svm example 1

July 12, 2022

[ ]:
```
import numpy as np
from mlxtend.plotting import plot_decision_regions
import matplotlib.pyplot as plt
```

[ ]:
```
from sklearn.datasets import load_iris

iris = load_iris()
# data with no heading info - sw, sl, pw, pl, target
iris
```

[ ]:
```
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dataset\n--------------------\n\n**Data Set Characteristics:**\n\n    :Number of
Instances: 150 (50 in each of three classes)\n    :Number of Attributes: 4
numeric, predictive attributes and the class\n    :Attribute Information:\n
- sepal length in cm\n        - sepal width in cm\n        - petal length in
cm\n        - petal width in cm\n        - class:\n                - Iris-
Setosa\n                - Iris-Versicolour\n                - Iris-Virginica\n
\n    :Summary Statistics:\n\n    ============== ==== ==== ======= =====
====================\n                    Min  Max   Mean    SD   Class
```

```
Correlation\n    ============== ==== ==== ======= ===== ====================\n
sepal length:   4.3  7.9   5.84   0.83    0.7826\n    sepal width:    2.0  4.4
3.05   0.43   -0.4194\n    petal length:   1.0  6.9   3.76   1.76    0.9490
(high!)\n    petal width:    0.1  2.5   1.20   0.76    0.9565  (high!)\n
============== ==== ==== ======= ===== ====================\n\n    :Missing
Attribute Values: None\n    :Class Distribution: 33.3% for each of 3 classes.\n
:Creator: R.A. Fisher\n    :Donor: Michael Marshall
(MARSHALL%PLU@io.arc.nasa.gov)\n    :Date: July, 1988\n\nThe famous Iris
database, first used by Sir R.A. Fisher. The dataset is taken\nfrom Fisher\'s
paper. Note that it\'s the same as in R, but not as in the UCI\nMachine Learning
Repository, which has two wrong data points.\n\nThis is perhaps the best known
database to be found in the\npattern recognition literature.  Fisher\'s paper is
a classic in the field and\nis referenced frequently to this day.  (See Duda &
Hart, for example.)  The\ndata set contains 3 classes of 50 instances each,
where each class refers to a\ntype of iris plant.  One class is linearly
separable from the other 2; the\nlatter are NOT linearly separable from each
other.\n\n.. topic:: References\n\n   - Fisher, R.A. "The use of multiple
measurements in taxonomic problems"\n     Annual Eugenics, 7, Part II, 179-188
(1936); also in "Contributions to\n     Mathematical Statistics" (John Wiley,
NY, 1950).\n   - Duda, R.O., & Hart, P.E. (1973) Pattern Classification and
Scene Analysis.\n     (Q327.D83) John Wiley & Sons.  ISBN 0-471-22361-1.  See
page 218.\n   - Dasarathy, B.V. (1980) "Nosing Around the Neighborhood: A New
System\n     Structure and Classification Rule for Recognition in Partially
Exposed\n     Environments".  IEEE Transactions on Pattern Analysis and
Machine\n     Intelligence, Vol. PAMI-2, No. 1, 67-71.\n   - Gates, G.W. (1972)
"The Reduced Nearest Neighbor Rule".  IEEE Transactions\n     on Information
Theory, May 1972, 431-433.\n   - See also: 1988 MLC Proceedings, 54-64.
Cheeseman et al"s AUTOCLASS II\n     conceptual clustering system finds 3
classes in the data.\n   - Many, many more …',
 'feature_names': ['sepal length (cm)',
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 'data_module': 'sklearn.datasets.data'}
```
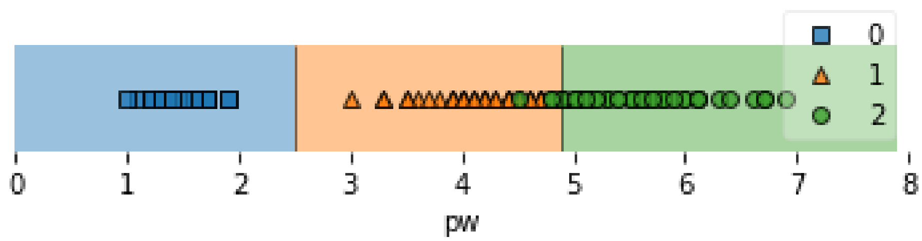

1 Linear SVM: One feature (petal width)

[ ]:
```
X = iris.data[:, 2]
X = X[:, None]
y = iris.target
```

[ ]:
```
from sklearn.svm import SVC

svm = SVC(kernel = 'linear', C = 0.5)
svm.fit(X, y)
```

```
# drawing decision regions
plot_decision_regions(X, y, clf = svm, legend = 'lower right')
plt.xlabel('pw')
plt.ylim(-1, 10)
plt.xlim(0, 8)
plt.show()
```

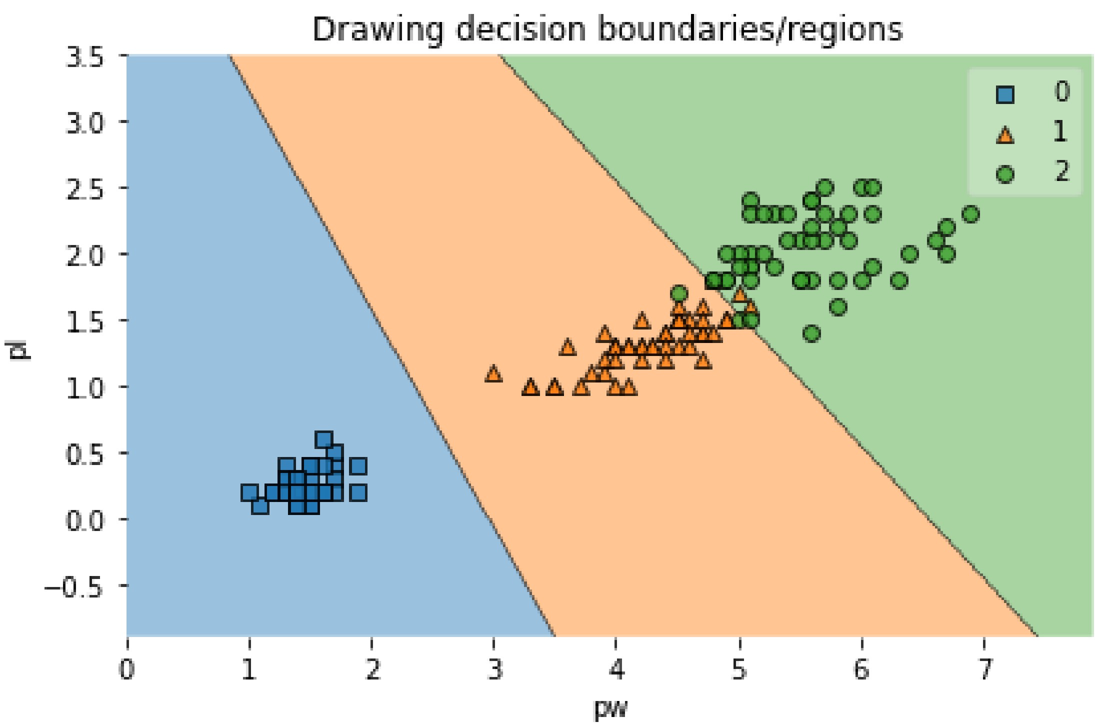


2 2D SVM: Two features (petal width and petal length)

[ ]:
```
from sklearn.datasets import load_iris

iris = load_iris()

XX = iris.data[:, [2, 3]]
yy = iris.target
```

[ ]:
```
from sklearn.svm import SVC

svm = SVC(kernel = 'linear', C = 0.5)
svm.fit(XX, yy)

# drawing decision regions
```

```python
plot_decision_regions(XX, yy, clf = svm, legend = 'upper right')

# 0 = Setosa
# 1 = Veriscolour
# 2 = Virginica

plt.xlabel('pw')
plt.ylabel('pl')
plt.title('Drawing decision boundaries/regions')
plt.tight_layout()
plt.show()
```



[ ]: