TP2 - SDN

March 3, 2022

1 TP2

2 Prétraitement et visualisation de données

2.1 A- Normalisation de données

Le package sklearn.preprocessing offre plusieurs fonctions pour la transformations de données, i.e. changer les caractéristiques initiales de données en une représentation qui est plus approprié pour le traitement de ces données.Ce traitement est souvent nécessaire pour les données en grande dimension. La normalisation de données est une étape importante dans le processus de traitement de données. Par exemple, de nombreux éléments utilisés dans la fonction objective d'un algorithme d'apprentissage (tels que le noyau RBF de Support Vector Machines ou la L1 et L2 régularisé des modèles linéaires) supposent que toutes les variables sont centrées autour de zéro et ont la variance dans le même ordre. Si une caractéristique a une variance qui est des ordres de grandeur plus grand que les autres, il pourrait dominer la fonction objectif et de faire l'estimateur incapable d'apprendre correctement comme prévu. En pratique, nous ignorons souvent la forme de la distribution de données eton simplement transformeles données en les centrenten retirant la valeur moyenne de chaque variable, puis en divisant les variables par leur écart--type.

```python
[80]: from numpy import *
      import sklearn.preprocessing as sp
      from sklearn import * #besoin pour Iris
```

```python
[183]: A = array([(1,-1,2),(2,0,0),(0,1,-1)])
       print(A) #On a un problème quand on essaie de faire print(A.data) : donc on
        ↪garde avec array pour l'instant
```

```
[[ 1 -1  2]
 [ 2  0  0]
 [ 0  1 -1]]
```

```python
[294]: print(numpy.average(A))
```

```
0.4444444444444444
```

```python
[185]: V = var(A)
       print(V)
```

```
1.1358024691358024
```

[186]:
```
X_N = sp.scale(A)
print(X_N)
```

```
[[ 0.         -1.22474487  1.33630621]
 [ 1.22474487  0.         -0.26726124]
 [-1.22474487  1.22474487 -1.06904497]]
```

[187]:
```
print(mean(X_N))
print(var(X_N))
```

```
4.9343245538895844e-17
1.0
```

La moyenne est plus proche de zéro et la variance est égale à un parce qu'on a normalisé la matrice.

2.2   B- Normalisation MinMax

Un autretype de normalisation est de normaliser les caractéristiques (variables) de données entre un minimum et une valeur maximale donnée, souvent entre zéro et un. Ceci peut être réalisé en utilisant la fonction MinMaxScaler.

[189]:
```
X2 = array([(1,-1,2),(2,0,0),(0,1,-1)])
print(X2)
```

```
[[ 1 -1  2]
 [ 2  0  0]
 [ 0  1 -1]]
```

[190]:
```
print(mean(X2))
```

```
0.4444444444444444
```

[250]:
```
X3=sp.minmax_scale(X2)
print(X3)
```

```
[[0.5        0.         1.        ]
 [1.         0.5        0.33333333]
 [0.         1.         0.        ]]
```
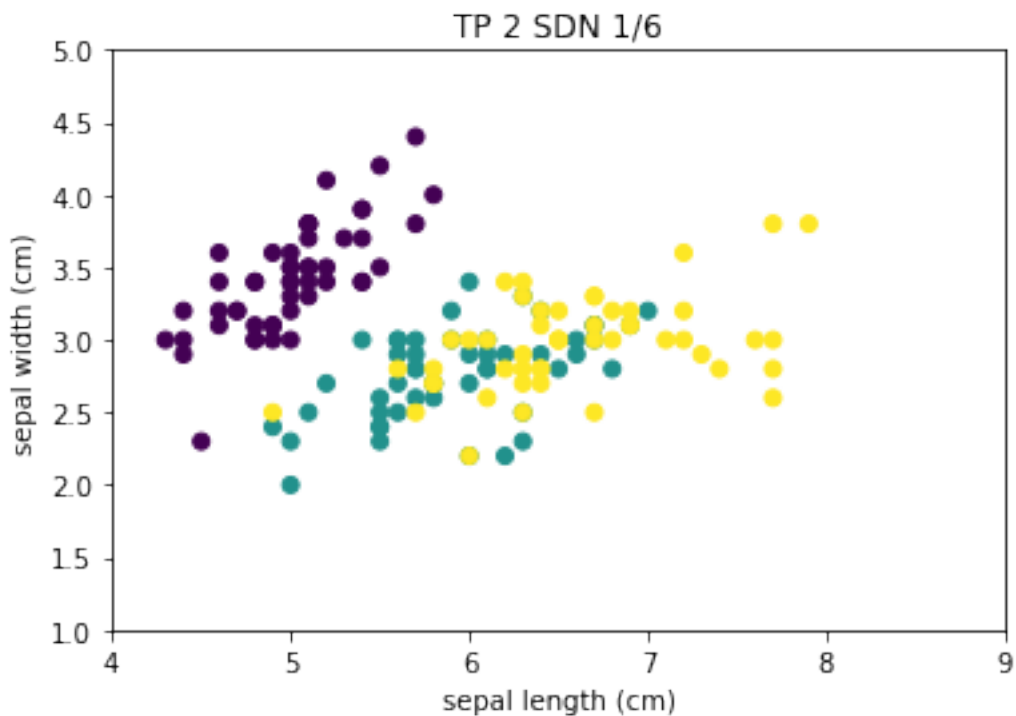
[251]:
```
print(mean(X3))
```

```
0.48148148148148145
```

Cette fois-ci, la moyenne se rapproche de la moyenne initiale de la matrice (0.4444444).

2.3 C- Visualisation de données

```
[159]: iris = datasets.load_iris()
```

```
[149]: F = figure()
       scatter (iris.data[:,0], iris.data[:,1], c=iris.target)
       title("TP 2 SDN 1/6")
       xlim ([4,9])
       ylim ([1,5])
       xlabel("sepal length (cm)")
       ylabel("sepal width (cm)")
       show()
```
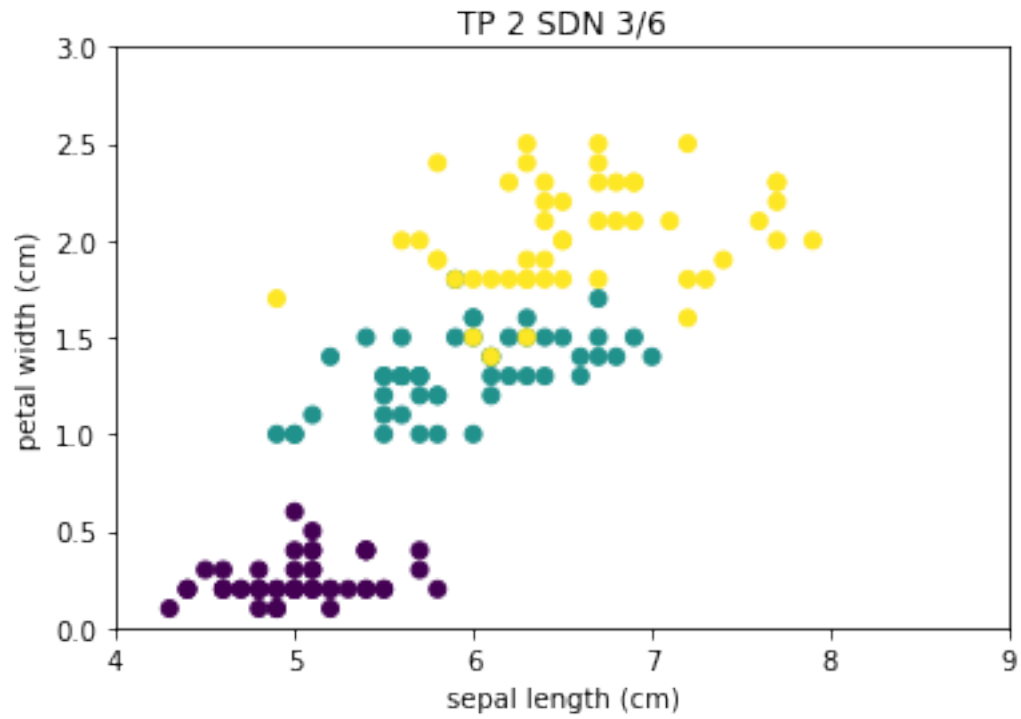


```
[150]: F = figure()
       scatter (iris.data[:,0], iris.data[:,2], c=iris.target)
       title("TP 2 SDN 2/6")
       xlim ([4,9])
       ylim ([0,8])
       xlabel("sepal length (cm)")
       ylabel("petal length (cm)")
       show()
```
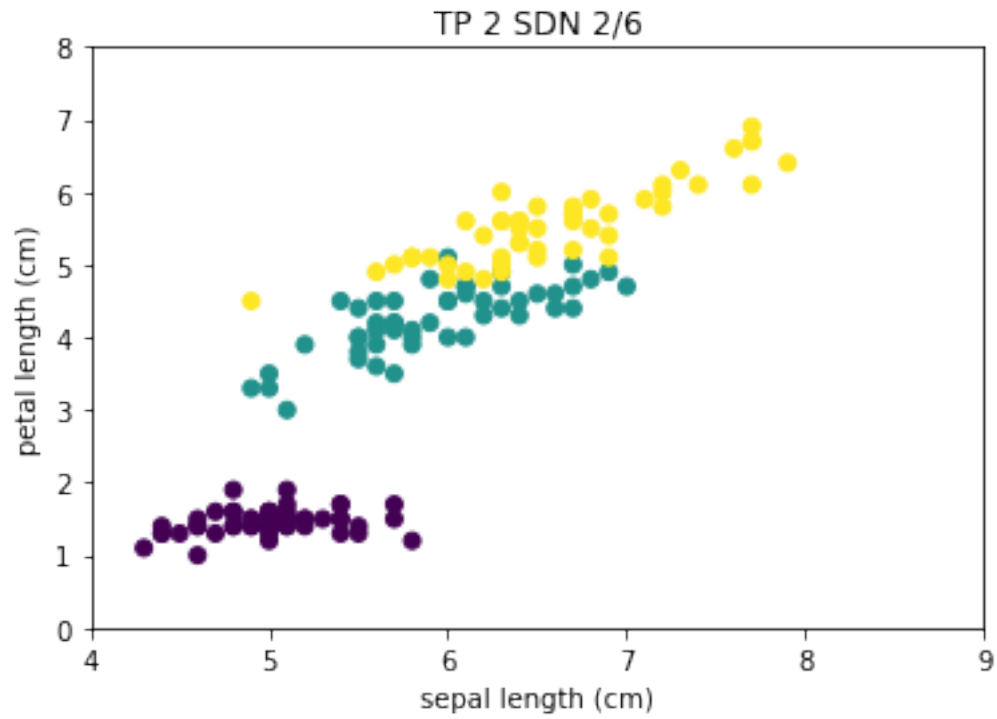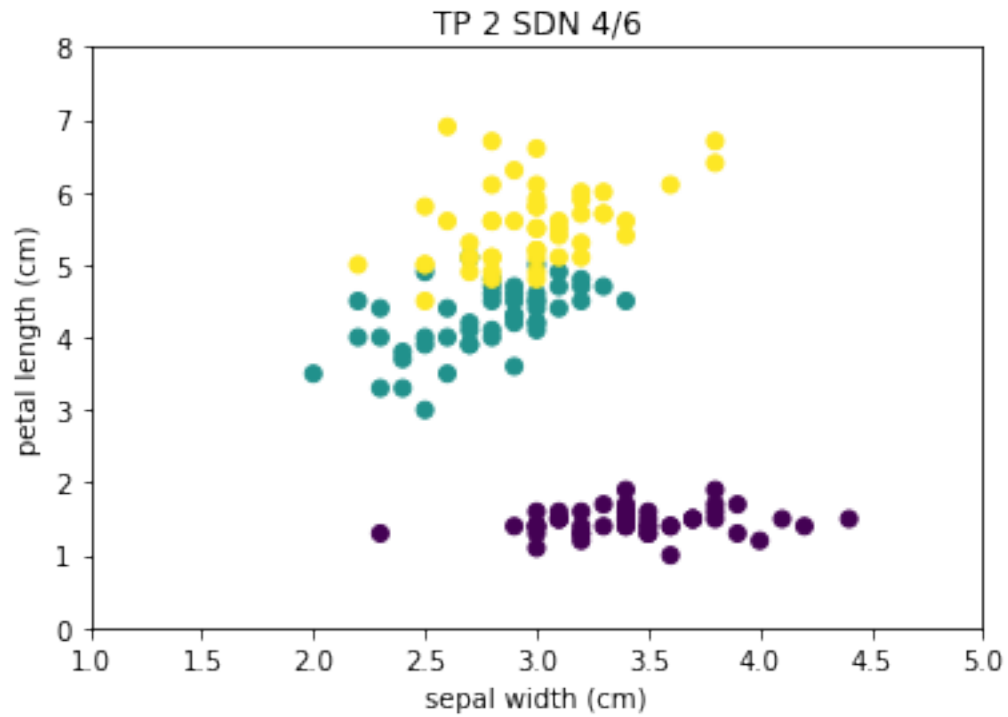
TP 2 SDN 2/6
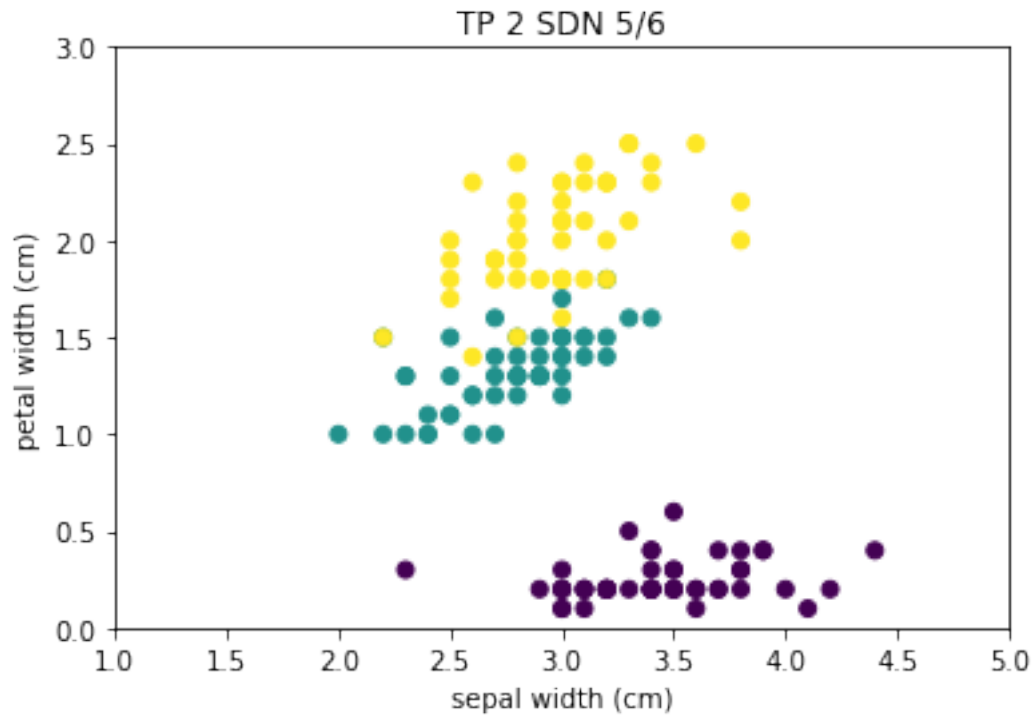
```
[151]: F = figure()
       scatter (iris.data[:,0], iris.data[:,3], c=iris.target)
       title("TP 2 SDN 3/6")
       xlim ([4,9])
       ylim ([0,3])
       xlabel("sepal length (cm)")
       ylabel("petal width (cm)")
       show()
```

TP 2 SDN 3/6

```
[152]: F = figure()
       scatter (iris.data[:,1], iris.data[:,2], c=iris.target)
       title("TP 2 SDN 4/6")
       xlim ([1,5])
       ylim ([0,8])
       xlabel("sepal width (cm)")
       ylabel("petal length (cm)")
       show()
```

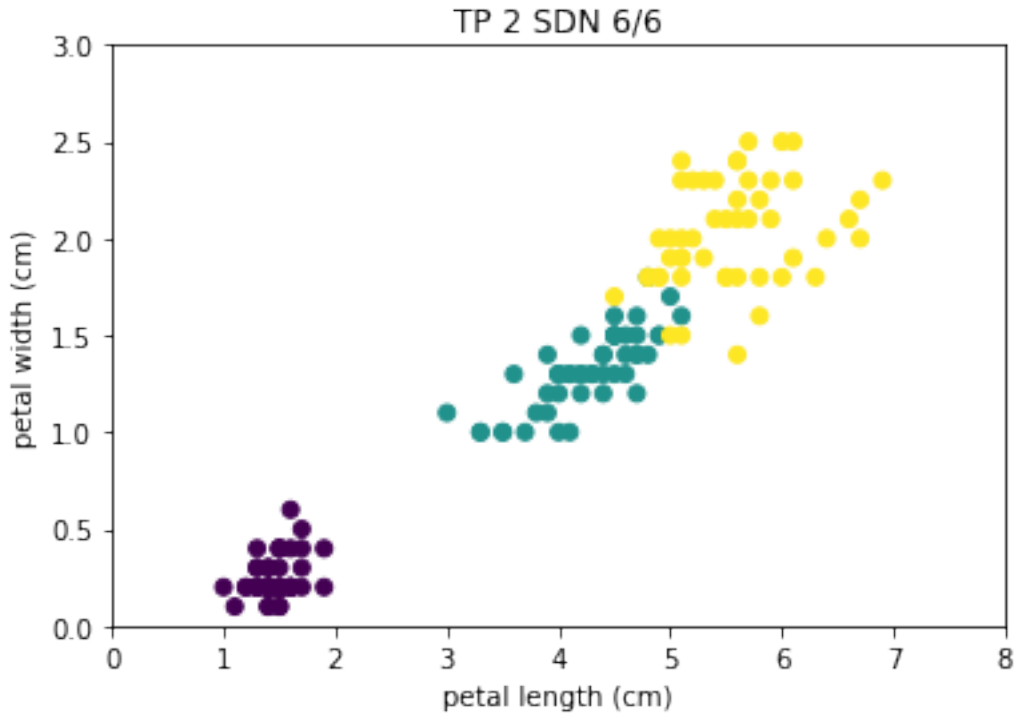## TP 2 SDN 4/6


```
[153]:  F = figure()
        scatter (iris.data[:,1], iris.data[:,3], c=iris.target)
        title("TP 2 SDN 5/6")
        xlim ([1,5])
        ylim ([0,3])
        xlabel("sepal width (cm)")
        ylabel("petal width (cm)")
        show()
```

TP 2 SDN 5/6

```
[155]: F = figure()
scatter (iris.data[:,2], iris.data[:,3], c=iris.target)
title("TP 2 SDN 6/6")
xlim ([0,8])
ylim ([0,3])
xlabel("petal length (cm)")
ylabel("petal width (cm)")
show()
```

Le meilleure visualisation est probablement le dernier graphe où on reconnait le mieux les différents espèces d'iris grâce aux nuages de points de différentes couleurs : Donc c'est plutôt les deux différentes variables (longueur et largeur des pétales) qu'il faut plutôt prendre en compte si on veut faire une visualisation.

2.4 D- Réduction de dimensions et visualisation de données

L'Analyse en Composantes Principales (ACP) a comme objectif d'identifier la combinaison d'attributs (composants principaux, ou les directions dans l'espace de caractéristique), qui représentent le plus la variance dans les données. L'Analyse discriminante linéaire (ADL) tente d'identifier les attributs qui représentent le plus la variance entre les classes. En particulier, l'ADL, contrairement à l'APC, est un procédé supervisé en utilisant les étiquettes de classe connus.

```
[216]: from sklearn.decomposition import PCA
       from sklearn.discriminant_analysis import LinearDiscriminantAnalysis as LDA
```

```
[262]: pca = PCA(n_components=4)
       IrisPCA = pca.fit(iris.data).transform(iris.data)
       print(IrisPCA)
```

```
[[-2.68412563e+00  3.19397247e-01 -2.79148276e-02 -2.26243707e-03]
 [-2.71414169e+00 -1.77001225e-01 -2.10464272e-01 -9.90265503e-02]
 [-2.88899057e+00 -1.44949426e-01  1.79002563e-02 -1.99683897e-02]
 [-2.74534286e+00 -3.18298979e-01  3.15593736e-02  7.55758166e-02]
 [-2.72871654e+00  3.26754513e-01  9.00792406e-02  6.12585926e-02]
 [-2.28085963e+00  7.41330449e-01  1.68677658e-01  2.42008576e-02]
```

```
[-2.82053775e+00 -8.94613845e-02  2.57892158e-01  4.81431065e-02]
[-2.62614497e+00  1.63384960e-01 -2.18793179e-02  4.52978706e-02]
[-2.88638273e+00 -5.78311754e-01  2.07595703e-02  2.67447358e-02]
[-2.67275580e+00 -1.13774246e-01 -1.97632725e-01  5.62954013e-02]
[-2.50694709e+00  6.45068899e-01 -7.53180094e-02  1.50199245e-02]
[-2.61275523e+00  1.47299392e-02  1.02150260e-01  1.56379208e-01]
[-2.78610927e+00 -2.35112000e-01 -2.06844430e-01  7.88791149e-03]
[-3.22380374e+00 -5.11394587e-01  6.12996725e-02  2.16798118e-02]
[-2.64475039e+00  1.17876464e+00 -1.51627524e-01 -1.59209718e-01]
[-2.38603903e+00  1.33806233e+00  2.77776903e-01 -6.55154587e-03]
[-2.62352788e+00  8.10679514e-01  1.38183228e-01 -1.67734737e-01]
[-2.64829671e+00  3.11849145e-01  2.66683156e-02 -7.76281796e-02]
[-2.19982032e+00  8.72839039e-01 -1.20305523e-01 -2.70518681e-02]
[-2.58798640e+00  5.13560309e-01  2.13665172e-01  6.62726502e-02]
[-2.31025622e+00  3.91345936e-01 -2.39444043e-01  1.50707908e-02]
[-2.54370523e+00  4.32996063e-01  2.08457232e-01 -4.10654027e-02]
[-3.21593942e+00  1.33468070e-01  2.92396751e-01 -4.48212505e-03]
[-2.30273318e+00  9.87088548e-02  3.91232587e-02 -1.48352589e-01]
[-2.35575405e+00 -3.72818597e-02  1.25021083e-01  3.00330904e-01]
[-2.50666891e+00 -1.46016880e-01 -2.53420042e-01 -3.46074722e-02]
[-2.46882007e+00  1.30951489e-01  9.49105761e-02 -5.74497158e-02]
[-2.56231991e+00  3.67718857e-01 -7.84942051e-02  1.41727423e-02]
[-2.63953472e+00  3.12039980e-01 -1.45908896e-01 -6.57834667e-02]
[-2.63198939e+00 -1.96961225e-01  4.07710791e-02  1.23983306e-01]
[-2.58739848e+00 -2.04318491e-01 -7.72229891e-02  6.04622767e-02]
[-2.40993250e+00  4.10924264e-01 -1.45524972e-01 -2.31628492e-01]
[-2.64886233e+00  8.13363820e-01  2.25669150e-01  2.81372347e-01]
[-2.59873675e+00  1.09314576e+00  1.57810813e-01  9.53488583e-02]
[-2.63692688e+00 -1.21322348e-01 -1.43049582e-01 -1.90703413e-02]
[-2.86624165e+00  6.93644716e-02 -1.64332307e-01 -1.62598446e-01]
[-2.62523805e+00  5.99370021e-01 -2.68350376e-01 -1.76441213e-01]
[-2.80068412e+00  2.68643738e-01  9.36990825e-02  1.68173054e-01]
[-2.98050204e+00 -4.87958344e-01  7.29270457e-02  1.07331474e-02]
[-2.59000631e+00  2.29043837e-01 -8.00823030e-02  1.37491513e-02]
[-2.77010243e+00  2.63527534e-01  7.72476932e-02 -9.40633590e-02]
[-2.84936871e+00 -9.40960574e-01 -3.49230377e-01 -3.19987487e-01]
[-2.99740655e+00 -3.41926057e-01  1.92509212e-01  7.46777682e-02]
[-2.40561449e+00  1.88871429e-01  2.63867946e-01 -1.76208890e-01]
[-2.20948924e+00  4.36663142e-01  2.98742746e-01  1.82842502e-01]
[-2.71445143e+00 -2.50208204e-01 -9.76781440e-02 -1.42843574e-01]
[-2.53814826e+00  5.03771144e-01  1.66705637e-01  1.89622291e-01]
[-2.83946217e+00 -2.27945569e-01  8.37268490e-02  5.95642283e-02]
[-2.54308575e+00  5.79410022e-01 -1.71150242e-02  4.65686438e-02]
[-2.70335978e+00  1.07706082e-01 -8.92940085e-02 -3.46583385e-02]
[ 1.28482569e+00  6.85160470e-01 -4.06568025e-01 -1.85252879e-02]
[ 9.32488532e-01  3.18333638e-01 -1.80141866e-02 -5.66512106e-04]
[ 1.46430232e+00  5.04262815e-01 -3.38325765e-01  1.65317587e-03]
[ 1.83317720e-01 -8.27959012e-01 -1.79591392e-01 -9.35668402e-02]
```

```
[ 1.08810326e+00  7.45906752e-02 -3.07757896e-01 -1.12020574e-01]
[ 6.41669084e-01 -4.18246872e-01  4.10760908e-02  2.43116767e-01]
[ 1.09506066e+00  2.83468270e-01  1.69810240e-01  8.35565724e-02]
[-7.49122670e-01 -1.00489096e+00  1.23029192e-02  1.79077226e-02]
[ 1.04413183e+00  2.28361900e-01 -4.15336085e-01  3.91345020e-02]
[-8.74540408e-03 -7.23081905e-01  2.81141431e-01  5.61891788e-03]
[-5.07840884e-01 -1.26597119e+00 -2.69817183e-01 -4.55624408e-02]
[ 5.11698557e-01 -1.03981235e-01  1.30547750e-01 -5.07192325e-02]
[ 2.64976508e-01 -5.50036464e-01 -6.94146830e-01 -5.71855195e-02]
[ 9.84934510e-01 -1.24817854e-01 -6.21144083e-02  1.69496255e-01]
[-1.73925372e-01 -2.54854209e-01  9.04576907e-02 -1.25217292e-01]
[ 9.27860781e-01  4.67179494e-01 -3.14620976e-01 -9.98031365e-02]
[ 6.60283762e-01 -3.52969666e-01  3.28027528e-01  1.87878621e-01]
[ 2.36104993e-01 -3.33610767e-01 -2.71161837e-01  2.13757370e-01]
[ 9.44733728e-01 -5.43145551e-01 -4.99519046e-01 -2.57192177e-01]
[ 4.52269763e-02 -5.83834377e-01 -2.35002105e-01  4.15766476e-02]
[ 1.11628318e+00 -8.46168522e-02  4.59620991e-01  7.50315529e-02]
[ 3.57888418e-01 -6.89250317e-02 -2.29853888e-01 -1.22997604e-01]
[ 1.29818388e+00 -3.27787308e-01 -3.47854352e-01 -8.88370584e-04]
[ 9.21728922e-01 -1.82737794e-01 -2.31071778e-01  2.88255429e-01]
[ 7.14853326e-01  1.49055944e-01 -3.21800937e-01 -4.17197556e-02]
[ 9.00174373e-01  3.28504474e-01 -3.16209074e-01 -1.00226728e-01]
[ 1.33202444e+00  2.44440876e-01 -5.21702780e-01 -3.53331921e-02]
[ 1.55780216e+00  2.67495447e-01 -1.64920984e-01 -6.99692823e-02]
[ 8.13290650e-01 -1.63350301e-01  3.54245048e-02  2.97114340e-02]
[-3.05583778e-01 -3.68262190e-01 -3.18491581e-01 -7.45696136e-02]
[-6.81264921e-02 -7.05172132e-01 -2.44213810e-01 -6.83084222e-03]
[-1.89622472e-01 -6.80286764e-01 -3.06420561e-01  2.05510016e-02]
[ 1.36428712e-01 -3.14032438e-01 -1.77242766e-01 -3.29419128e-02]
[ 1.38002644e+00 -4.20954287e-01  1.61671275e-02  1.78304463e-01]
[ 5.88006443e-01 -4.84287420e-01  4.44433499e-01  2.50976060e-01]
[ 8.06858313e-01  1.94182315e-01  3.88963063e-01  1.14207243e-01]
[ 1.22069088e+00  4.07619594e-01 -2.37167010e-01 -3.12171829e-02]
[ 8.15095236e-01 -3.72037060e-01 -6.14720843e-01 -1.54021000e-01]
[ 2.45957680e-01 -2.68524397e-01  1.88366812e-01  1.46674512e-01]
[ 1.66413217e-01 -6.81926725e-01 -6.00092259e-02 -2.96222195e-02]
[ 4.64800288e-01 -6.70711545e-01 -2.43068557e-02  2.69651428e-01]
[ 8.90815198e-01 -3.44644444e-02 -9.94693289e-03  1.53484666e-01]
[ 2.30548024e-01 -4.04385848e-01 -2.29410241e-01 -1.69303245e-02]
[-7.04531759e-01 -1.01224823e+00 -1.05691149e-01 -4.56133071e-02]
[ 3.56981495e-01 -5.04910093e-01  1.66171702e-02  9.87414793e-02]
[ 3.31934480e-01 -2.12654684e-01  8.32042909e-02  2.38475434e-01]
[ 3.76215651e-01 -2.93218929e-01  7.79963511e-02  1.31137381e-01]
[ 6.42576008e-01  1.77381901e-02 -2.05394967e-01  2.13776830e-02]
[-9.06469865e-01 -7.56093367e-01 -1.25996476e-02 -2.32534844e-01]
[ 2.99000842e-01 -3.48897806e-01  1.05816605e-02  5.11811717e-02]
[ 2.53119273e+00 -9.84910950e-03  7.60165427e-01  2.90555728e-02]
[ 1.41523588e+00 -5.74916348e-01  2.96322527e-01  1.53046739e-02]
```

```
[ 2.61667602e+00  3.43903151e-01 -1.10787883e-01 -6.57720412e-02]
[ 1.97153105e+00 -1.79727904e-01  1.08424662e-01  2.36790934e-01]
[ 2.35000592e+00 -4.02609471e-02  2.85389563e-01  1.70633278e-04]
[ 3.39703874e+00  5.50836673e-01 -3.48437556e-01  1.12371653e-01]
[ 5.21232244e-01 -1.19275873e+00  5.45659296e-01  9.81266196e-02]
[ 2.93258707e+00  3.55500003e-01 -4.20239936e-01  2.57191032e-01]
[ 2.32122882e+00 -2.43831502e-01 -3.48304395e-01  7.86746130e-02]
[ 2.91675097e+00  7.82791949e-01  4.23335418e-01 -1.10982071e-01]
[ 1.66177415e+00  2.42228408e-01  2.42440190e-01 -1.21040552e-01]
[ 1.80340195e+00 -2.15637617e-01 -3.76481682e-02 -7.80198444e-02]
[ 2.16559180e+00  2.16275585e-01  3.33266418e-02 -1.63061478e-01]
[ 1.34616358e+00 -7.76818347e-01  2.81902882e-01 -1.40440869e-01]
[ 1.58592822e+00 -5.39640714e-01  6.29029326e-01 -3.29551728e-01]
[ 1.90445637e+00  1.19250692e-01  4.79639820e-01 -2.19621263e-01]
[ 1.94968906e+00  4.19432597e-02  4.41861676e-02  1.57681907e-01]
[ 3.48705536e+00  1.17573933e+00  1.33894874e-01  3.09219573e-01]
[ 3.79564542e+00  2.57322973e-01 -5.13767764e-01 -5.38460965e-02]
[ 1.30079171e+00 -7.61149636e-01 -3.44995038e-01  4.58247549e-02]
[ 2.42781791e+00  3.78196013e-01  2.19119324e-01 -1.85429264e-01]
[ 1.19900111e+00 -6.06091528e-01  5.11855509e-01 -6.09591171e-02]
[ 3.49992004e+00  4.60674099e-01 -5.73182243e-01  1.40227954e-01]
[ 1.38876613e+00 -2.04399327e-01 -6.45227566e-02 -1.63040977e-01]
[ 2.27543050e+00  3.34990606e-01  2.86150091e-01  6.03719696e-02]
[ 2.61409047e+00  5.60901355e-01 -2.05534524e-01  2.40704986e-01]
[ 1.25850816e+00 -1.79704795e-01  4.58477039e-02 -1.47503846e-01]
[ 1.29113206e+00 -1.16668651e-01  2.31256463e-01 -4.02660775e-03]
[ 2.12360872e+00 -2.09729477e-01  1.54180024e-01 -5.28273230e-02]
[ 2.38800302e+00  4.64639805e-01 -4.49530192e-01  2.31524053e-01]
[ 2.84167278e+00  3.75269167e-01 -4.98898076e-01  2.23364626e-02]
[ 3.23067366e+00  1.37416509e+00 -1.14548205e-01  2.52901923e-01]
[ 2.15943764e+00 -2.17277579e-01  2.08763167e-01 -1.28193066e-01]
[ 1.44416124e+00 -1.43413410e-01 -1.53233888e-01  1.90996358e-01]
[ 1.78129481e+00 -4.99901681e-01 -1.72875189e-01  5.05434412e-01]
[ 3.07649993e+00  6.88085678e-01 -3.35592292e-01 -3.09828045e-01]
[ 2.14424331e+00  1.40064201e-01  7.34878937e-01 -5.55419691e-02]
[ 1.90509815e+00  4.93005260e-02  1.62180236e-01  2.21202937e-01]
[ 1.16932634e+00 -1.64990262e-01  2.81835840e-01 -2.04617872e-02]
[ 2.10761114e+00  3.72287872e-01  2.72911321e-02 -2.10621786e-01]
[ 2.31415471e+00  1.83651279e-01  3.22693747e-01 -2.77653777e-01]
[ 1.92226780e+00  4.09203467e-01  1.13586596e-01 -5.05304967e-01]
[ 1.41523588e+00 -5.74916348e-01  2.96322527e-01  1.53046739e-02]
[ 2.56301338e+00  2.77862603e-01  2.92569525e-01 -5.79127477e-02]
[ 2.41874618e+00  3.04798198e-01  5.04482664e-01 -2.41091000e-01]
[ 1.94410979e+00  1.87532303e-01  1.77825091e-01 -4.26195940e-01]
[ 1.52716661e+00 -3.75316983e-01 -1.21898172e-01 -2.54367442e-01]
[ 1.76434572e+00  7.88588545e-02  1.30481631e-01 -1.37001274e-01]
[ 1.90094161e+00  1.16627959e-01  7.23251563e-01 -4.45953047e-02]
[ 1.39018886e+00 -2.82660938e-01  3.62909648e-01  1.55038628e-01]]
```

```
[263]: lda = LDA(n_components=2)
       IrisLDA = lda.fit(iris.data, y=iris.target).transform(iris.data)
       print(IrisLDA)
```

```
[[ 8.06179978e+00  3.00420621e-01]
 [ 7.12868772e+00 -7.86660426e-01]
 [ 7.48982797e+00 -2.65384488e-01]
 [ 6.81320057e+00 -6.70631068e-01]
 [ 8.13230933e+00  5.14462530e-01]
 [ 7.70194674e+00  1.46172097e+00]
 [ 7.21261762e+00  3.55836209e-01]
 [ 7.60529355e+00 -1.16338380e-02]
 [ 6.56055159e+00 -1.01516362e+00]
 [ 7.34305989e+00 -9.47319209e-01]
 [ 8.39738652e+00  6.47363392e-01]
 [ 7.21929685e+00 -1.09646389e-01]
 [ 7.32679599e+00 -1.07298943e+00]
 [ 7.57247066e+00 -8.05464137e-01]
 [ 9.84984300e+00  1.58593698e+00]
 [ 9.15823890e+00  2.73759647e+00]
 [ 8.58243141e+00  1.83448945e+00]
 [ 7.78075375e+00  5.84339407e-01]
 [ 8.07835876e+00  9.68580703e-01]
 [ 8.02097451e+00  1.14050366e+00]
 [ 7.49680227e+00 -1.88377220e-01]
 [ 7.58648117e+00  1.20797032e+00]
 [ 8.68104293e+00  8.77590154e-01]
 [ 6.25140358e+00  4.39696367e-01]
 [ 6.55893336e+00 -3.89222752e-01]
 [ 6.77138315e+00 -9.70634453e-01]
 [ 6.82308032e+00  4.63011612e-01]
 [ 7.92461638e+00  2.09638715e-01]
 [ 7.99129024e+00  8.63787128e-02]
 [ 6.82946447e+00 -5.44960851e-01]
 [ 6.75895493e+00 -7.59002759e-01]
 [ 7.37495254e+00  5.65844592e-01]
 [ 9.12634625e+00  1.22443267e+00]
 [ 9.46768199e+00  1.82522635e+00]
 [ 7.06201386e+00 -6.63400423e-01]
 [ 7.95876243e+00 -1.64961722e-01]
 [ 8.61367201e+00  4.03253602e-01]
 [ 8.33041759e+00  2.28133530e-01]
 [ 6.93412007e+00 -7.05519379e-01]
 [ 7.68823131e+00 -9.22362309e-03]
 [ 7.91793715e+00  6.75121313e-01]
 [ 5.66188065e+00 -1.93435524e+00]
 [ 7.24101468e+00 -2.72615132e-01]
```

```
[ 6.41443556e+00  1.24730131e+00]
[ 6.85944381e+00  1.05165396e+00]
[ 6.76470393e+00 -5.05151855e-01]
[ 8.08189937e+00  7.63392750e-01]
[ 7.18676904e+00 -3.60986823e-01]
[ 8.31444876e+00  6.44953177e-01]
[ 7.67196741e+00 -1.34893840e-01]
[-1.45927545e+00  2.85437643e-02]
[-1.79770574e+00  4.84385502e-01]
[-2.41694888e+00 -9.27840307e-02]
[-2.26247349e+00 -1.58725251e+00]
[-2.54867836e+00 -4.72204898e-01]
[-2.42996725e+00 -9.66132066e-01]
[-2.44848456e+00  7.95961954e-01]
[-2.22666513e-01 -1.58467318e+00]
[-1.75020123e+00 -8.21180130e-01]
[-1.95842242e+00 -3.51563753e-01]
[-1.19376031e+00 -2.63445570e+00]
[-1.85892567e+00  3.19006544e-01]
[-1.15809388e+00 -2.64340991e+00]
[-2.66605725e+00 -6.42504540e-01]
[-3.78367218e-01  8.66389312e-02]
[-1.20117255e+00  8.44373592e-02]
[-2.76810246e+00  3.21995363e-02]
[-7.76854039e-01 -1.65916185e+00]
[-3.49805433e+00 -1.68495616e+00]
[-1.09042788e+00 -1.62658350e+00]
[-3.71589615e+00  1.04451442e+00]
[-9.97610366e-01 -4.90530602e-01]
[-3.83525931e+00 -1.40595806e+00]
[-2.25741249e+00 -1.42679423e+00]
[-1.25571326e+00 -5.46424197e-01]
[-1.43755762e+00 -1.34424979e-01]
[-2.45906137e+00 -9.35277280e-01]
[-3.51848495e+00  1.60588866e-01]
[-2.58979871e+00 -1.74611728e-01]
[ 3.07487884e-01 -1.31887146e+00]
[-1.10669179e+00 -1.75225371e+00]
[-6.05524589e-01 -1.94298038e+00]
[-8.98703769e-01 -9.04940034e-01]
[-4.49846635e+00 -8.82749915e-01]
[-2.93397799e+00  2.73791065e-02]
[-2.10360821e+00  1.19156767e+00]
[-2.14258208e+00  8.87797815e-02]
[-2.47945603e+00 -1.94073927e+00]
[-1.32552574e+00 -1.62869550e-01]
[-1.95557887e+00 -1.15434826e+00]
[-2.40157020e+00 -1.59458341e+00]
```

```
[-2.29248878e+00 -3.32860296e-01]
[-1.27227224e+00 -1.21458428e+00]
[-2.93176055e-01 -1.79871509e+00]
[-2.00598883e+00 -9.05418042e-01]
[-1.18166311e+00 -5.37570242e-01]
[-1.61615645e+00 -4.70103580e-01]
[-1.42158879e+00 -5.51244626e-01]
[ 4.75973788e-01 -7.99905482e-01]
[-1.54948259e+00 -5.93363582e-01]
[-7.83947399e+00  2.13973345e+00]
[-5.50747997e+00 -3.58139892e-02]
[-6.29200850e+00  4.67175777e-01]
[-5.60545633e+00 -3.40738058e-01]
[-6.85055995e+00  8.29825394e-01]
[-7.41816784e+00 -1.73117995e-01]
[-4.67799541e+00 -4.99095015e-01]
[-6.31692685e+00 -9.68980756e-01]
[-6.32773684e+00 -1.38328993e+00]
[-6.85281335e+00  2.71758963e+00]
[-4.44072512e+00  1.34723692e+00]
[-5.45009572e+00 -2.07736942e-01]
[-5.66033713e+00  8.32713617e-01]
[-5.95823722e+00 -9.40175447e-02]
[-6.75926282e+00  1.60023206e+00]
[-5.80704331e+00  2.01019882e+00]
[-5.06601233e+00 -2.62733839e-02]
[-6.60881882e+00  1.75163587e+00]
[-9.17147486e+00 -7.48255067e-01]
[-4.76453569e+00 -2.15573720e+00]
[-6.27283915e+00  1.64948141e+00]
[-5.36071189e+00  6.46120732e-01]
[-7.58119982e+00 -9.80722934e-01]
[-4.37150279e+00 -1.21297458e-01]
[-5.72317531e+00  1.29327553e+00]
[-5.27915920e+00 -4.24582377e-02]
[-4.08087208e+00  1.85936572e-01]
[-4.07703640e+00  5.23238483e-01]
[-6.51910397e+00  2.96976389e-01]
[-4.58371942e+00 -8.56815813e-01]
[-6.22824009e+00 -7.12719638e-01]
[-5.22048773e+00  1.46819509e+00]
[-6.80015000e+00  5.80895175e-01]
[-3.81515972e+00 -9.42985932e-01]
[-5.10748966e+00 -2.13059000e+00]
[-6.79671631e+00  8.63090395e-01]
[-6.52449599e+00  2.44503527e+00]
[-4.99550279e+00  1.87768525e-01]
[-3.93985300e+00  6.14020389e-01]
```

```
[-5.20383090e+00  1.14476808e+00]
[-6.65308685e+00  1.80531976e+00]
[-5.10555946e+00  1.99218201e+00]
[-5.50747997e+00 -3.58139892e-02]
[-6.79601924e+00  1.46068695e+00]
[-6.84735943e+00  2.42895067e+00]
[-5.64500346e+00  1.67771734e+00]
[-5.17956460e+00 -3.63475041e-01]
[-4.96774090e+00  8.21140550e-01]
[-5.88614539e+00  2.34509051e+00]
[-4.68315426e+00  3.32033811e-01]]
```

[274]:
```python
F = figure()
scatter (IrisPCA[:,0], IrisPCA[:,1], c=iris.target)
title("TP 2 SDN PCA 1/6")
xlim ([-5,5])
ylim ([-2,2])
xlabel("sepal length (cm)")
ylabel("sepal width (cm)")
show()
```
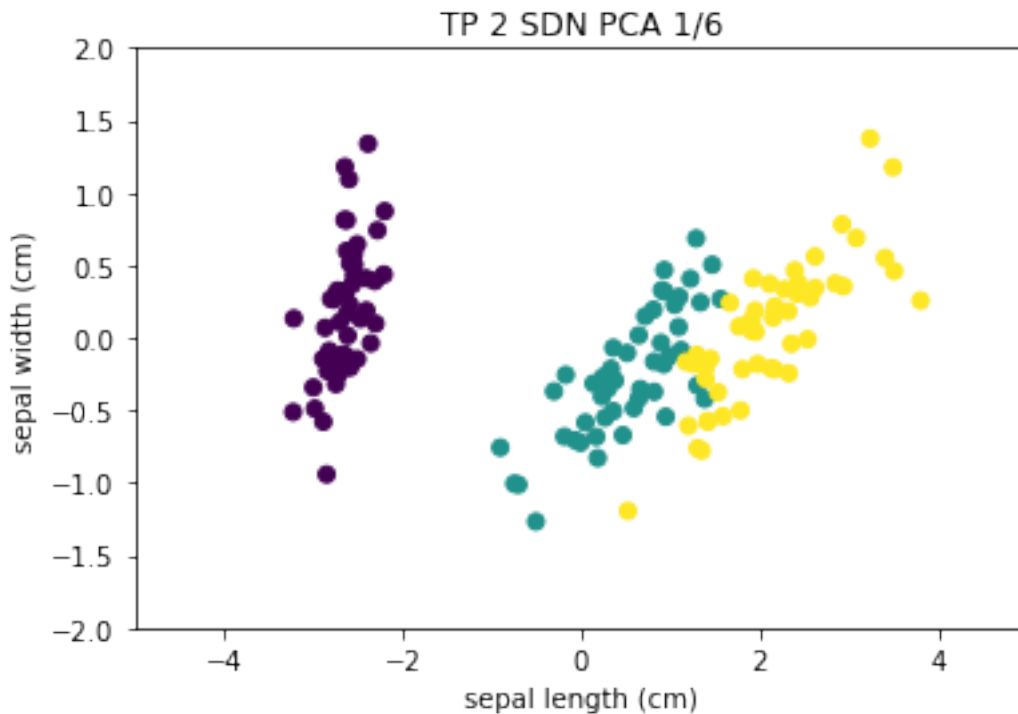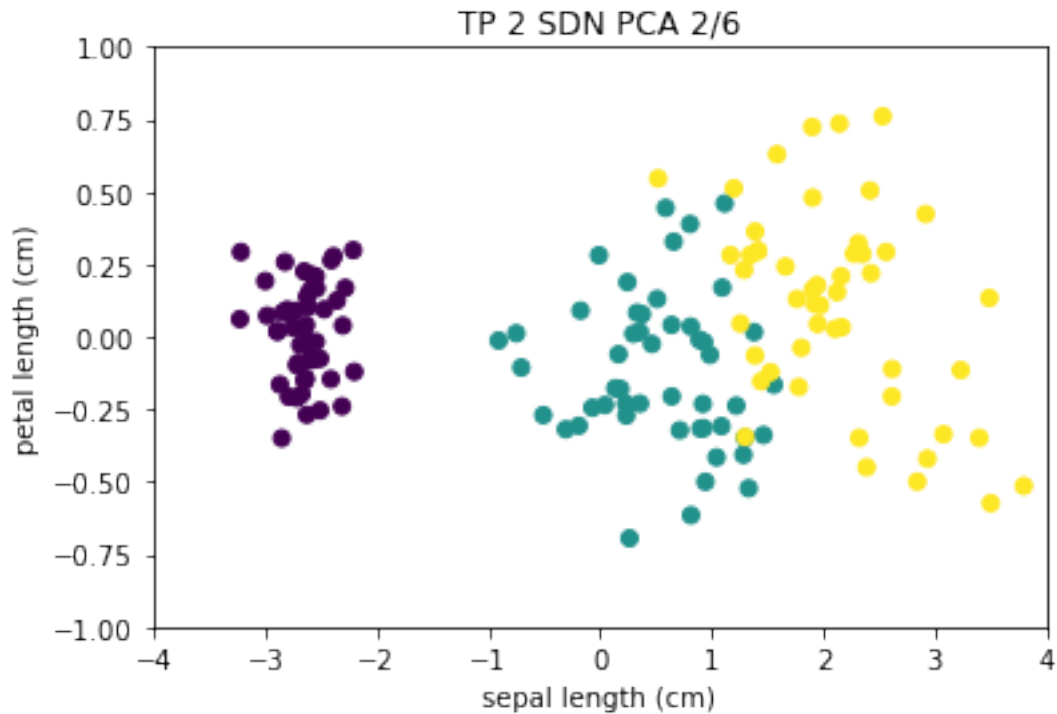

[268]:
```python
F = figure()
scatter (IrisPCA[:,0], IrisPCA[:,2], c=iris.target)
title("TP 2 SDN PCA 2/6")
```

```
xlim ([-4,4])
ylim ([-1,1])
xlabel("sepal length (cm)")
ylabel("petal length (cm)")
show()
```
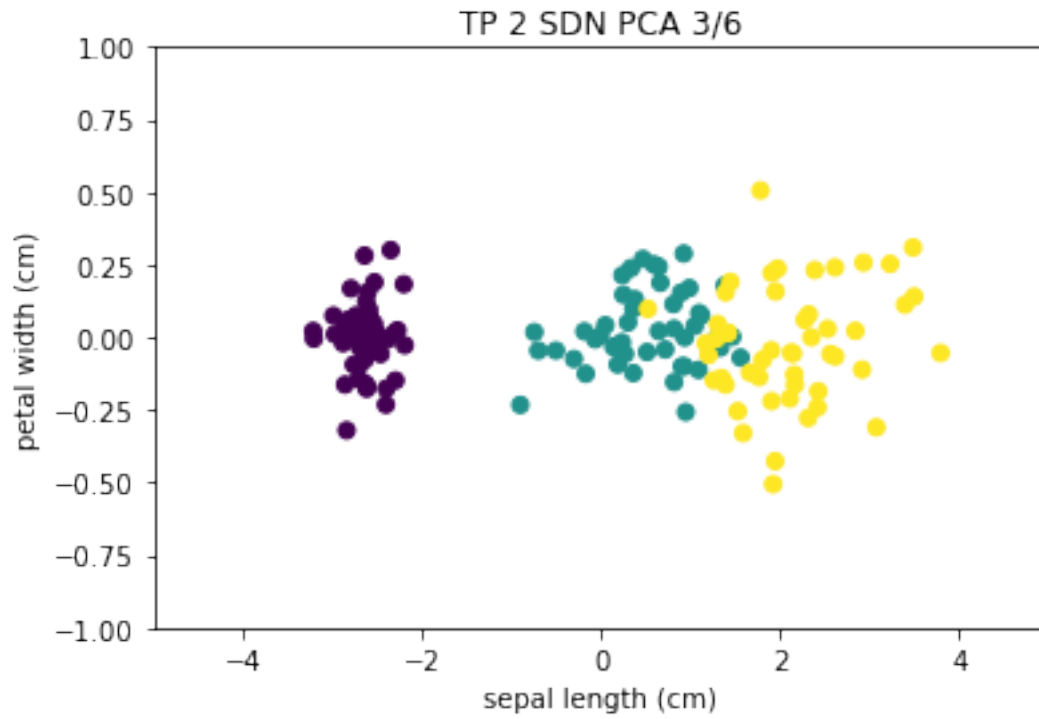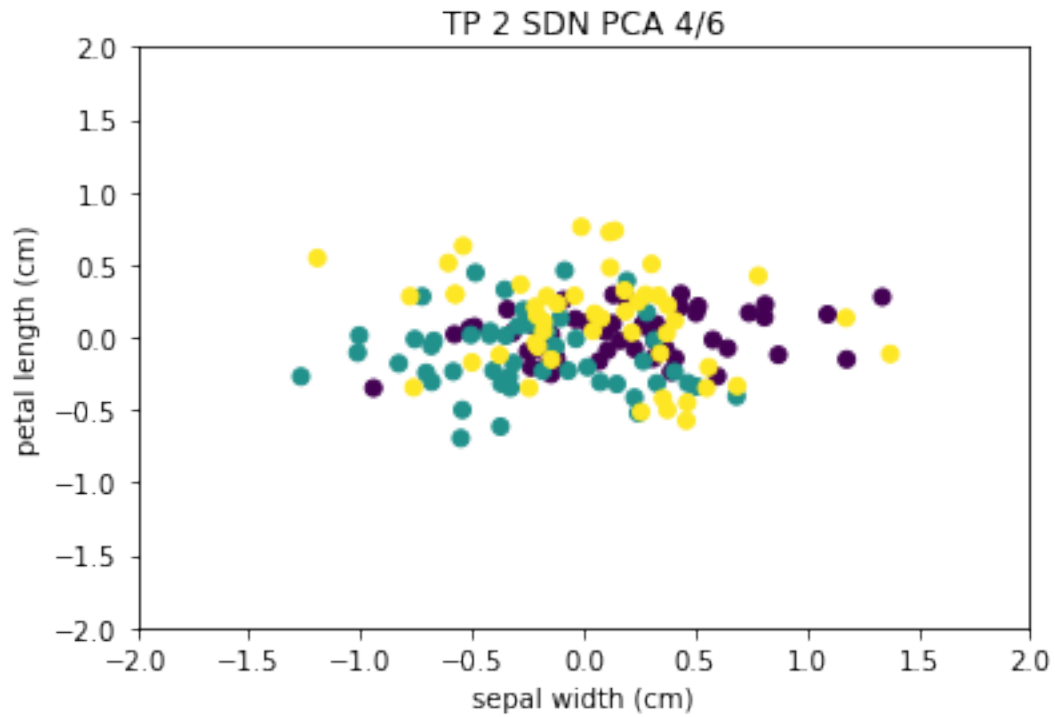
TP 2 SDN PCA 2/6

[272]:
```
F = figure()
scatter (IrisPCA[:,0], IrisPCA[:,3], c=iris.target)
title("TP 2 SDN PCA 3/6")
xlim ([-5,5])
ylim ([-1,1])
xlabel("sepal length (cm)")
ylabel("petal width (cm)")
show()
```

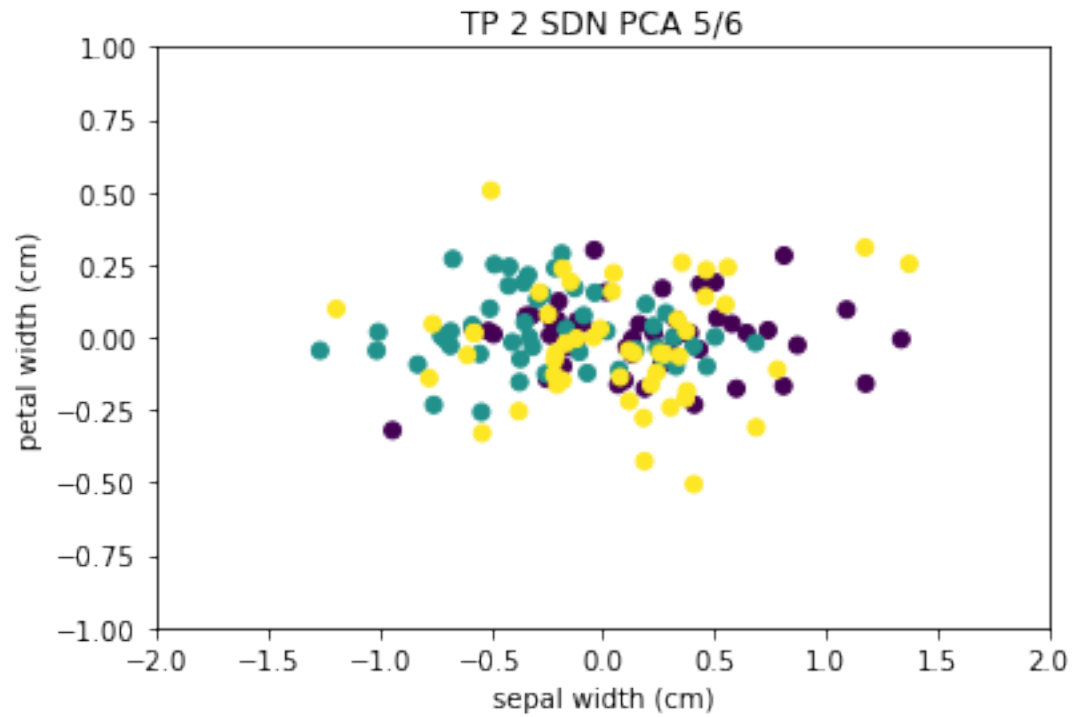TP 2 SDN PCA 3/6

```
[282]: F = figure()
       scatter (IrisPCA[:,1], IrisPCA[:,2], c=iris.target)
       title("TP 2 SDN PCA 4/6")
       xlim ([-2,2])
       ylim ([-2,2])
       xlabel("sepal width (cm)")
       ylabel("petal length (cm)")
       show()
```

TP 2 SDN PCA 4/6

[281]:
```
F = figure()
scatter (IrisPCA[:,1], IrisPCA[:,3], c=iris.target)
title("TP 2 SDN PCA 5/6")
xlim ([-2,2])
ylim ([-1,1])
xlabel("sepal width (cm)")
ylabel("petal width (cm)")
show()
```

TP 2 SDN PCA 5/6

```
[278]: F = figure()
       scatter (IrisPCA[:,2], IrisPCA[:,3], c=iris.target)
       title("TP 2 SDN PCA 6/6")
       xlim ([-1,1])
       ylim ([-1,1])
       xlabel("petal length (cm)")
       ylabel("petal width (cm)")
       show()
```

TP 2 SDN PCA 6/6
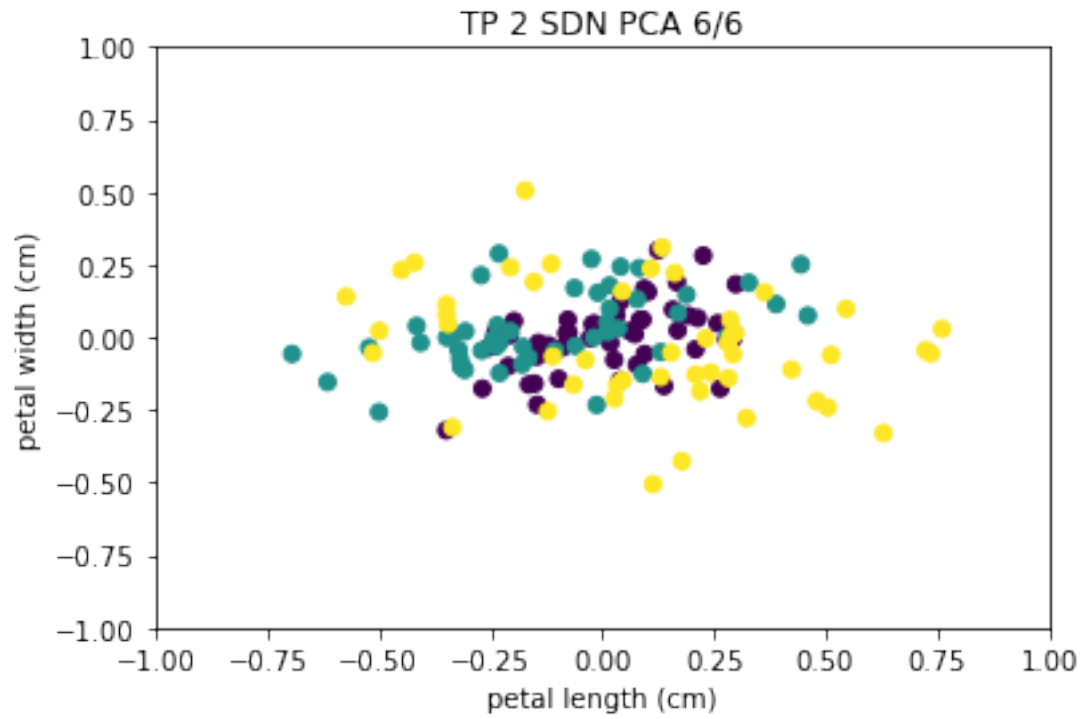
```
[293]:  F = figure()
        scatter (IrisLDA[:,0], IrisLDA[:,1], c=iris.target)
        title("TP 2 SDN LDA")
        xlim ([-12,12])
        ylim ([-5,5])
        xlabel("IrisLDA[:,0]")
        ylabel("IrisLDA[:,1]")
        show()
```

TP 2 SDN LDA
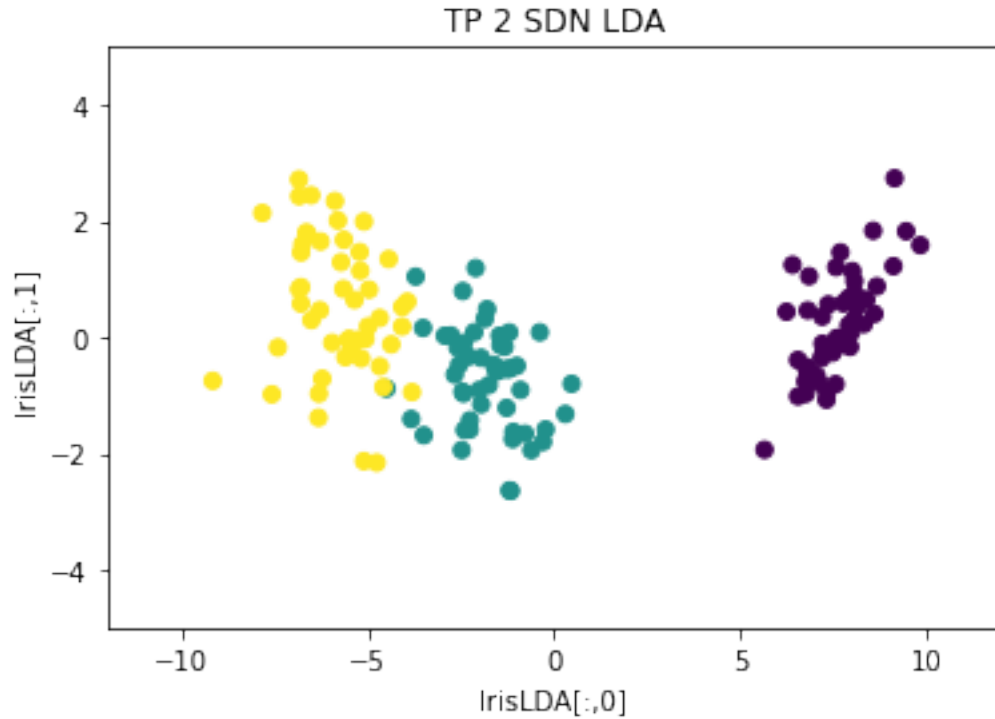
Conclusion : Pour les visualisations en ACP, on peut éliminer les trois dernières où toutes les espèces d'iris sont confondues dans un gros nuage de point. On a toujours du mal à distinguer deux des trois espèces d'iris... (vert et jaune sur le graphique) La seule différence que je remarque est l'arrangement des nuages de points : ils sont disposés dans un ordre différent en LDA, de la gauche vers la droite : les jaunes d'abord, les verts et ensuite les violets.

3 Fin du TP