new read result

March 18, 2021

[1]:
```
import os;
import sys;
import random;
import math
import json
import imutils;

import numpy as np;
import cv2;
import matplotlib.pyplot as plt;

from skimage.feature import greycomatrix, greycoprops,local_binary_pattern


import tensorflow as tf
from tensorflow import keras;

from tensorflow.keras.callbacks import ModelCheckpoint

from sklearn.metrics import roc_curve, auc

from keras import backend as K


import mahotas as mt
import sklearn

from skimage.filters import gabor



from sklearn.manifold import TSNE

from mpl_toolkits.mplot3d import Axes3D


import umap
```

```
import phate

from pywt import dwt2

import csv
```

```
/usr/lib/python3/dist-packages/h5py/__init__.py:36: FutureWarning: Conversion of
the second argument of issubdtype from `float` to `np.floating` is deprecated.
In future, it will be treated as `np.float64 == np.dtype(float).type`.
  from ._conv import register_converters as _register_converters
Using TensorFlow backend.
/home/ubuntu/dlenv3/lib/python3.6/site-packages/numba/errors.py:137:
UserWarning: Insufficiently recent colorama version found. Numba requires
colorama >= 0.3.9
  warnings.warn(msg)
```

[ ]:

[2]:
```
mapfile="/home/ubuntu/project/pythologyImageDL/scatterplot/data/
 ↪new_gland_tsne32.csv"
```

[3]:
```
data=[]
with open(mapfile) as f:
    f2 =csv.reader(f)
    data=list(f2)

data=np.asarray(data)
```

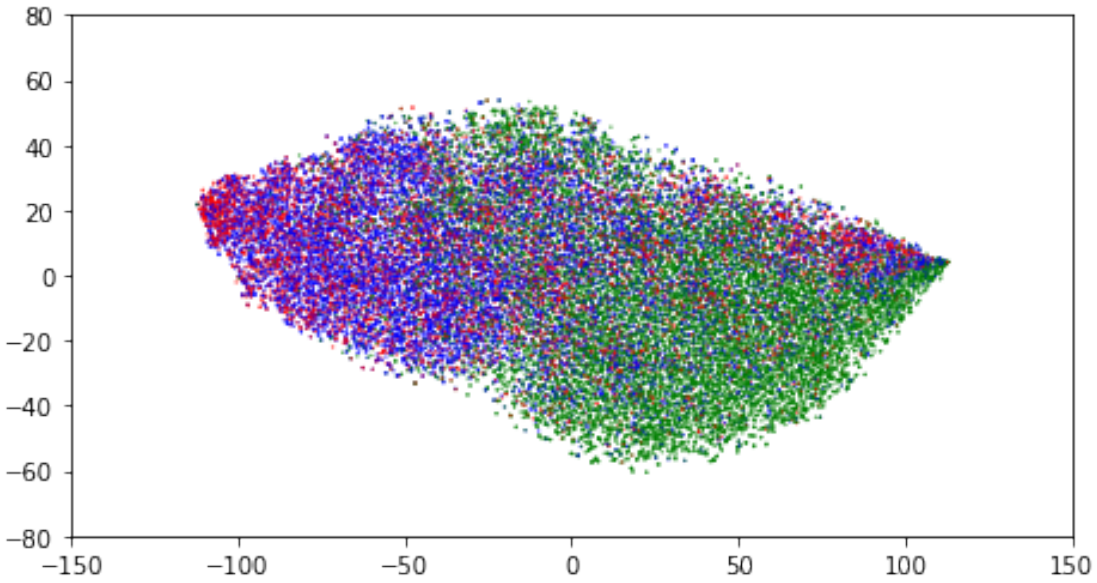
[5]:
```
colors=[];
for i in data:
    if i[1] =="normal":
        colors.append("green")
    elif i[1] =="treatment":
        colors.append("blue")
    elif i[1] =="dss":
        colors.append("red")

    else:
        print(i)
```

[6]:
```
x=[float(i) for i in data[:, 2]];
y=[float(i) for i in data[:,3]];
```

[274]:
```
fig= plt.figure(figsize=(7.5,4))
plt.xlim([-150,150])
plt.ylim([-80,80])

ax = fig.add_subplot(111)
ax.scatter(x, y,c=colors,s=0.1)
```

```
/home/ubuntu/dlenv3/lib/python3.6/site-packages/ipykernel_launcher.py:5:
MatplotlibDeprecationWarning: Adding an axes using the same arguments as a
previous axes currently reuses the earlier instance.  In a future version, a new
instance will always be created and returned.  Meanwhile, this warning can be
suppressed, and the future behavior ensured, by passing a unique label to each
axes instance.
  """
```

[274]:
```
<matplotlib.collections.PathCollection at 0x7ff39b3099e8>
```

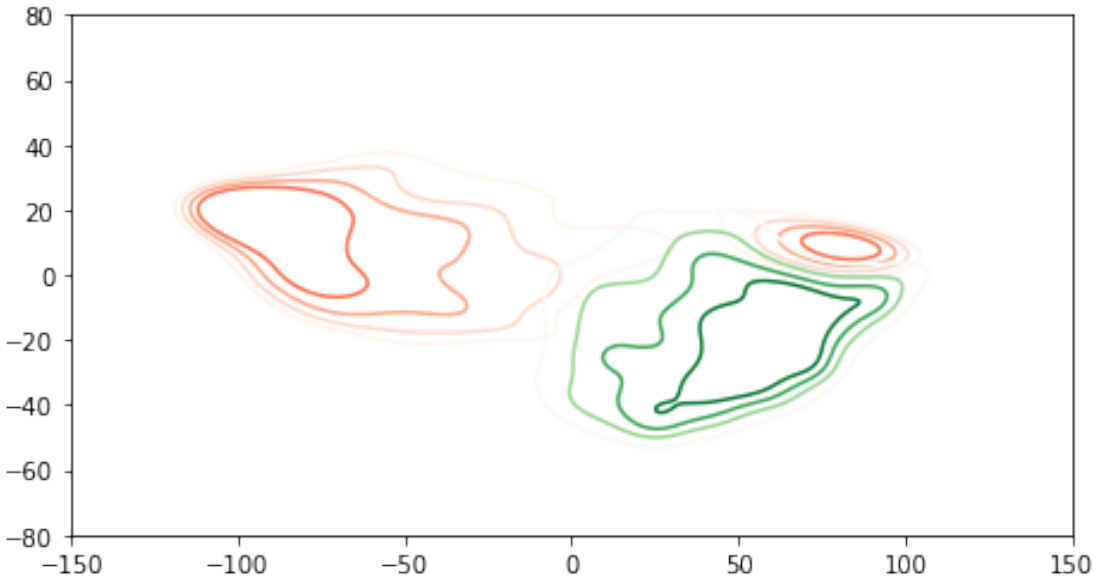


[10]:
```
import seaborn as sns
```

[74]:
```
dssx = []
dssy = []
dssid=[];

normalx = []
normaly = []
normalid=[];



treatx = []
treaty = []
treatid=[];


for i in data:
```

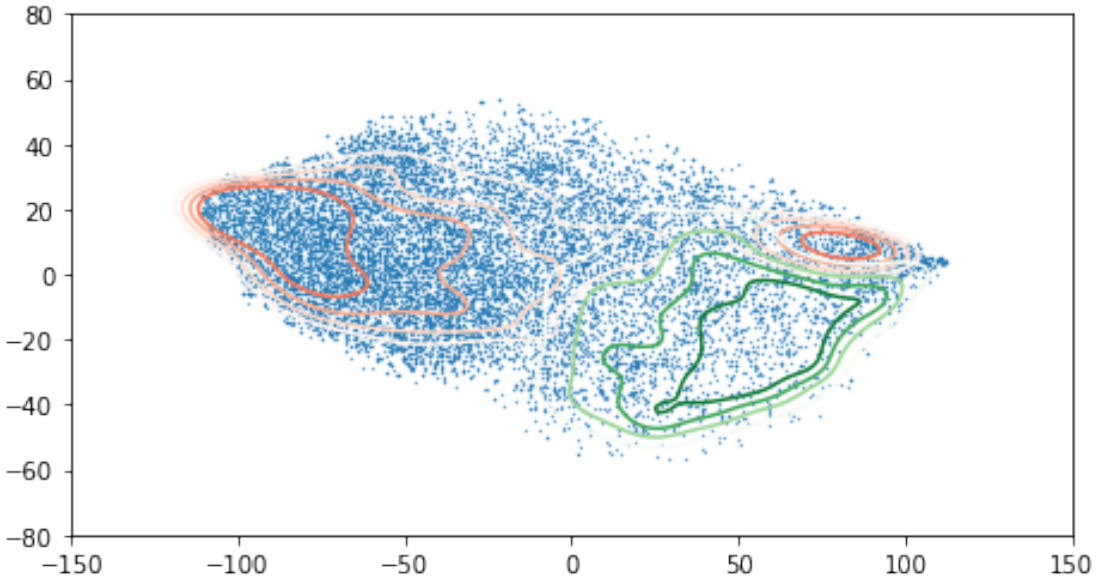
```
    if i[1] =="normal":
        normalx.append(float(i[2]))
        normaly.append(float(i[3]))
        normalid.append(i[0])

    elif i[1] =="treatment":
        treatx.append(float(i[2]))
        treaty.append(float(i[3]))
        treatid.append(i[0])
    elif i[1] =="dss":
        dssx.append(float(i[2]))
        dssy.append(float(i[3]))
        dssid.append(i[0])

    else:
        print(i)
```

[508]:
```
fig = plt.figure(figsize=(7.5, 4))

sns.kdeplot(x=dssx, y=dssy, levels=5,cmap="Reds",thresh=0.4)
sns.kdeplot(x=normalx, y=normaly, levels=5,cmap="Greens",thresh=0.4)

plt.xlim([-150,150])
plt.ylim([-80,80])


plt.show()
```



[510]:
```
# I score each level of contour. dissease is -4,-3,-2,-1,0   control is␣
↪0,1,2,3,4
#we observe all the node location from treatment. and get the score of␣
↪node(each gland).
```

[509]:
```
fig = plt.figure(figsize=(7.5, 4))

sns.kdeplot(x=dssx, y=dssy, levels=5,cmap="Reds",thresh=0.4)
sns.kdeplot(x=normalx, y=normaly, levels=5,cmap="Greens",thresh=0.4)

plt.xlim([-150,150])
plt.ylim([-80,80])

plt.scatter(treatx, treaty,s=0.1)

plt.show()
```



[ ]:

[ ]:

[511]:
```
fig= plt.figure(figsize=(7.5/1.8,4/1.8))
sns.kdeplot(x=dssx, y=dssy, levels=5 ,thresh=0.4,fill=True,colors=["#C0C0C0",␣
↪"#808080", "#404040","#000000"])

plt.xlim([-150,150])
plt.ylim([-80,80])

plt.axis('off')
```

```
plt.savefig("dss_contour.png",pad_inches=0)
```

[513]:
```
fig= plt.figure(figsize=(7.5/1.8,4/1.8))


sns.kdeplot(x=normalx, y=normaly, levels=5 ,thresh=0.
 ↪4,fill=True,colors=["#C0C0C0", "#808080", "#404040","#000000"])

plt.xlim([-150,150])
plt.ylim([-80,80])

plt.axis('off')

plt.savefig("normal_contour.png",pad_inches=0)
```

[ ]:
```

```

[514]:
```
nc = cv2.imread("normal_contour.png",cv2.IMREAD_GRAYSCALE)
```

[515]:
```
nc.shape
```

[515]:
```
(160, 300)
```

[516]:
```
dc = cv2.imread("dss_contour.png",cv2.IMREAD_GRAYSCALE)
```

[517]:
```
dc.shape
```

[517]:
```
(160, 300)
```

[ ]:
```

```

[518]:
```
dss_score=[];
control_score=[];
eval_score=[];
for i in range(len(treatid)):
    dsscolor=dc[round(treaty[i]) +80  ][round(treatx[i]) +150 ]
    dss_score.append(4-round(dsscolor/64))


    controlcolor=nc[round(treaty[i]) +80  ][round(treatx[i]) +150 ]
    control_score.append(4-round(controlcolor/64))
    eval_score.append(control_score[i]-dss_score[i])
```

[519]:
```
score2=[x*-1 for x in eval_score]
```

[520]:
```
score3=[ ]
for x in score2:
    if x <=0:
        score3.append(0)
    else:
        score3.append(x)
```

[521]:
```
result=dict()
for i in treatid:
    result[i.split("___")[0]]={"dss_score":[],"combine_score":[]};

for i in range(len(treatid)):
    result[treatid[i].split("___")[0]]["dss_score"].append(dss_score[i]);
    result[treatid[i].split("___")[0]]["combine_score"].append(score3[i]);
```

[522]:
```
for i in result:
    result[i]['dss_score']=np.mean(result[i]['dss_score'])
    result[i]['combine_score']=np.mean(result[i]['combine_score'])
```

[ ]:
```

```

[524]:
```
#score method 2
```

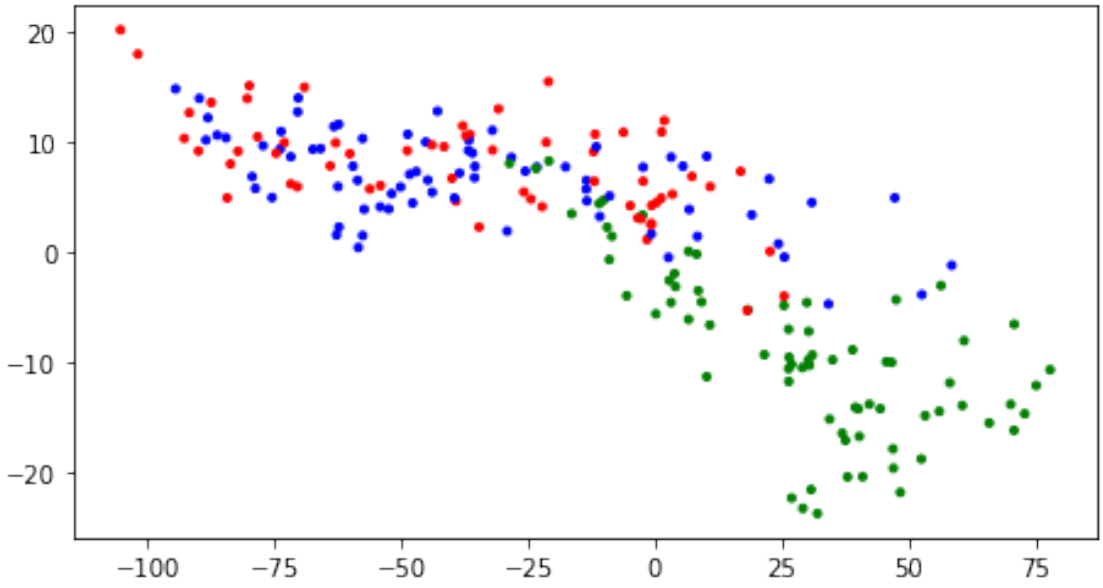
[540]:
```
slidedata=dict();

ids32 = data[:,0]
for i in range(len(ids32)):
    name = ids32[i].split("___")[0];
    slidedata[name]={"color":colors[i],"umap":[],"phate":[],"tsne":[]};
```

```
for i in range(len(ids32)):
    name = ids32[i].split("___")[0];

    coor =[float(data[i][2]),float(data[i][ 3])];
    slidedata[name]["tsne"].append(coor);

for i in slidedata:

    coors = slidedata[i]["tsne"];
    xs=[];
    ys=[];
    for c in coors:
        xs.append(c[0])
        ys.append(c[1])

    mean = np.mean(xs);
    std = np.std(xs)
    xs = [x for x in xs if (x > mean - 2 * std)]
    xs = [x for x in xs if (x < mean + 2 * std)]

    mean = np.mean(ys);
    std = np.std(ys)
    ys = [x for x in ys if (x > mean - 2 * std)]
    ys = [x for x in ys if (x < mean + 2 * std)]

    xs = sum(xs)/len(xs)
    ys = sum(ys)/len(ys)

    slidedata[i]["tsne"]=(xs,ys);
```

[542]:
```
slidecolors=[];

slidetsne=[];
slideid=[]
for i in slidedata:
    slidecolors.append(slidedata[i]["color"]);

    slidetsne.append(list(slidedata[i]["tsne"]));
    slideid.append(i)

slidetsne=np.asarray(slidetsne)
```

[543]:
```
fig = plt.figure(figsize=(7.5, 4))

ax = fig.add_subplot(111)

ax.scatter(slidetsne[:, 0], slidetsne[:, 1],c=slidecolors,s=9)
```

[543]: <matplotlib.collections.PathCollection at 0x7ff34424f908>



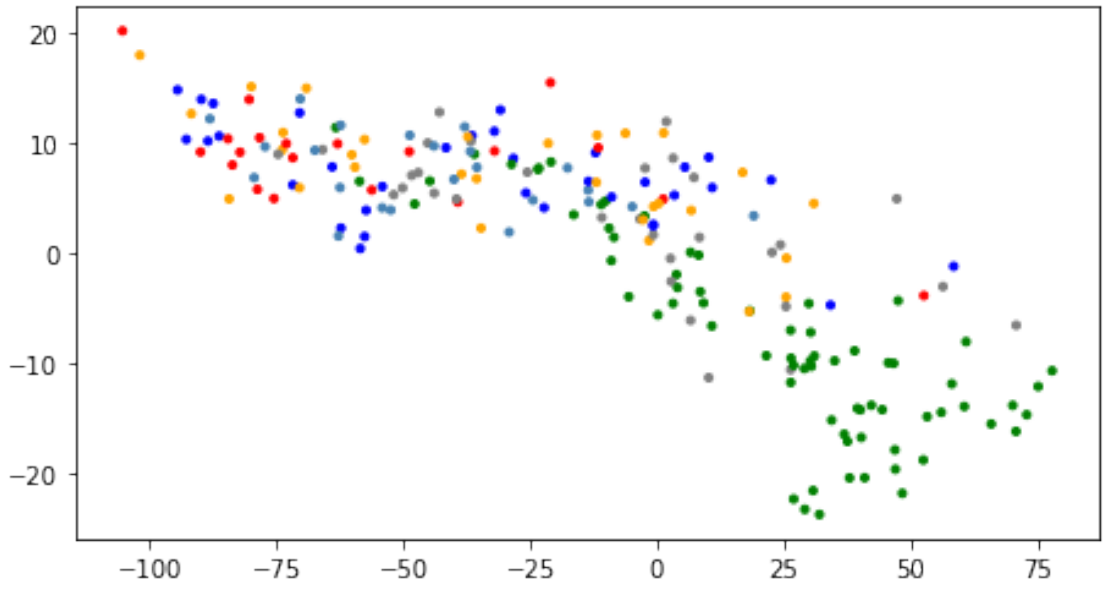
[614]:
```
scoredata=[]
with open("dss32_slidelevel_v4.csv") as f:
    f2 =csv.reader(f)
    scoredata=list(f2)

scoredata=np.asarray(scoredata)
```

[639]:
```
keyvalue=dict();
for i in scoredata[1:]:
    keyvalue[i[0]]=int( float(i[-3]))

scorecolor=["green","steelblue","blue","orange","red"]
```

[640]:
```
scorecolors=[];
for i in slideid:
    if i in keyvalue:
        val=keyvalue[ i]
        scorecolors.append(scorecolor[val])
    else:
        scorecolors.append("gray")
```

[641]:
```
fig = plt.figure(figsize=(7.5, 4))

ax = fig.add_subplot(111)

ax.scatter(slidetsne[:, 0], slidetsne[:, 1],c=scorecolors,s=9)
```

[641]: <matplotlib.collections.PathCollection at 0x7ff3442e4c18>



[ ]:

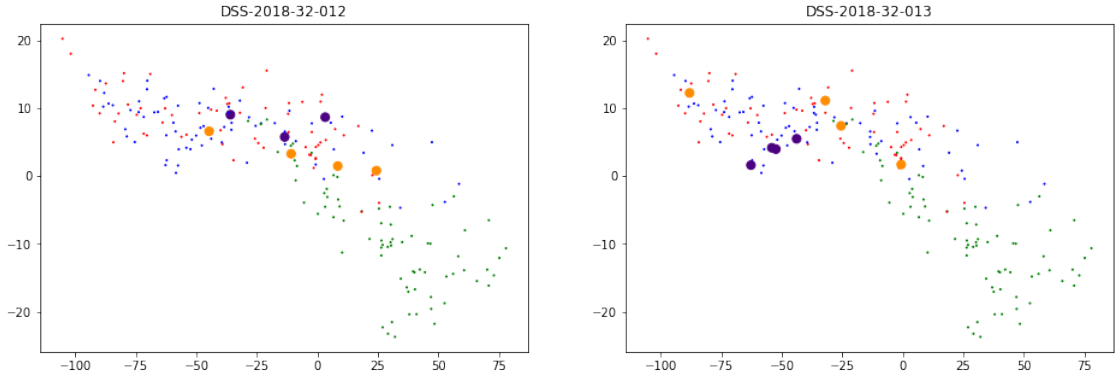
[ ]:

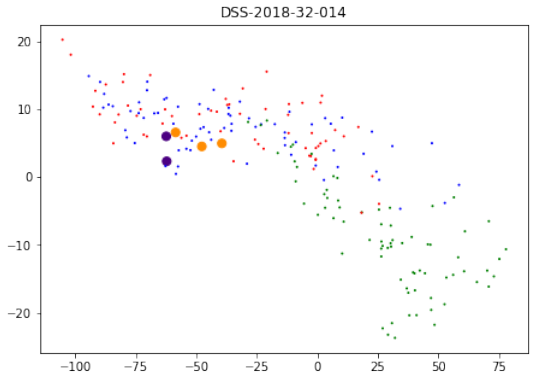
[544]:
```
dssdict={"treatment":set(),"dss":set(),"normal":set()};
for i in range(len(slideid)):
    if slidecolors[i] == "blue":
        dssdict["treatment"].add(slideid[i].split("_")[0])

    if slidecolors[i] == "red":
        dssdict["dss"].add(slideid[i].split("_")[0])

    if slidecolors[i] == "green":
        dssdict["normal"].add(slideid[i].split("_")[0])
```

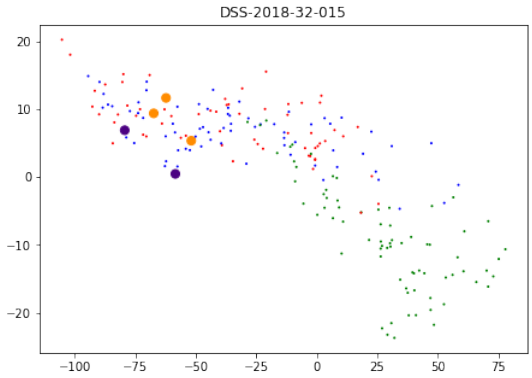
[546]:
```
for i in dssdict:
    dssdict[i]=list(dssdict[i])
    dssdict[i].sort()
```

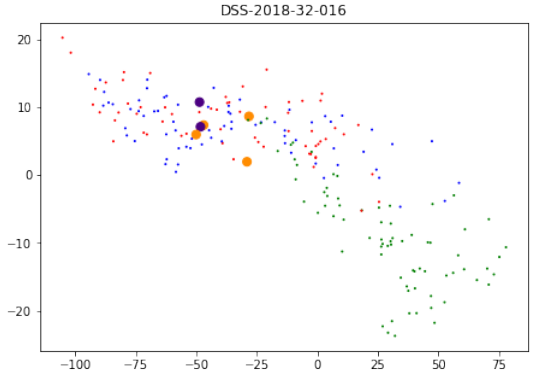
[547]:
```
pltindex=1;

for i in dssdict["treatment"]:
    sizelist=[];
    newcolors=[];

    for index in range(len(slideid)):


        if slideid[index].startswith(i+"_"):
            sizelist.append(50)
```

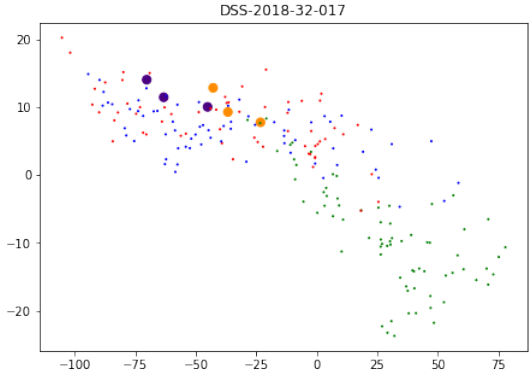
```
        location = slideid[index].split("_")[1];
        location=location[0];
        if location == "a":
            newcolors.append("indigo")
        elif location == "b":
            newcolors.append("darkorange")
    else:
        sizelist.append(1)
        newcolors.append(slidecolors[index])
if pltindex==1:
    fig = plt.figure(figsize=(16, 5))
ax = fig.add_subplot(120+pltindex)

ax.set_title(i)

ax.scatter(slidetsne[:, 0], slidetsne[:, 1],c=newcolors,s=sizelist)



pltindex+=1;

if pltindex>2:
    pltindex=1;
```

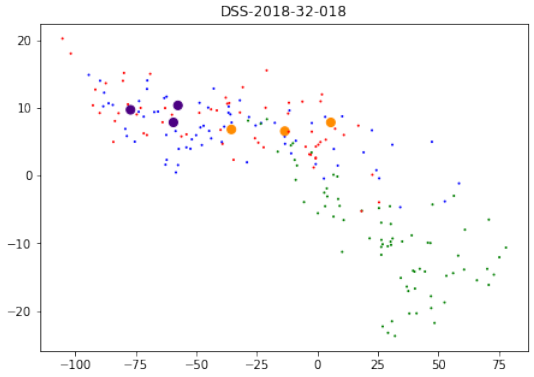


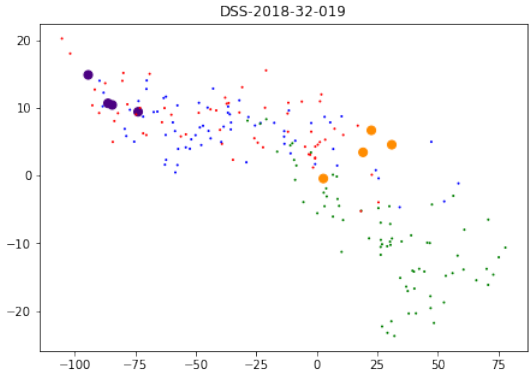

DSS-2018-32-014

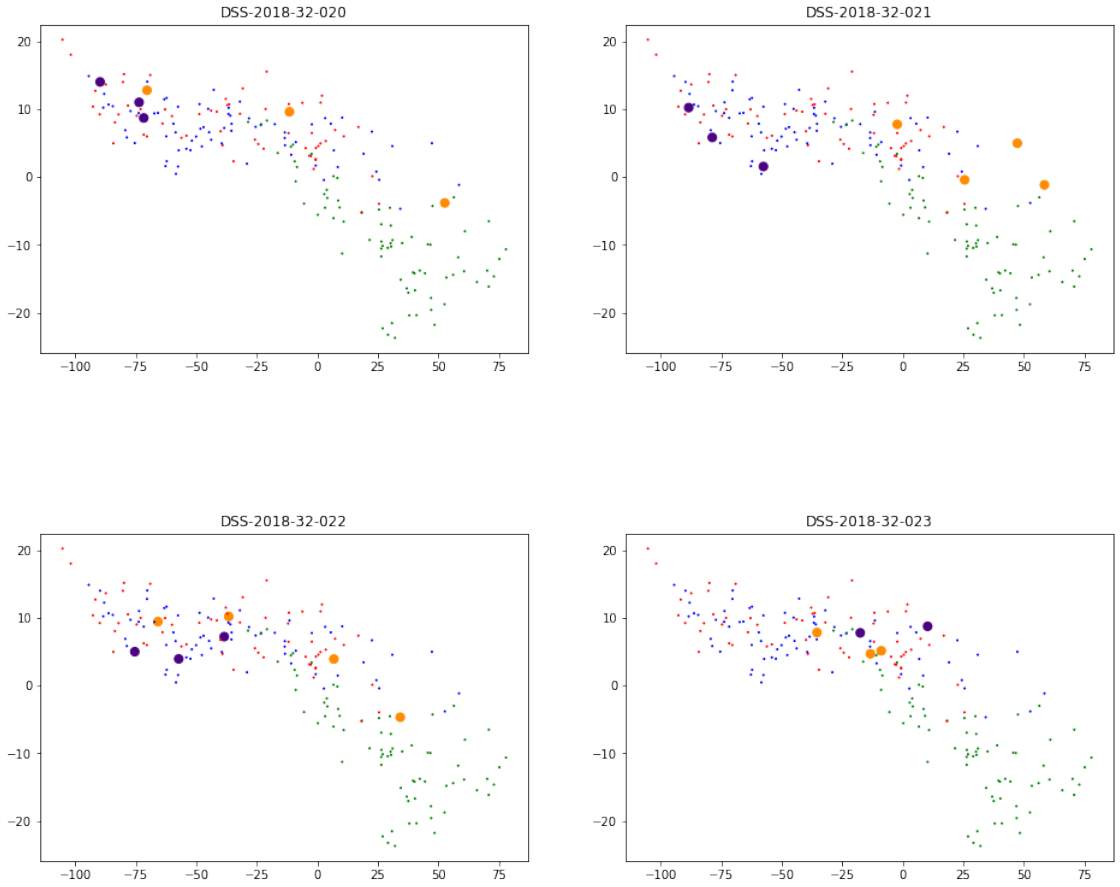

DSS-2018-32-015


DSS-2018-32-016


DSS-2018-32-017

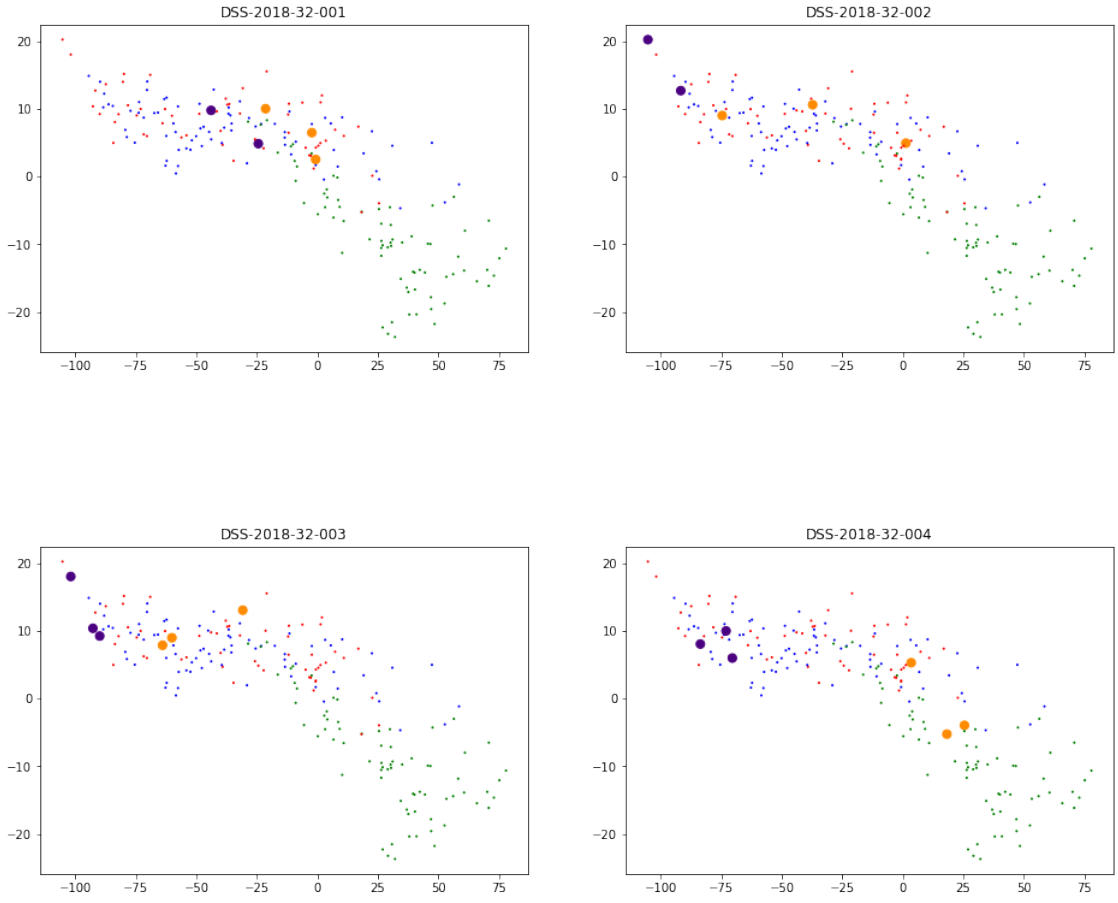

DSS-2018-32-018

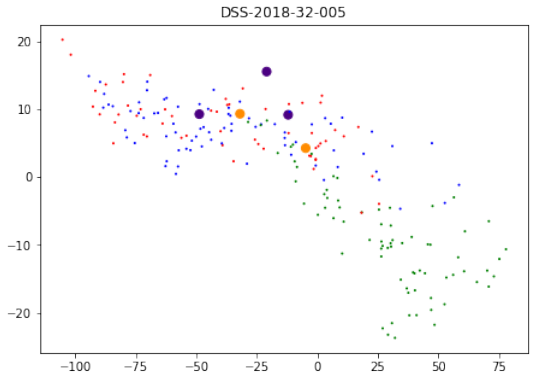

DSS-2018-32-019

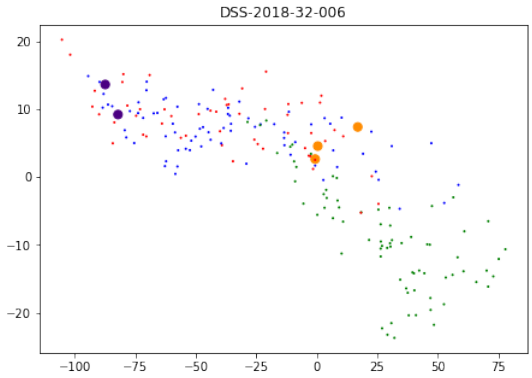


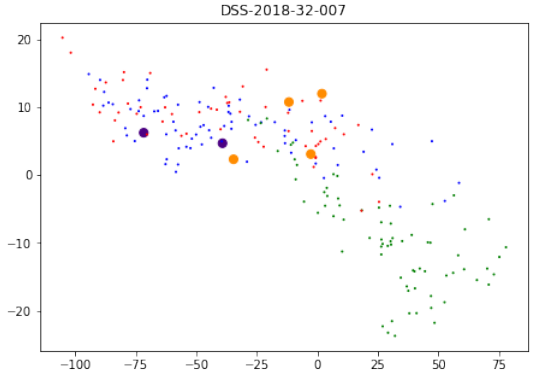
[548]:
```
pltindex=1;

for i in dssdict["dss"]:
    sizelist=[];
    newcolors=[];

    for index in range(len(slideid)):


        if slideid[index].startswith(i+"_"):
            sizelist.append(50)

            location = slideid[index].split("_")[1];
            location=location[0];
            if location == "a":
                newcolors.append("indigo")
            elif location == "b":
                newcolors.append("darkorange")
        else:
            sizelist.append(1)
```

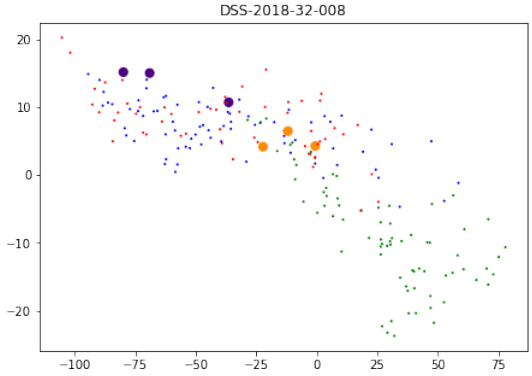
```
        newcolors.append(slidecolors[index])
if pltindex==1:
    fig = plt.figure(figsize=(16, 5))
ax = fig.add_subplot(120+pltindex)

ax.set_title(i)

ax.scatter(slidetsne[:, 0], slidetsne[:, 1],c=newcolors,s=sizelist)



pltindex+=1;

if pltindex>2:
    pltindex=1;
```

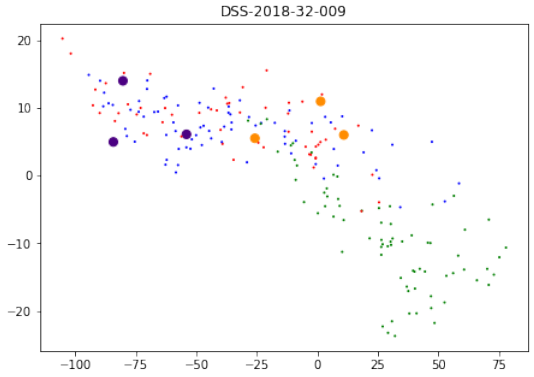


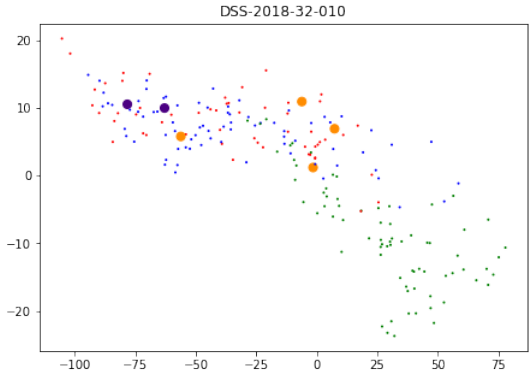

DSS-2018-32-005

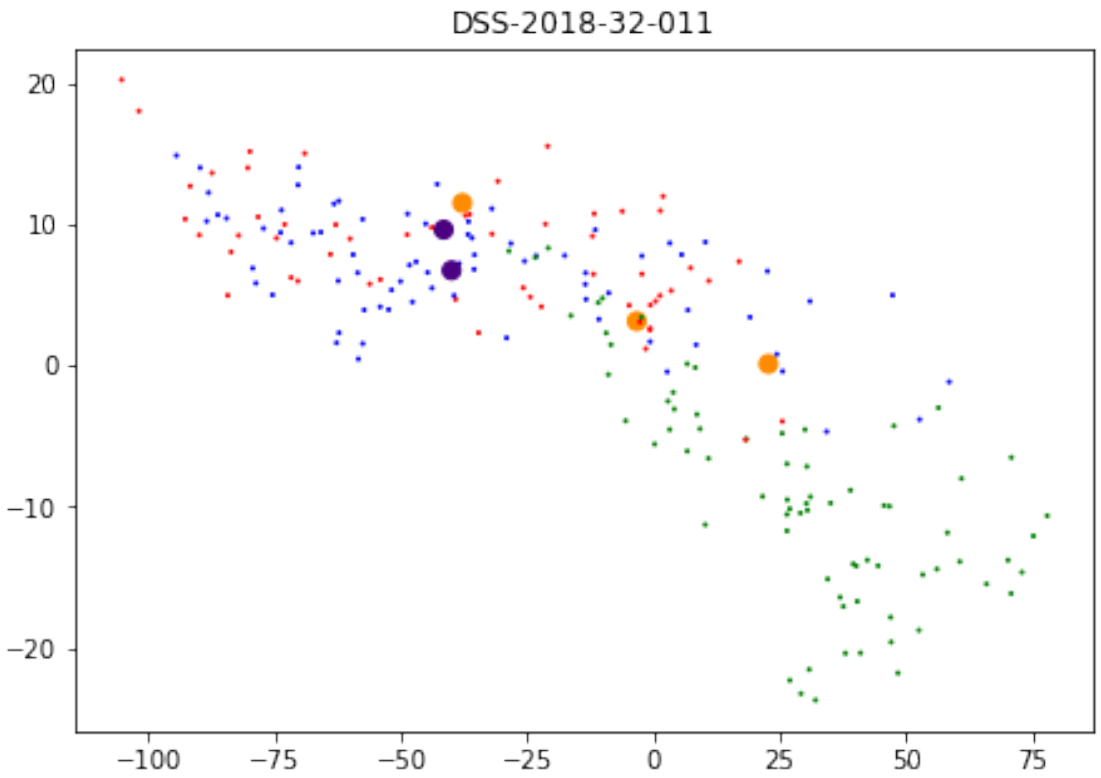

DSS-2018-32-006


DSS-2018-32-007


DSS-2018-32-008

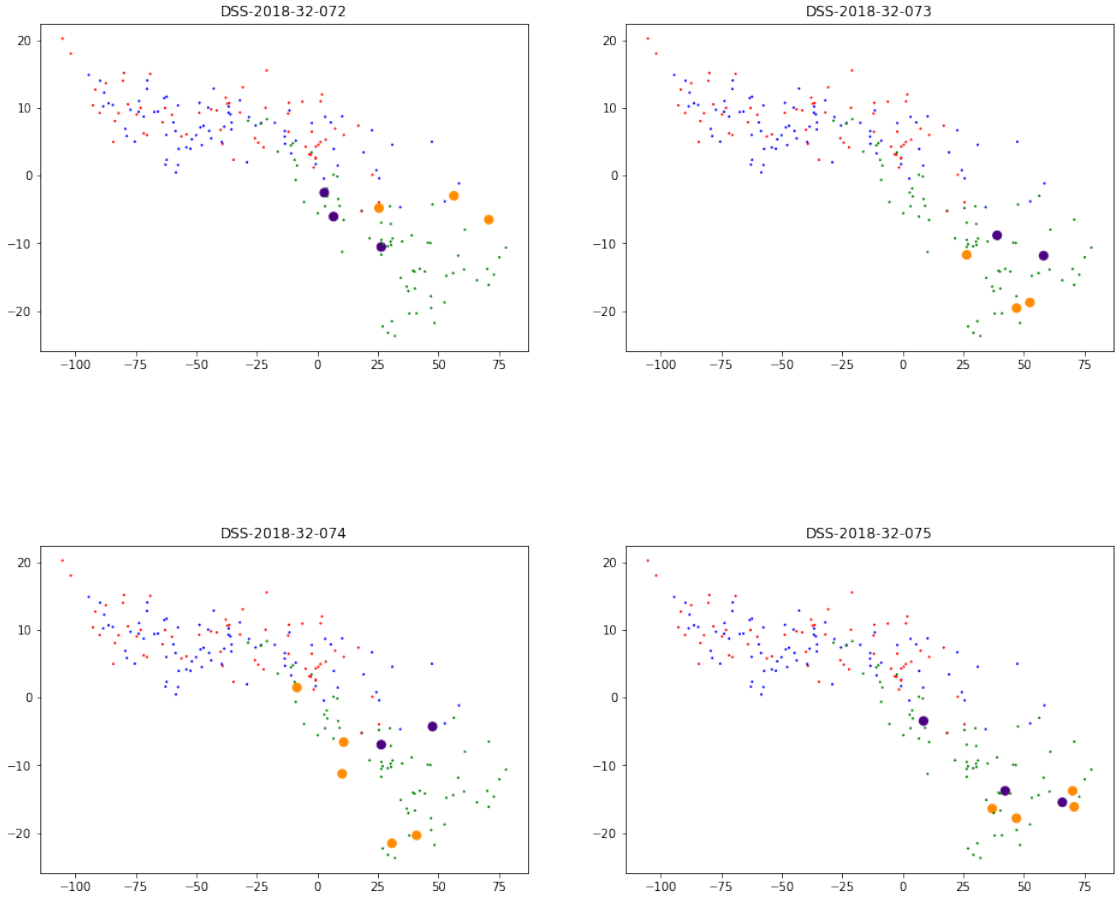

DSS-2018-32-009

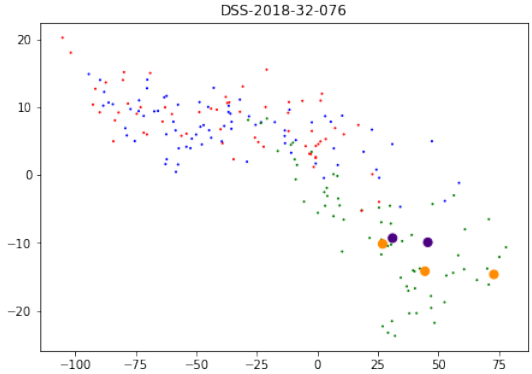

DSS-2018-32-010

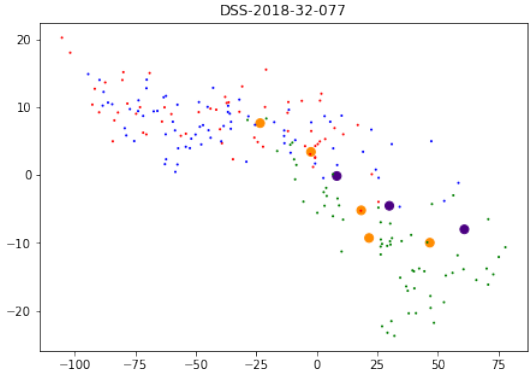


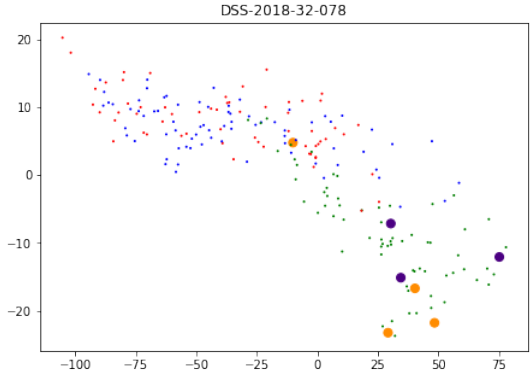
[549]:
```
pltindex=1;

for i in dssdict["normal"]:
    sizelist=[];
    newcolors=[];

    for index in range(len(slideid)):


        if slideid[index].startswith(i+"_"):
            sizelist.append(50)

            location = slideid[index].split("_")[1];
            location=location[0];
            if location == "a":
                newcolors.append("indigo")
            elif location == "b":
                newcolors.append("darkorange")
        else:
            sizelist.append(1)
            newcolors.append(slidecolors[index])
    if pltindex==1:
```

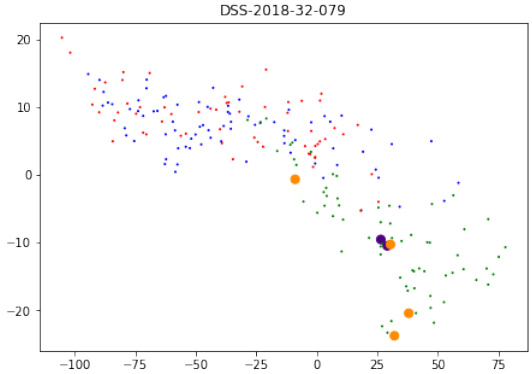
```
    fig = plt.figure(figsize=(16, 5))
ax = fig.add_subplot(120+pltindex)

ax.set_title(i)

ax.scatter(slidetsne[:, 0], slidetsne[:, 1],c=newcolors,s=sizelist)



pltindex+=1;

if pltindex>2:
    pltindex=1;
```




DSS-2018-32-076
20
10
0
−10
−20
−100
−75
−50
−25
0
25
50
75


DSS-2018-32-077
20
10
0
−10
−20
−100
−75
−50
−25
0
25
50
75


DSS-2018-32-078
20
10
0
−10
−20
−100
−75
−50
−25
0
25
50
75


DSS-2018-32-079
20
10
0
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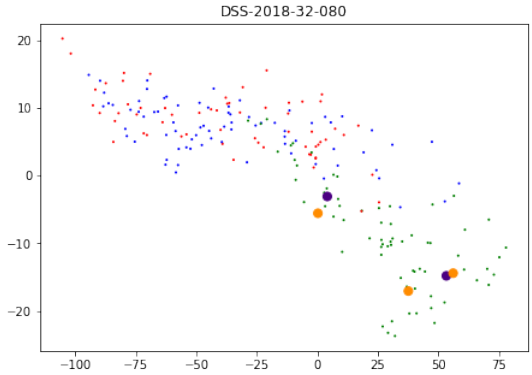
DSS-2018-32-080
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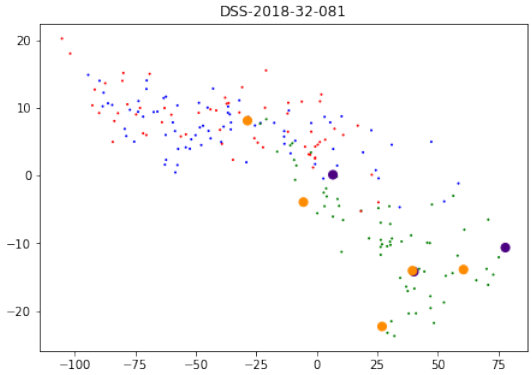
DSS-2018-32-081
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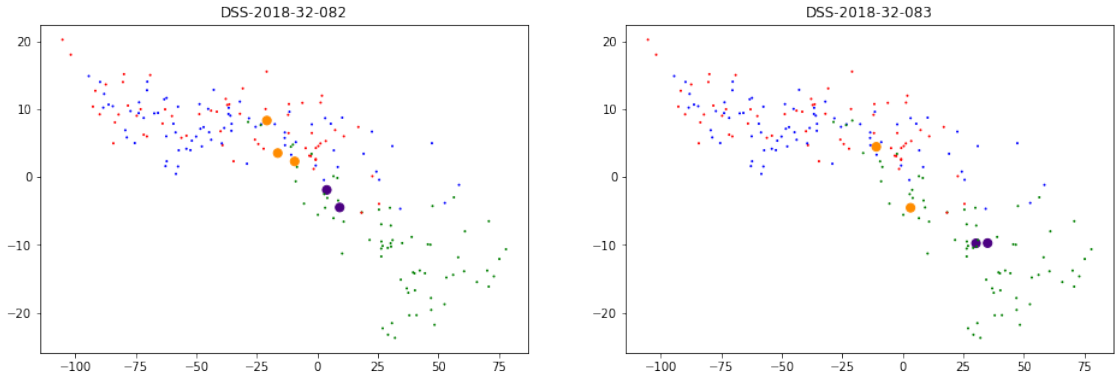
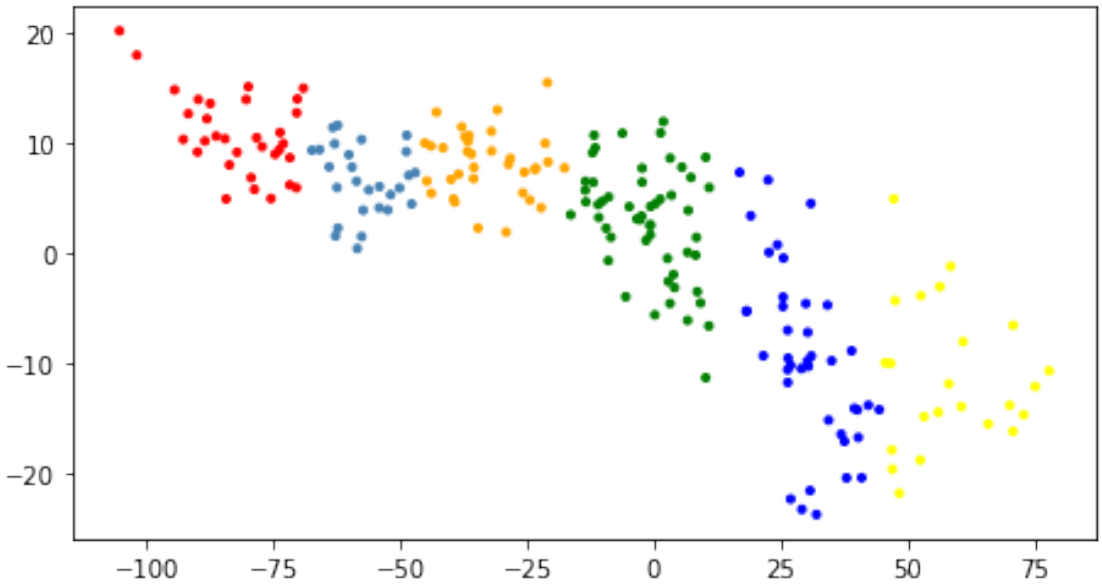


[ ]:

[568]:
```
hc=sklearn.cluster.AgglomerativeClustering(n_clusters = 6,).
 ↪fit_predict(slidetsne)

colordict=["blue","red","green","orange","yellow","steelblue","#aabbcc","#aabb00","#aa43cc","#
colorlabels=[]
for i in hc:
    colorlabels.append(colordict[i])
```

[569]:
```
fig = plt.figure(figsize=(7.5, 4))

ax = fig.add_subplot(111)

ax.scatter(slidetsne[:, 0], slidetsne[:, 1],c=colorlabels,s=9)
```

[569]:
```
<matplotlib.collections.PathCollection at 0x7ff33c17e550>
```



[570]:
```
#score 2.1
```

[571]:
```
score21=[]
for i in range(len(slideid)):
    hcolor = colorlabels[i]
    if hcolor == "red":
        score21.append(4)
    elif hcolor == "steelblue":
        score21.append(3)
    elif hcolor == "orange":
        score21.append(2)
    elif hcolor == "green":
        score21.append(1)
    else:
        score21.append(0)
```

[ ]:
```
#score 2.2
```

[574]:
```
threshold = 0.3
```

[573]:
```
right=np.max(slidetsne[:, 0])
left=np.min(slidetsne[:, 0])
top=np.max(slidetsne[:, 1])
bottom=np.min(slidetsne[:, 1])
```

[576]:
```
xlength = right-left
ylength = top - bottom
```

[586]:
```
levels=4

xlength2 =(1-threshold)*xlength
ylength2 =(1-threshold)*ylength

gapx=xlength2/4
gapy=ylength2/4
```

[595]:
```
score22=[]
for i in range(len(slideid)):
    x=slidetsne[i][0];
    y=slidetsne[i][1];

    xvalue = 0;
    yvalue = 0;

    if x - left > (1-threshold)*xlength :
        xvalue = 0;
    else:
        temp =x-left;
```

```
        lv = temp/gapx
        xvalue = 4-(lv)


    if y- bottom < threshold*ylength:
        yvalue=0;

    else:
        temp = y-bottom-threshold*ylength
        lv = temp/gapy
        yvalue=(lv)


    score22.append(xvalue/2 + yvalue/2 )
```

[ ]:

[644]:
```
scoredata_head = scoredata[0]
```

[647]:
```
scoredata_head[23]
```

[647]: 'gland_divid_mucosa'

[654]:
```
myscore=[]

for i in scoredata[1:]:
    gdm = float(i[23])*10;
    score = 4-gdm;
    if score <0:
        score =0;

    myscore.append(score)
```

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