HW4 6214500875 Pranpaveen

My data sentiment analysis

In [1]:

```
'''!wget https://github.com/PyThaiNLP/wisesight-sentiment/archive/master.zip; unzip maste
r.zip
!mv wisesight-sentiment-master/kaggle-competition/* .
!pip install tensorflow_text
!pip install pythainlp
!pip install emoji
!ls'''
```

Out[1]:

```
'!wget https://github.com/PyThaiNLP/wisesight-sentiment/archive/master.zip; unzip master.
zip\n!mv wisesight-sentiment-master/kaggle-competition/* .\n!pip install tensorflow_text\
n!pip install pythainlp\n!pip install emoji\n!ls'
```

In [2]:

```
import pandas as pd
import numpy as np
from pythainlp import word_tokenize
from tqdm import tqdm_notebook
import re
import emoji
import matplotlib.pyplot as plt
```

In [3]:

```
def replace_url(text):
    URL_PATTERN = r"""(?i)\b((?:https?:(?:/{1,3}|[a-z0-9%])|[a-z0-9.\-]+[.](?:com|net|org
|edu|gov|mil|aero|asia|biz|cat|coop|info|int|jobs|mobi|museum|name|post|pro|tel|travel|xx
x|ac|ad|ae|af|ag|ai|al|am|an|ao|aq|ar|as|at|au|aw|ax|az|ba|bb|bd|be|bf|bg|bh|bi|bj|bm|bn|
bo|br|bs|bt|bv|bw|by|bz|ca|cc|cd|cf|cg|ch|ci|ck|cl|cm|cn|co|cr|cs|cu|cv|cx|cy|cz|dd|de|dj
|dk|dm|do|dz|ec|ee|eg|eh|er|es|et|eu|fi|fj|fk|fm|fo|fr|ga|gb|gd|ge|gf|gg|gh|gi|gl|gm|gn|g
p|gq|gr|gs|gt|gu|gw|gy|hk|hm|hn|hr|ht|hu|id|ie|il|im|in|io|iq|ir|is|it|je|jm|jo|jp|ke|kg|
kh|ki|km|kn|kp|kr|kw|ky|kz|la|lb|lc|li|lk|lr|ls|lt|lu|lv|ly|ma|mc|md|me|mg|mh|mk|ml|mm|mn
|mo|mp|mq|mr|ms|mt|mu|mv|mw|mx|my|mz|na|nc|ne|nf|ng|ni|nl|no|np|nr|nu|nz|om|pa|pe|pf|pg|p
h|pk|pl|pm|pn|pr|ps|pt|pw|py|qa|re|ro|rs|ru|rw|sa|sb|sc|sd|se|sg|sh|si|sj|Ja|sk|sl|sm|sn|
so|sr|ss|st|su|sv|sx|sy|sz|tc|td|tf|tg|th|tj|tk|tl|tm|tn|to|tp|tr|tt|tv|tw|tz|ua|ug|uk|us
|uy|uz|va|vc|ve|vg|vi|vn|vu|wf|ws|ye|yt|yu|za|zm|zw)/)(?:[^\s()<>{}\[\]]+|\([^\s()]*?\([^
\s()]+\)[^\s()]*?\)|\([^\s]+?\))+(?:\([^\s()]*?\([^\s()]+\)[^\s()]*?\)|\([^\s]+?\)|[^\s`!
()\[\]{};:'".,<>?«»“”‘’])|(?:(?<!@)[a-z0-9]+(?:[.\-][a-z0-9]+)*[.](?:com|net|org|edu|gov|
mil|aero|asia|biz|cat|coop|info|int|jobs|mobi|museum|name|post|pro|tel|travel|xxx|ac|ad|a
e|af|ag|ai|al|am|an|ao|aq|ar|as|at|au|aw|ax|az|ba|bb|bd|be|bf|bg|bh|bi|bj|bm|bn|bo|br|bs|
bt|bv|bw|by|bz|ca|cc|cd|cf|cg|ch|ci|ck|cl|cm|cn|co|cr|cs|cu|cv|cx|cy|cz|dd|de|dj|dk|dm|do
|dz|ec|ee|eg|eh|er|es|et|eu|fi|fj|fk|fm|fo|fr|ga|gb|gd|ge|gf|gg|gh|gi|gl|gm|gn|gp|gq|gr|g
s|gt|gu|gw|gy|hk|hm|hn|hr|ht|hu|id|ie|il|im|in|io|iq|ir|is|it|je|jm|jo|jp|ke|kg|kh|ki|km|
kn|kp|kr|kw|ky|kz|la|lb|lc|li|lk|lr|ls|lt|lu|lv|ly|ma|mc|md|me|mg|mh|mk|ml|mm|mn|mo|mp|mq
|mr|ms|mt|mu|mv|mw|mx|my|mz|na|nc|ne|nf|ng|ni|nl|no|np|nr|nu|nz|om|pa|pe|pf|pg|ph|pk|pl|p
m|pn|pr|ps|pt|pw|py|qa|re|ro|rs|ru|rw|sa|sb|sc|sd|se|sg|sh|si|sj|Ja|sk|sl|sm|sn|so|sr|ss|
st|su|sv|sx|sy|sz|tc|td|tf|tg|th|tj|tk|tl|tm|tn|to|tp|tr|tt|tv|tw|tz|ua|ug|uk|us|uy|uz|va
|vc|ve|vg|vi|vn|vu|wf|ws|ye|yt|yu|za|zm|zw)\b/?(?!@)))"""
    return re.sub(URL_PATTERN, 'xxurl', text)

def replace_rep(text):
    def _replace_rep(m):
        c,cc = m.groups()
        return f'{c}xxrep'
    re_rep = re.compile(r'(\S)(\1{2,})')
    return re_rep.sub(_replace_rep, text)
```

```
def ungroup_emoji(toks):
    res = []
    for tok in toks:
        if emoji.emoji_count(tok) == len(tok):
            for char in tok:
                res.append(char)
        else:
            res.append(tok)
    return res

def process_text(text):
    #pre rules
    res = text.lower().strip()
    res = replace_url(res)
    res = replace_rep(res)

    #tokenize
    res = [word for word in word_tokenize(res) if word and not re.search(pattern=r"\s+",
string=word)]

    #post rules
    res = ungroup_emoji(res)

    return res
```

Read data

In [4]:

```
with open('train.txt') as f:
    texts = [line.strip() for line in f.readlines()]
f.close()
with open('train_label.txt') as f:
    categories = [line.strip() for line in f.readlines()]
f.close()
all_df = pd.DataFrame({'category':categories, 'texts':texts})
all_df.head()
```

Out[4]:

	category	texts
0	neu	ประเทศเราผลิตและส่งออกยาสูบเยอะสุดในโลกจิงป่าวคับ
1	neu	คะ
2	neg	อิเหี้ยออมทำกูอยากกินเอ็มเค
3	neu	😂😂😂
4	neu	สวัสดีวันพุธ แนน อะไรนะ

In [5]:

```
all_df['processed'] = all_df.texts.map(lambda x: '|'.join(process_text(x)))
all_df['wc'] = all_df.processed.map(lambda x: len(x.split('|')))
all_df['uwc'] = all_df.processed.map(lambda x: len(set(x.split('|'))))
all_df.head()
```

Out[5]:

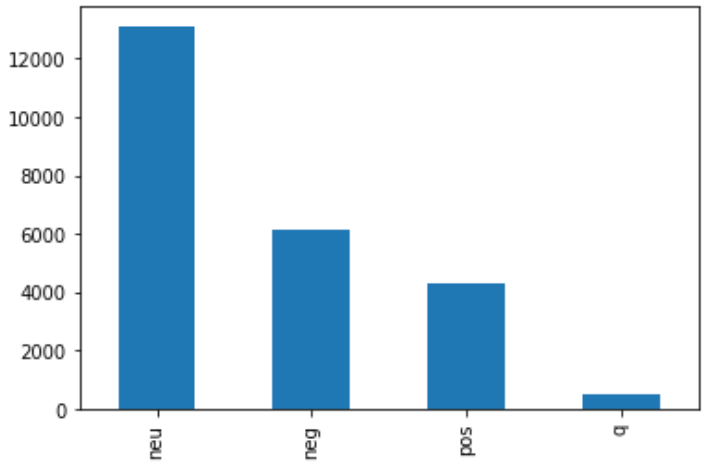
	category	texts	processed	wc	uwc
0	neu	ประเทศเราผลิตและส่งออกยาสูบเยอะสุดในโลกจิงป่าวคับ	ประเทศ|เรา|ผลิต|และ|ส่งออก|ยาสูบ|เยอะ|สุด|ใน|โ...	13	13
1	neu	คะ	คะ	1	1
2	neg	อิเหี้ยออมทำกูอยากกินเอ็มเค	อิ|เหี้ย|ออม|ทำ|กู|อยาก|กิน|เอ็ม|เค	9	9
3	neu	😂😂😂	😂|xxrep	2	2
4	neu	สวัสดีวันพุธ แนน อะไรนะ	สวัสดี|วัน|พุธ|แนน|อะไร|นะ	6	6

In [6]:

```
all_df.category.value_counts().plot.bar()
```

Out[6]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f1ed7d09f10>
```



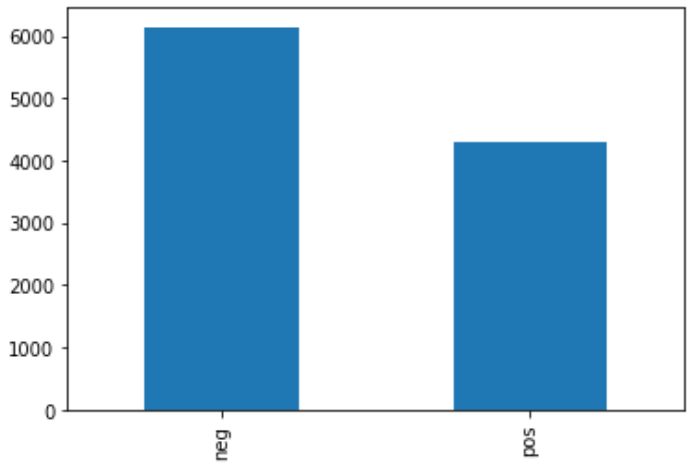
ใช้แค่ neg(negative) & pos(posivive)

In [7]:

```
all_df = all_df[(all_df['category']=='neg') |  (all_df['category']=='pos') ]
all_df.category.value_counts().plot.bar()
```

Out[7]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f1ed66f0b50>
```



In [111]:

```
all_df[all_df['category']=='neg'].head()
```

Out[111]:

	category	texts	processed	wc	uwc
2	**neg**	อิเหี้ยออมทำกูอยากกินเอ็มเค	อิ|เหี้ย|ออม|ทำ|กู|อยาก|กิน|เอ็ม|เค	**9**	**9**
6	**neg**	เน็ตควายมากกูพูดจริงเสียดายตังค์ที่ติดตั้งเน็ต...	เน็ต|ควาย|มาก|กู|พูด|จริง|เสียดาย|ตังค์|ที่|ติ...	**126**	**89**
8	**neg**	เหล้าเบลล์รสชาติเหี้ยสุด จะไม่แดกอีกละ	เหล้า|เบลล์|รสชาติ|เหี้ย|สุด|จะ|ไม่|แดก|อีก|ละ	**11**	**11**
11	**neg**	ลิปมันของแบร์น **Mistine** ราคากลาง ๆ ไม่แพงมาก ร...	ลิป|มัน|ของ|แบร์น|**mistine**|ราคา|กลาง|ๆ|ไม่|แพง...	**18**	**17**
12	**neg**	ทำไมมันไม่มีโปรให้เร๊าาาาาา	ทำ|ไม|มัน|ไม่|มี|โปร|ให้|เร๊า|**xxrep**	**8**	**8**

In [112]:

```
all_df[all_df['category']=='pos'].head()
```

Out[112]:

	category	texts	processed	wc	uwc
10	**pos**	สนใจ ฟอจูนเนอร์ สีขาวครับ	สนใจ|ฟอ|จูน|เนอ|ร์|สี|ขาว|ครับ	**8**	**8**
16	**pos**	ไปดิ..รอไร	ไป|ดิ|..|รอ|ไร	**4**	**4**
19	**pos**	อยากกินบาบีก้อนหรอ**555555**	อยาก|กิน|บา|บี|ก้อน|หรอ|**5|xxrep**	**7**	**7**
22	**pos**	ต้องไปลองกันนะ	ต้อง|ไป|ลอง|กัน|นะ	**5**	**5**
25	**pos**	ขอให้ **SHEENe** มีกิจการรุ่งเรือง ขายดีๆ ยอดไลท์เ...	ขอให้|**sheene**|มี|กิจการ|รุ่งเรือง|ขาย|ดี|ๆ|ยอด|ไ...	**27**	**22**

In [8]:

```
from sklearn.model_selection import train_test_split
train_df, valid_df = train_test_split(all_df, test_size=0.15, random_state=1412)
train_df = train_df.reset_index(drop=True)
valid_df = valid_df.reset_index(drop=True)
```

In [9]:

```
import torch
device = 'cuda' if torch.cuda.is_available() else 'cpu'
device
```

Out[9]:

```
'cuda'
```

In [10]:

```
y_train = train_df['category']
y_valid = valid_df['category']
label_map = {'neg':0,'pos':1}
y_train = np.vectorize(label_map.get)(y_train)
y_valid = np.vectorize(label_map.get)(y_valid)
```

Text feature extraction

In [11]:

```
from sklearn.feature_extraction.text import TfidfVectorizer
```

In [12]:

```
tfidf = TfidfVectorizer(tokenizer=process_text, ngram_range=(1,2), min_df=20, sublinear_
tf=True)
tfidf_fit = tfidf.fit(all_df['texts'])
text_train = tfidf_fit.transform(train_df['texts'])
text_valid = tfidf_fit.transform(valid_df['texts'])
```

```
/home/ml-lab/anaconda3/envs/ptorch/lib/python3.7/site-packages/sklearn/feature_extraction
/text.py:484: UserWarning: The parameter 'token_pattern' will not be used since 'tokenize
r' is not None'
  warnings.warn("The parameter 'token_pattern' will not be used"
```

In [15]:

```
text_train.shape , text_valid.shape
```

Out[15]:

```
((8874, 1772), (1566, 1772))
```

In [16]:

```
x_train = text_train.toarray()
```

```
x_valid = text_valid.toarray()
```

In [22]:

```
class create_model():
    def __init__(self,hid_node = [10],in_features=2,activation=torch.nn.Sigmoid()):
        layers = []
        for i in range(len(hid_node)):
            if i == 0:
                layers.append(torch.nn.Linear(in_features=in_features,out_features=hid_n
ode[i]))
            else :
                layers.append(torch.nn.Linear(in_features=hid_node[i-1],out_features=hid
_node[i]))
            layers.append(activation)
        layers.append(torch.nn.Linear(in_features=hid_node[-1],out_features=1))
        layers.append(activation)
        self.model = torch.nn.Sequential(*layers).to(device)
        self.log_loss = []
        self.test_loss = []

    def predict(self,x):
        x = torch.Tensor(x).to(device)
        pred = self.model(x)
        pred = pred.reshape(-1)
        pred = (pred > 0.5).int().cpu().numpy()
        return pred
    def evaluate(self,x,y):
        x = torch.Tensor(x).to(device)
        y = torch.Tensor(y).to(device)
        pred = self.model(x)
        pred = pred.reshape(-1)
        pred = (pred > 0.5).int()
        return (pred == y).int().sum().cpu().numpy()/len(y)
    def train(self,x,y,epoch,opt,loss_fn = torch.nn.BCELoss(),lr=0.001 ,val_data = None)
:
        opt = opt(self.model.parameters(),lr=lr)
        x = torch.Tensor(x).to(device)
        y = torch.Tensor(y).to(device)
        ep_bar = tqdm(total=epoch, desc='Epoch')
        if val_data is not None :
            x_val = torch.Tensor(val_data[0]).to(device)
            y_val = torch.Tensor(val_data[1]).to(device)
        for i in range(epoch):
            pred = self.model(x)
            pred = pred.reshape(-1)
            opt.zero_grad()
            loss = loss_fn(pred,y)
            loss.backward()
            opt.step()
            self.log_loss.append(loss.item())
            if val_data is not None :
                self.test_loss.append(loss_fn(self.model(x_val).reshape(-1),y_val))
            ep_bar.set_postfix({'Loss':+loss.item()})
            ep_bar.update(1)
```

In [18]:

```
from tqdm.notebook import tqdm
```

1 Neural Network Classifier แบบ 1 Hidden Layer

1.1 ทดลองปรับค่าจำนวน Node ใน Hidden Layer จากน้อยไปมาก แล้ววิเคราะห์ผลการ Training

1 Node

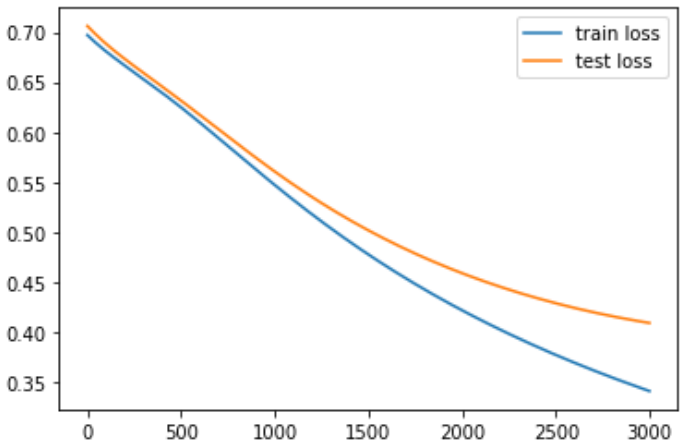
In [29]:

```
model = create_model([1],in_features=x_train.shape[1]) #1 Node
model.train(x_train,y_train,epoch=3000,opt=torch.optim.Adam,loss_fn=torch.nn.functional.
binary_cross_entropy
            , lr=0.001,val_data=(x_valid,y_valid))
print('accuracy',model.evaluate(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
plt.legend(['train loss','test loss'])
```

```
accuracy 0.8352490421455939
```

Out[29]:

```
<matplotlib.legend.Legend at 0x7f1e84dc30d0>
```



2 Node

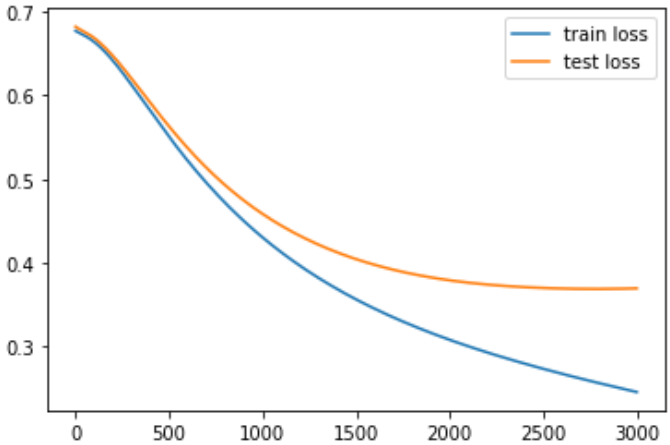
In [28]:

```
model = create_model([2],in_features=x_train.shape[1]) #2 Node
model.train(x_train,y_train,epoch=3000,opt=torch.optim.Adam,loss_fn=torch.nn.functional.
binary_cross_entropy
            , lr=0.001,val_data=(x_valid,y_valid))
print('accuracy',model.evaluate(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
plt.legend(['train loss','test loss'])
```

```
accuracy 0.8416347381864623
```

Out[28]:

```
<matplotlib.legend.Legend at 0x7f1e84efac50>
```



4 Node

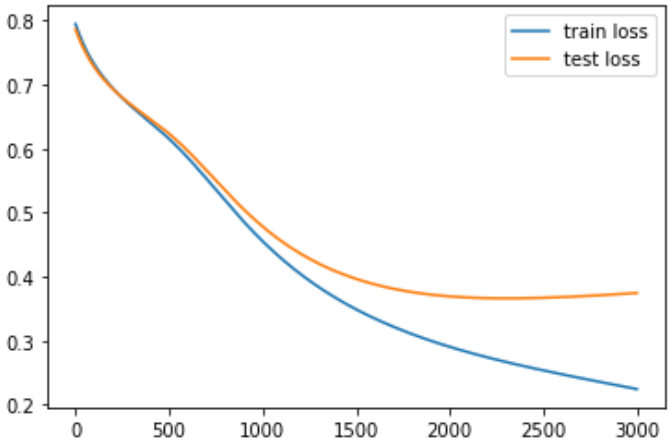
In [25]:

```
model = create_model([4],in_features=x_train.shape[1]) #4 Node
model.train(x_train,y_train,epoch=3000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss() ,

            lr=0.001,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

```
accuracy 0.8422733077905492
```

Out[25]:

```
<matplotlib.legend.Legend at 0x7f1e85658a90>
```



6 Node

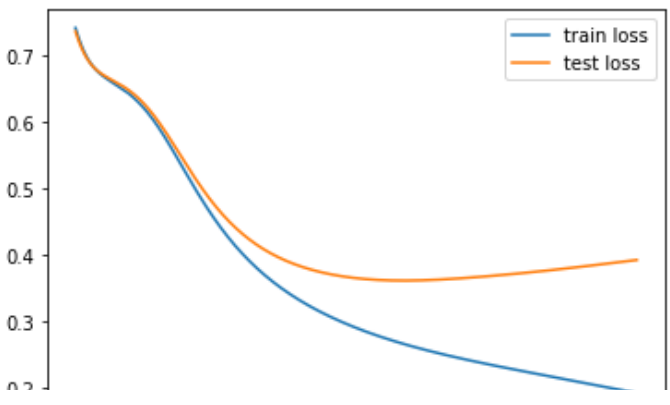
In [26]:

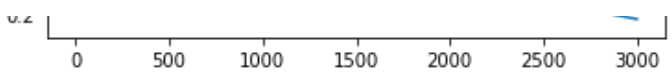
```
model = create_model([6],in_features=x_train.shape[1]) #6 Node
model.train(x_train,y_train,epoch=3000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss() ,

            lr=0.001,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

```
accuracy 0.8409961685823755
```

Out[26]:

```
<matplotlib.legend.Legend at 0x7f1e84be8e10>
```





10 Node

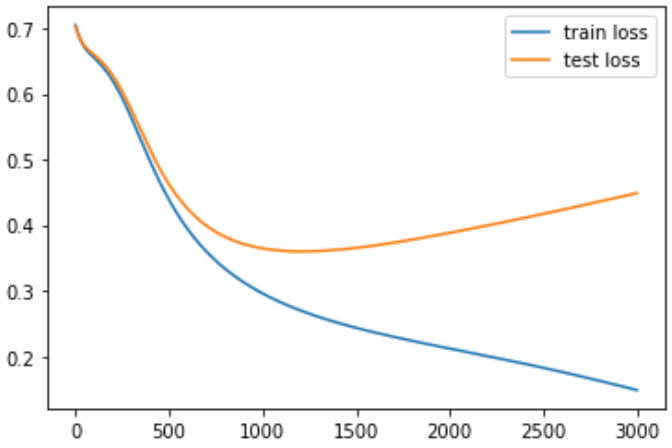
In [27]:

```
model = create_model([10],in_features=x_train.shape[1]) #10 Node
model.train(x_train,y_train,epoch=3000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss() ,

            lr=0.001,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

```
accuracy 0.834610472541507
```

Out[27]:

```
<matplotlib.legend.Legend at 0x7f1e849b8b50>
```



สรุป การกำหนด Node น้อยเกินไปจะทำให้ Model underfit แต่การกำหนด Node มากเกินไปจะทำให้ Model เข้าสู่ Overfit มาก

1.2. ทดลองปรับค่า Learning Rate จากน้อยไปมาก แล้ววิเคราะห์ผลการ Training

Use 4 Node

Learning Rate = 0.1

In [36]:

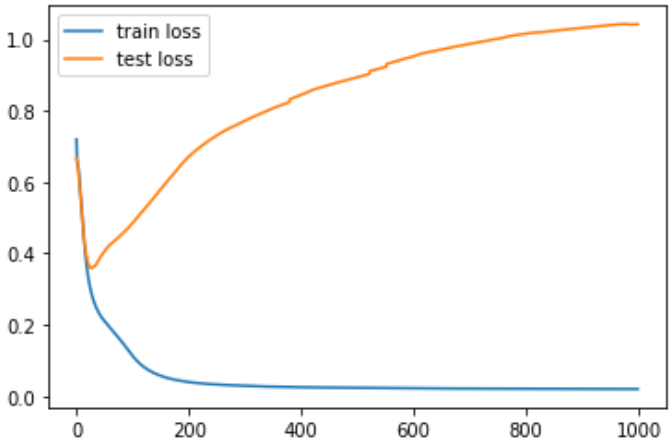
```
model = create_model([4],in_features=x_train.shape[1]) #4 Node
model.train(x_train,y_train,epoch=1000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss() ,

            lr=0.1,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

```
accuracy 0.8256704980842912
```

Out[36]:

Out[36]:

<matplotlib.legend.Legend at 0x7f1e83f183d0>



Learning Rate = 0.01

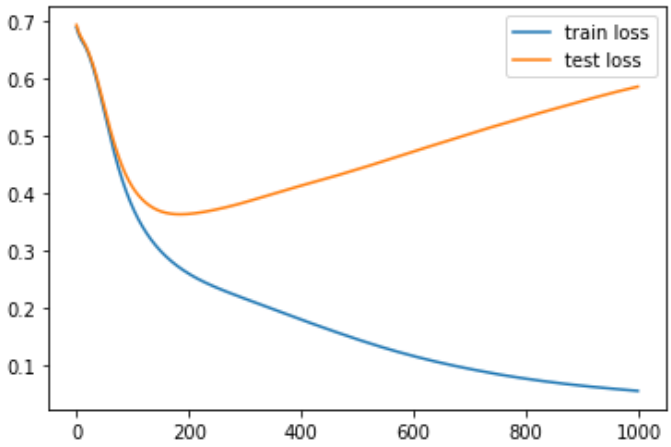
In [37]:

```
model = create_model([4],in_features=x_train.shape[1]) #4 Node
model.train(x_train,y_train,epoch=1000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss() ,

            lr=0.01,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

accuracy 0.8301404853128991

Out[37]:

<matplotlib.legend.Legend at 0x7f1e8405b350>



Learning Rate = 0.001

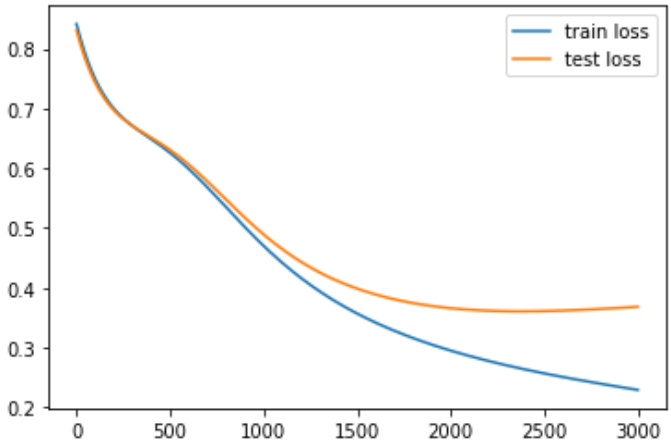
In [38]:

```
model = create_model([4],in_features=x_train.shape[1]) #4 Node
model.train(x_train,y_train,epoch=3000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss() ,

            lr=0.001,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

```
accuracy 0.8409961685823755
```

Out[38]:

```
<matplotlib.legend.Legend at 0x7f1e42fe2890>
```



Learning Rate = 0.0001

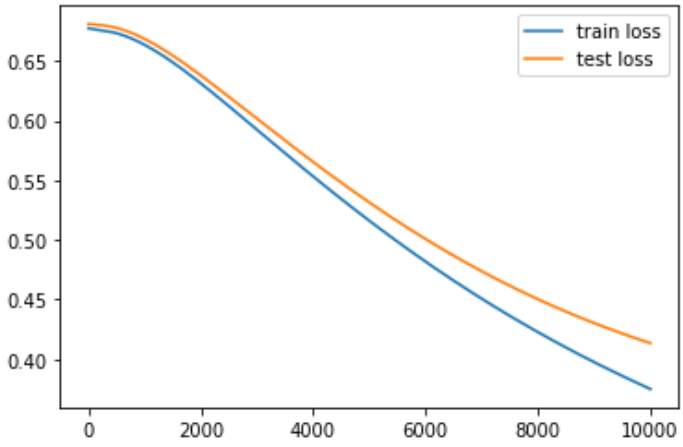
In [34]:

```
model = create_model([4],in_features=x_train.shape[1]) #4 Node
model.train(x_train,y_train,epoch=10000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss()
,
            lr=0.0001,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

```
accuracy 0.8365261813537676
```

Out[34]:

```
<matplotlib.legend.Legend at 0x7f1e84055bd0>
```



Learning Rate = 0.00001

In [35]:

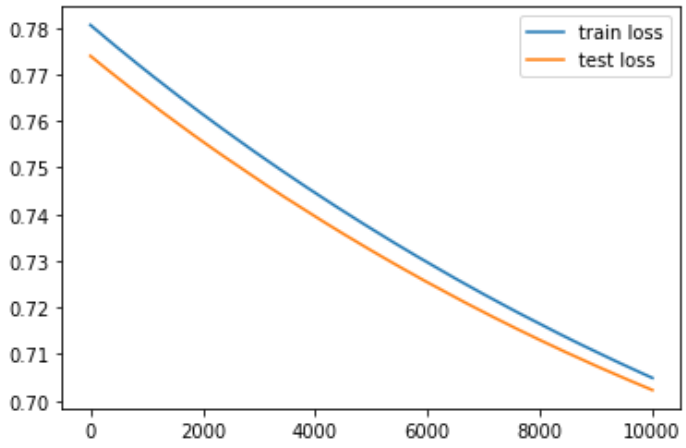
```
model = create_model([4],in_features=x_train.shape[1]) #4 Node
model.train(x_train,y_train,epoch=10000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss()
,
            lr=0.00001,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
```

```
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

```
accuracy 0.4220945083014049
```

Out[35]:

```
<matplotlib.legend.Legend at 0x7f1e840ae550>
```



สรุป การกำหนด Learning rate น้อยเกินไปทำให้ Model เข้าสู่ Optimum point ช้า แต่การกำหนดมากเกินไปก็ทำให้ไปไม่ถึงและเข้าสู่ overfit ไว

1.3. ทดลองการ Random Initial weight หรือทดลองการกำหนดให้ Initial Weight มีค่าคงที่ ให้ผลแตกต่างกันอย่างไร

Weight , Bias = 0

In [106]:

```
model = create_model([4],in_features=x_train.shape[1]) #4 Node
```

In [107]:

```
model.model[0].weight
```

Out[107]:

```
Parameter containing:
tensor([[-0.0201, -0.0147,  0.0126,  ...,  0.0191,  0.0182, -0.0099],
        [-0.0026, -0.0099, -0.0024,  ...,  0.0029, -0.0074, -0.0077],
        [-0.0011, -0.0206, -0.0084,  ..., -0.0131,  0.0073,  0.0120],
        [ 0.0011, -0.0063, -0.0231,  ..., -0.0036,  0.0225, -0.0052]],
       device='cuda:0', requires_grad=True)
```

In [108]:

```
model.model[0].bias
```

Out[108]:

```
Parameter containing:
tensor([ 0.0043, -0.0021, -0.0162, -0.0154], device='cuda:0',
       requires_grad=True)
```

In [109]:

```
model.model[0].weight = torch.nn.Parameter(torch.zeros_like(model.model[0].weight))
model.model[0].bias = torch.nn.Parameter(torch.zeros_like(model.model[0].bias))
model.model[2].weight = torch.nn.Parameter(torch.zeros_like(model.model[2].weight))
model.model[2].bias = torch.nn.Parameter(torch.zeros_like(model.model[2].bias))
```

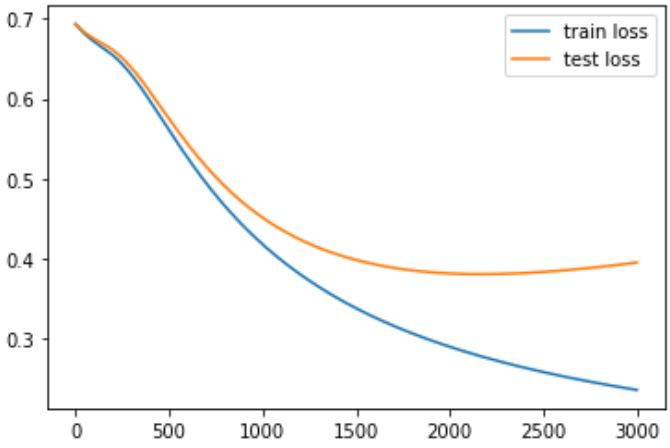
In [110]:

```
model.train(x_train,y_train,epoch=3000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss() ,

            lr=0.001,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

```
accuracy 0.8352490421455939
```

Out[110]:

```
<matplotlib.legend.Legend at 0x7f1e3cb6ad10>
```



Weight , Bias = 1

In [98]:

```
model = create_model([4],in_features=x_train.shape[1]) #4 Node
model.model[0].weight = torch.nn.Parameter(torch.ones_like(model.model[0].weight))
model.model[0].bias = torch.nn.Parameter(torch.ones_like(model.model[0].bias))
model.model[2].weight = torch.nn.Parameter(torch.ones_like(model.model[2].weight))
model.model[2].bias = torch.nn.Parameter(torch.ones_like(model.model[2].bias))
```

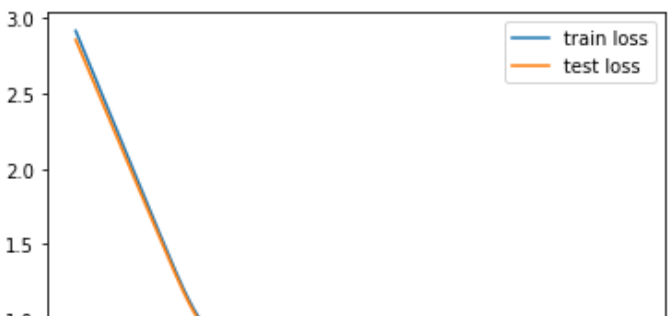
In [99]:

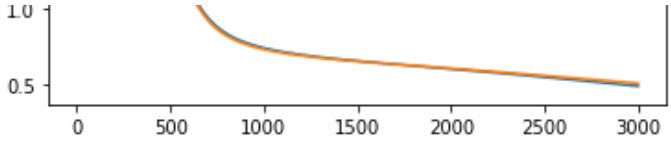
```
model.train(x_train,y_train,epoch=3000,opt=torch.optim.Adam,loss_fn=torch.nn.BCELoss() ,

            lr=0.001,val_data=(x_valid,y_valid))
# plot loss vs epoch
plt.plot(model.log_loss)
plt.plot(model.test_loss)
print('accuracy',model.evaluate(x_valid,y_valid))
plt.legend(['train loss','test loss'])
```

```
accuracy 0.8314176245210728
```

Out[99]:

```
<matplotlib.legend.Legend at 0x7f1e3cd19050>
```





สรุป การกำหนด Initial weight มีผลต่อการลู่เข้าสู่ optimum point

2 ทดลองสร้าง Neural Network Classifier โดยใช้ Training Data ทั้ง 4 แบบ (Gaussjan, XOR, Circular, and Spiral Distributions) ที่ได้ทำไว้ในการบ้านครั้งที่ 2 และ 3 การทดสอบ Neural Network Classifier ใช้ข้อมูลจาก Testing Data ในการทดสอบวัดผลเพื่อหาค่า Classification Error ให้ Plot ผลจากการ Classify โดยใช้ 4 สี เหมือนการบ้านที่ 3 และให้ให้ Plot decision boundary ของแต่ละกรณี

In [113]:

```
!wget https://raw.githubusercontent.com/layel2/pattern-course-ku/main/datagen.py
```

```
--2020-10-21 10:51:31--  https://raw.githubusercontent.com/layel2/pattern-course-ku/main/datagen.py
Resolving raw.githubusercontent.com (raw.githubusercontent.com)... 151.101.8.133
Connecting to raw.githubusercontent.com (raw.githubusercontent.com)|151.101.8.133|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 3967 (3.9K) [text/plain]
Saving to: 'datagen.py'

datagen.py          100%[===================>]   3.87K  --.-KB/s    in 0s

2020-10-21 10:51:31 (25.4 MB/s) - 'datagen.py' saved [3967/3967]
```

In [114]:

```
class model_kernel():
    def __init__(self,base_model,kenel):
        self.model = base_model
        self.kenel = kenel
    def predict(self,x):
        x = self.kenel(x)

        return self.model.predict(x)
```

In [115]:

```
def hw_pipe(x,y,hid_node=[5],epoch=200,kernel=None):
    #split data
    xtrain,xtest,ytrain,ytest = train_test_split(x,y,test_size=0.5)
    #plot
    datagen.myplot(x,y,'Data')
    #model
    if kernel is not None :
        xtrain = kernel(xtrain)
        model = create_model(hid_node,in_features=xtrain.shape[1])
        model.train(xtrain,ytrain,epoch=epoch,opt=torch.optim.Adam,loss_fn=torch.nn.MSELoss())
        pred = model.predict(kernel(xtest))
        print("Accuracy : ",sum(pred==ytest)/len(ytest))
        model_k = model_kernel(model,kernel)
        datagen.pred_plot(xtest,ytest,pred)
        datagen.plot_decisionBoundary(model_k,xtest,ytest)
    else :
        model = create_model(hid_node)
        model.train(xtrain,ytrain,epoch=epoch,opt=torch.optim.Adam,loss_fn=torch.nn.MSEL
```

```
oss())
        pred = model.predict(xtest)
        print("Accuracy : ",sum(pred==ytest)/len(ytest))
        datagen.pred_plot(xtest,ytest,pred)
        datagen.plot_decisionBoundary(model,xtest,ytest)
```

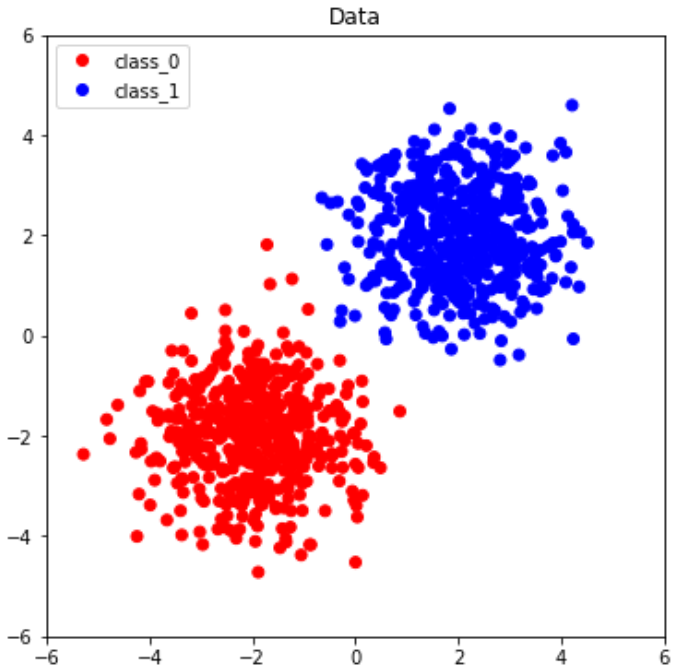
In [117]:

```
import datagen
```

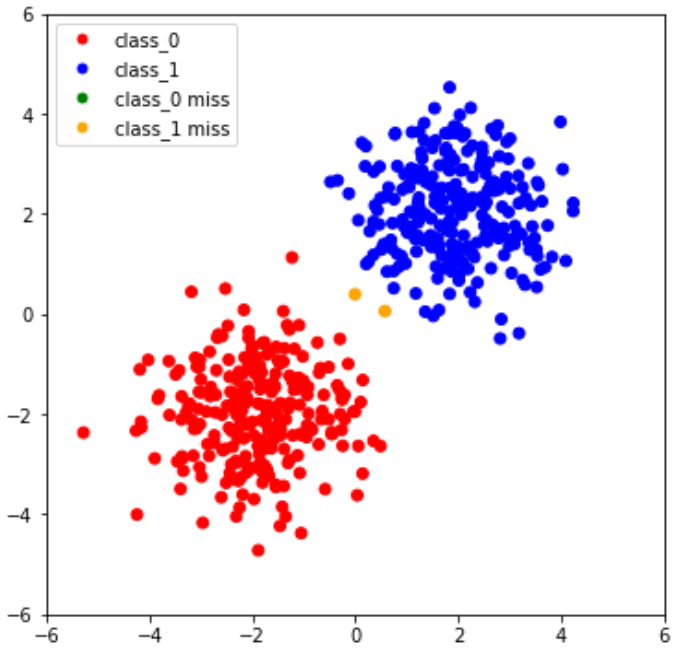
2.1 Gaussian

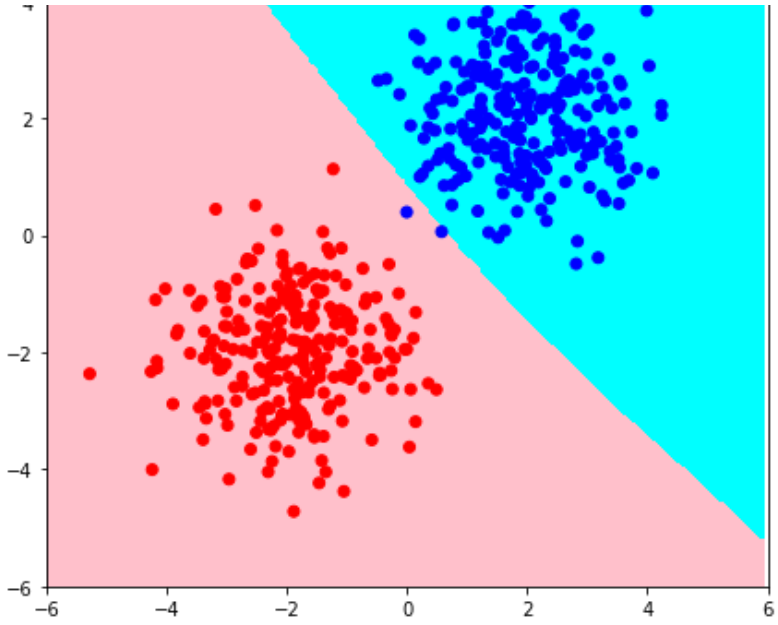
In [118]:

```
x,y = datagen.gaussian()
hw_pipe(x,y)
```




```
Accuracy :  0.996
```

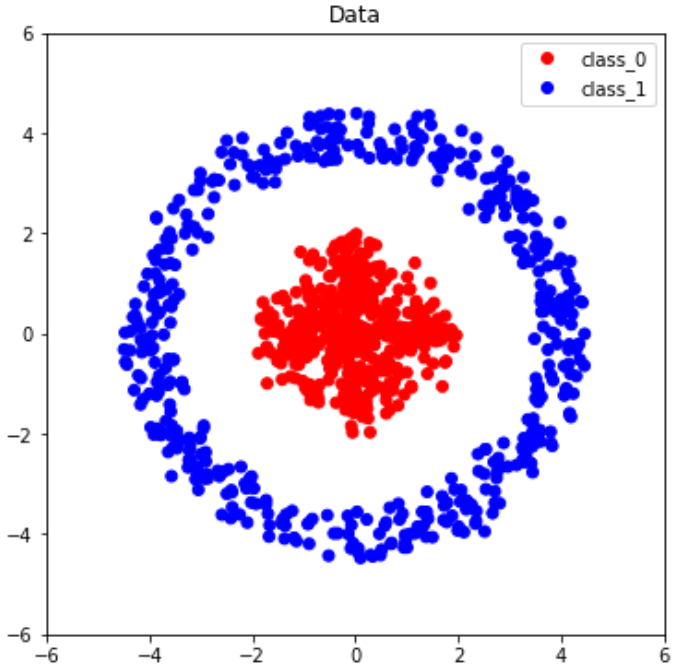




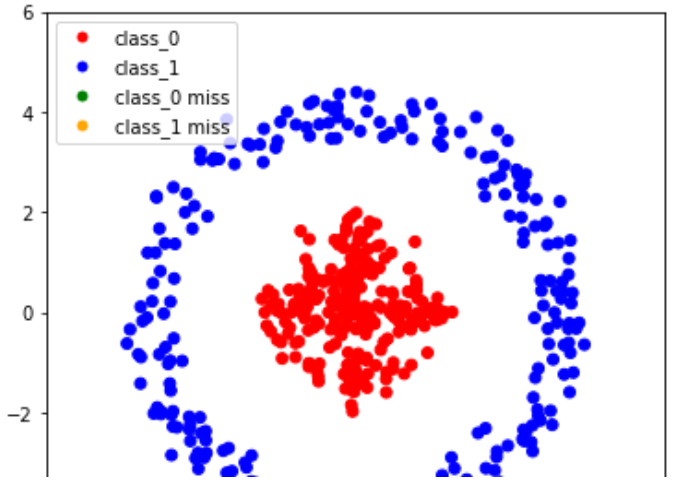
2.2 Circular

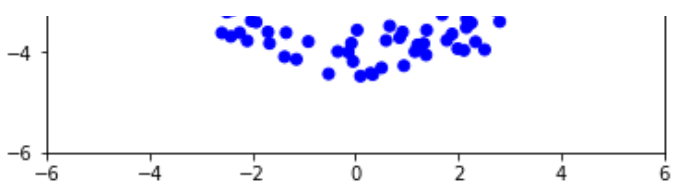
In [119]:

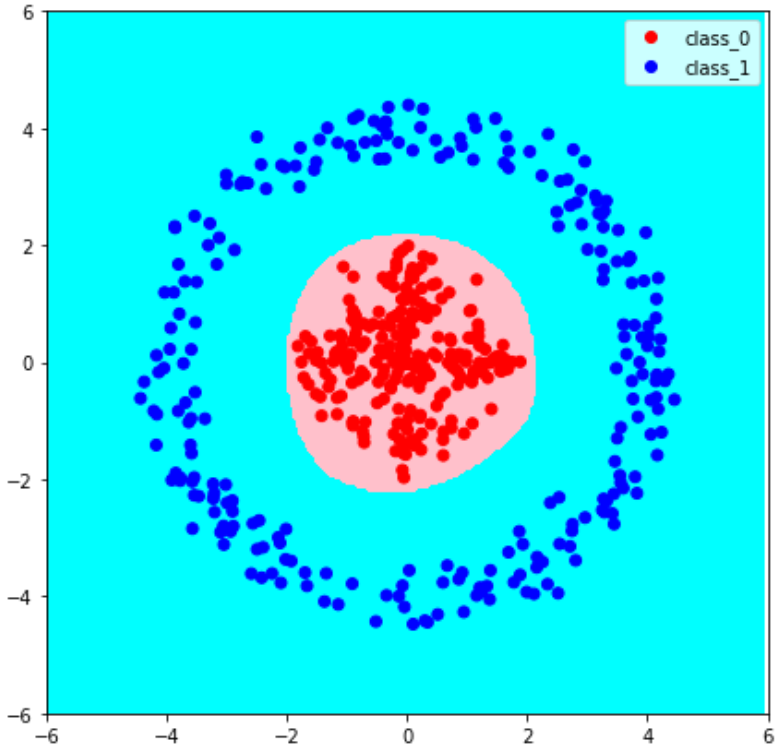
```
x,y = datagen.circular()
hw_pipe(x,y,hid_node=[10],epoch=1000)
```




```
Accuracy :  1.0
```



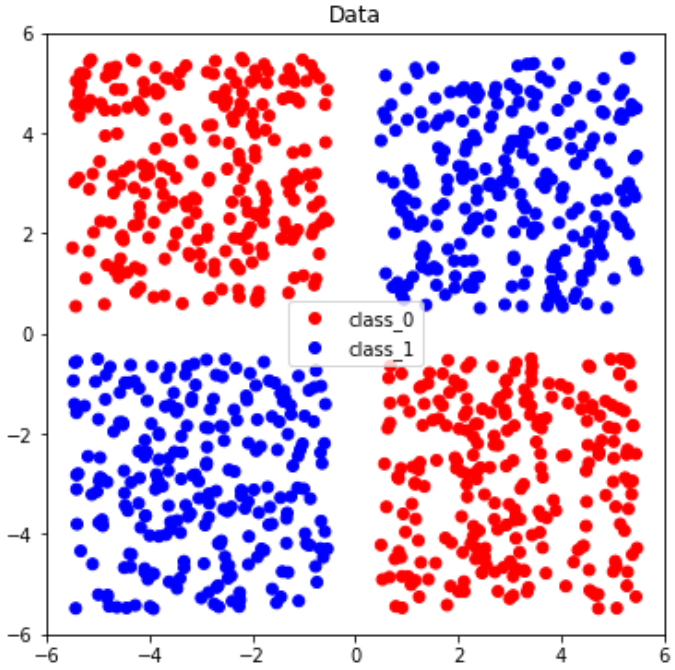




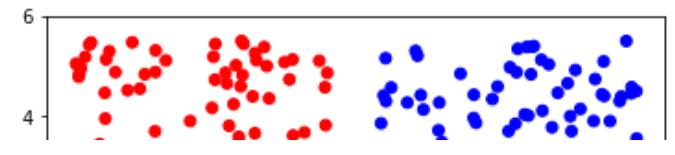
2.3 XOR

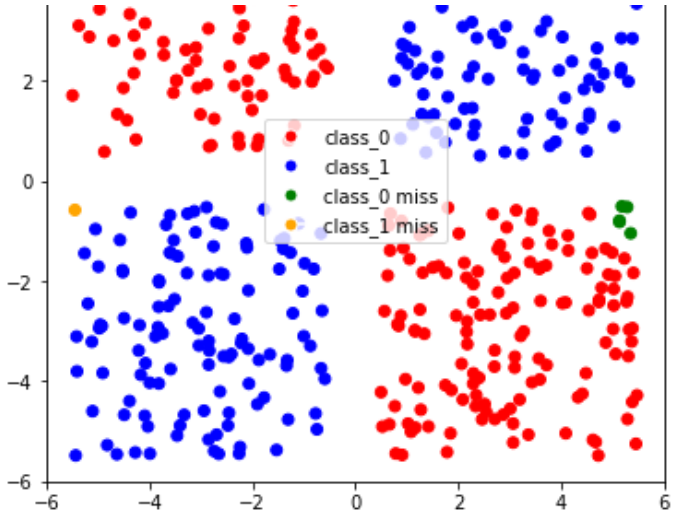
In [120]:

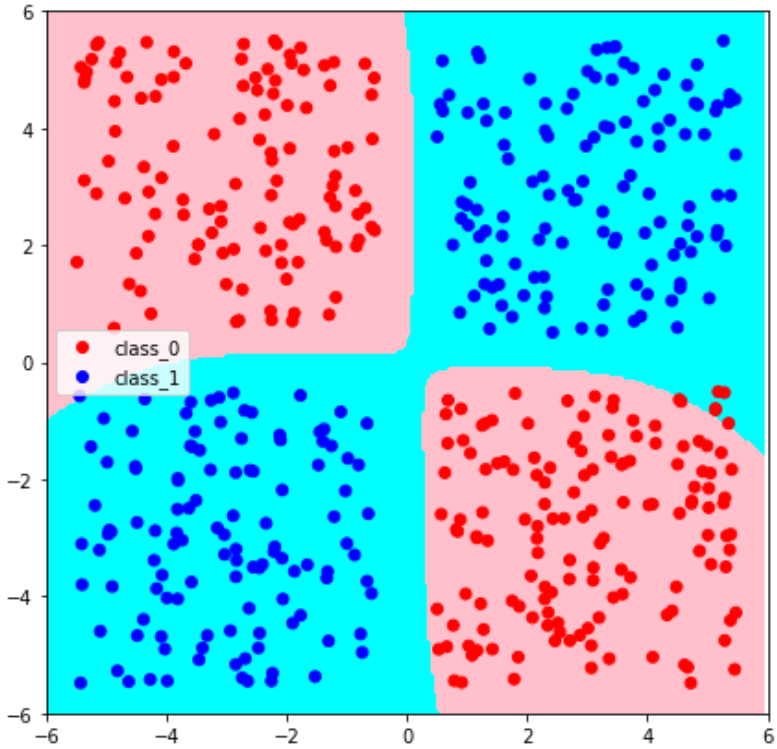
```
x,y = datagen.xor()
hw_pipe(x,y,hid_node=[10],epoch=1000)
```




```
Accuracy :  0.988
```



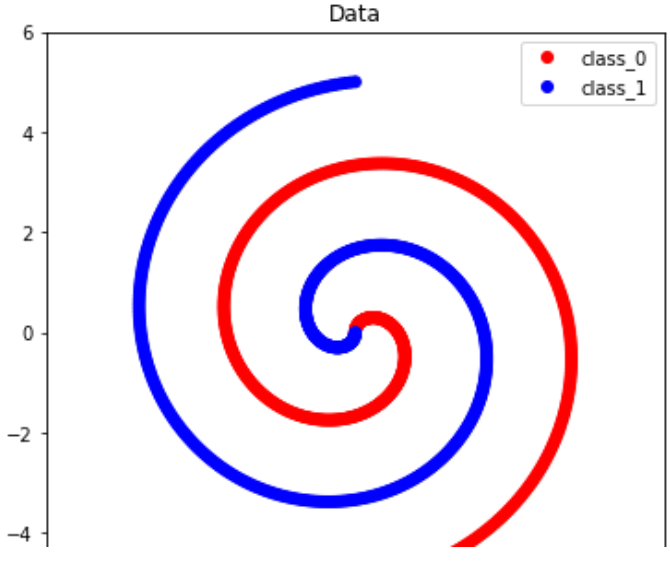


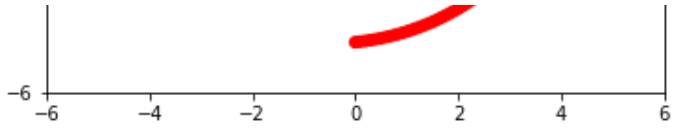


2.4 Spiral

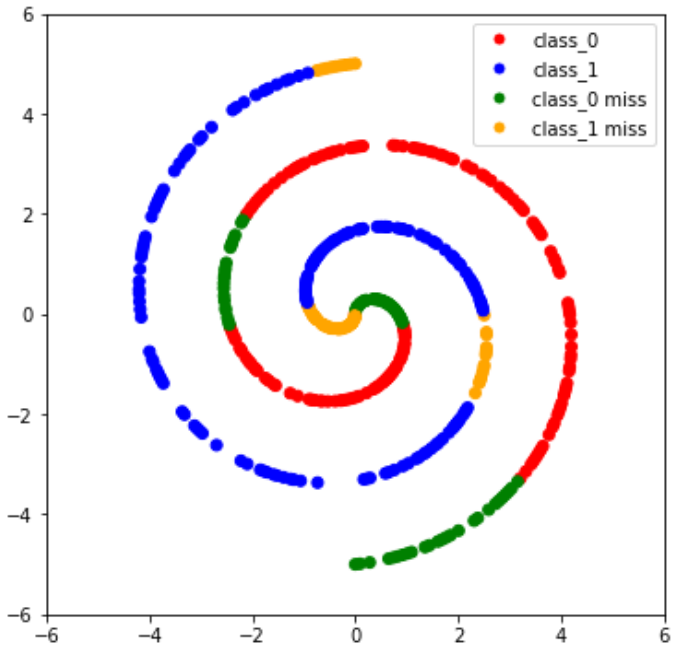
In [124]:

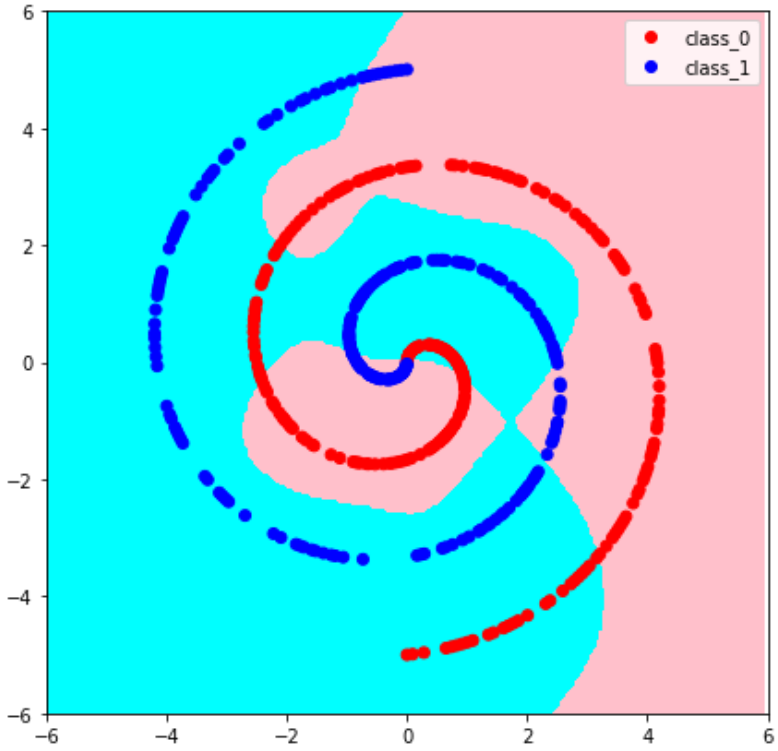
```
x,y = datagen.spiral()
def kernel_sine(x):
    return np.c_[x,np.sin(x)]
hw_pipe(x,y,hid_node=[10],epoch=1000,kernel=kernel_sine)
```





```
Accuracy :  0.66
```

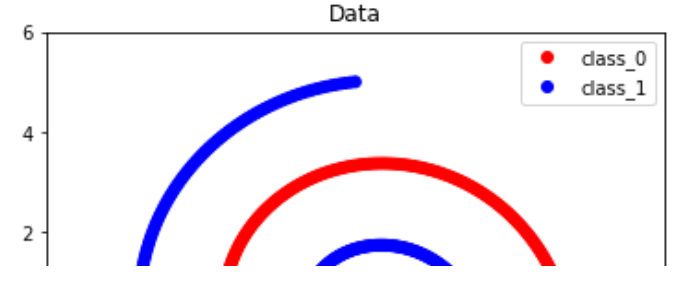


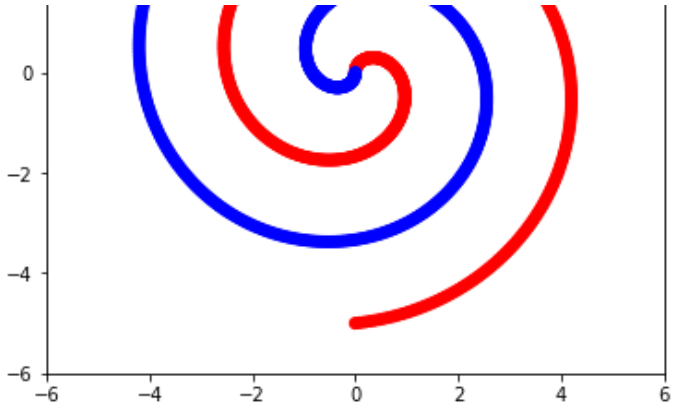


เพิ่มเป็น 2 hidden layers

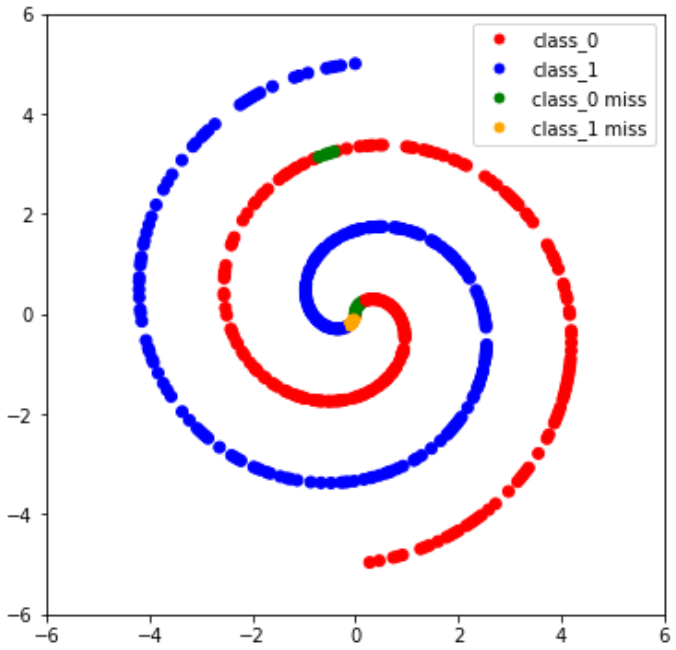
In [126]:

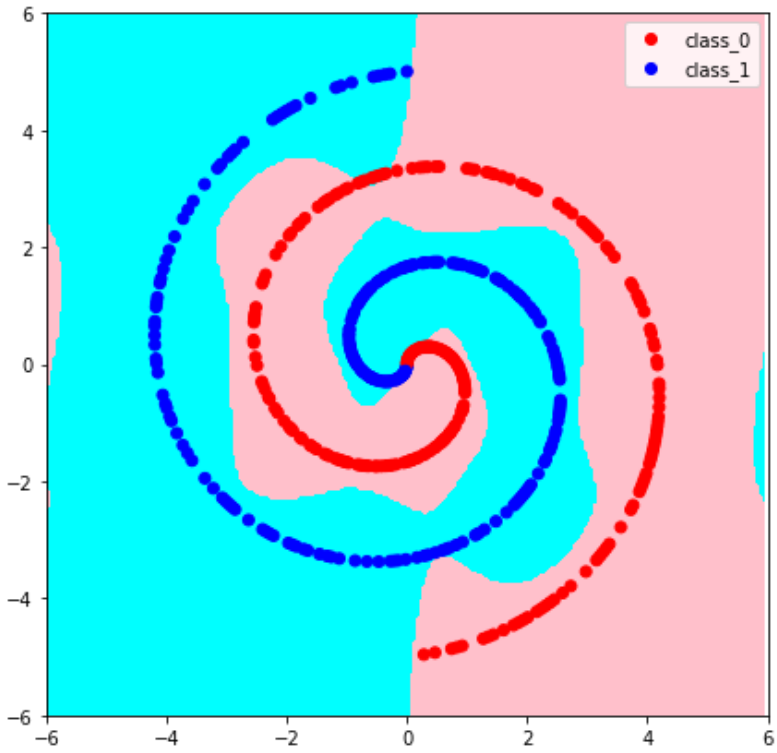
```
hw_pipe(x,y,hid_node=[10,10],epoch=1000,kernel=kernel_sine)
```






```
Accuracy :  0.934
```





In [ ]: