impurity\_decrease=0.,  min\_impurity\_split=None,  class\_weight=None,  presort=False | age7image22336age7image226560.774731 | age7image234240.773118 |
| age7image23920age7image24240Perceptron | penalty='l1',  alpha=0.0002,  fit\_intercept=True,  max\_iter=1500,  tol=0.0,  shuffle=False,  verbose=0,  eta0=1.0,  n\_jobs=1,  random\_state=None,  class\_weight=None,  warm\_start=False,  n\_iter=None | age7image26296age7image26616age7image27096age7image274160.857783 | age7image27880age7image28360  0.857783 |
| Neural Net | hidden\_layer\_sizes=(8,3),  activation="logistic",  solver='lbfgs',  alpha=1e-5,  batch\_size='auto',  learning\_rate="constant",  learning\_rate\_init=0.004,  power\_t=0.5,  max\_iter=1000,  shuffle=True,  random\_state=None,  tol=1e-4,  verbose=False,  warm\_start=False,  momentum=0.9,  nesterovs\_momentum=True,  early\_stopping=False,  validation\_fraction=0.1,  beta\_1=0.9, beta\_2=0.999,  epsilon=1e-8 | 0.956810 | 0.956836 |
| Deep Learning | hidden\_layer\_sizes=(10,10,10),  activation="relu",  solver='lbfgs',  alpha=1e-5,  batch\_size='auto',  learning\_rate="constant",  learning\_rate\_init=0.004,  power\_t=0.5,  max\_iter=1000,  shuffle=True,  random\_state=None,  tol=1e-4,  verbose=False,  warm\_start=False,  momentum=0.9,  nesterovs\_momentum=True,  early\_stopping=False,  validation\_fraction=0.1,  beta\_1=0.9, beta\_2=0.999,  epsilon=1e-8 | 0.963262 | 0.961598 |
| SVM | C=1.0,  kernel='sigmoid',  degree=2,  gamma='auto',  coef0=0.0,  shrinking=True,  probability=False,  tol=1e-3,  cache\_size=200,  class\_weight=None,  verbose=False,  max\_iter=-1,  decision\_function\_shape='ovo',  random\_state=None | 0.881644 | 0.881644 |
| Naïve Bayes | priors=None | 0.878469 | 0.878469 |
| Logistic Regression | penalty='l2',  dual=False,  tol=1e-4,  C=1.0,  fit\_intercept=True,  intercept\_scaling=1,  class\_weight=None,  random\_state=None,  solver='newton-cg',  max\_iter=200,  multi\_class='multinomial',  verbose=0,  warm\_start=False,  n\_jobs=1 | 0.856068 | 0.856068 |
| k-Nearest Neighbor | n\_neighbors=5,  weights='distance',  algorithm='auto',  leaf\_size=30,  p=1,  metric='minkowski',  metric\_params=None,  n\_jobs=1 | 0.854736 | 0.854736 |
| Bagging | base\_estimator=None,  n\_estimators=14,  max\_samples=1.0,  max\_features=1.0,  bootstrap=True,  bootstrap\_features=False,  oob\_score=False,  warm\_start=False,  n\_jobs=1,  random\_state=None,  verbose=0 | 0.803431 | 0.793932 |
| Random Forests | n\_estimators=10,  criterion="entropy",  max\_depth=10,  min\_samples\_split=4,  min\_samples\_leaf=1,  min\_weight\_fraction\_leaf=0.,  max\_features="auto",  max\_leaf\_nodes=None,  min\_impurity\_decrease=0.,  min\_impurity\_split=None,  bootstrap=True,  oob\_score=False,n\_jobs=1,  random\_state=None,  verbose=0,  warm\_start=False,  class\_weight=None | 0.838582 | 0.792243 |
| AdaBoost | base\_estimator=None,  n\_estimators=50,  learning\_rate=2.,  algorithm='SAMME',  random\_state=None | 0.836815 | 0.852944 |
| Gradient Boosting | loss='deviance',  learning\_rate=0.2,  n\_estimators=100,  subsample=1.0,  criterion='friedman\_mse',  min\_samples\_split=2,  min\_samples\_leaf=1,  min\_weight\_fraction\_leaf=0.,  max\_depth=2,  min\_impurity\_decrease=0.,  min\_impurity\_split=None, init=None,  random\_state=None,  max\_features=None,  verbose=0,  max\_leaf\_nodes=None,  warm\_start=False,  presort='auto' | 0.892960 | 0.892960 |

**Analysis:**

1. For the balance scale dataset, Neural Net and Deep Learning give the best accuracy.

2. Most of the classifiers performed quite well but compared to the others decision tree was a weak classifier.

* This is because a decision tree throws away the input features that it doesn't find useful, whereas a neural net or deep learning will use them all. Moreover, neural nets and deep learning can model more arbitrary functions and therefore may be more accurate.