To demonstrate perceptron cannot solve xor gate (non-linear problem)

In [1]:

```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:

```
or_data = pd.DataFrame()
and_data = pd.DataFrame()
xor_data = pd.DataFrame()
```

In [3]:

```
or_data['input1']=[1,1,0,0]
or_data['input2']=[1,0,1,0]
or_data['output']=[1,1,1,0]
```

In [4]:

```
and_data['input1']=[1,1,0,0]
and_data['input2']=[1,0,1,0]
and_data['output']=[1,0,0,0]
```

In [5]:

```
xor_data['input1']=[1,1,0,0]
xor_data['input2']=[1,0,1,0]
xor_data['output']=[0,1,1,0]
```

In [6]:

```
or_data
```

Out[6]:

	input1	input2	output
0	1	1	1
1	1	0	1
2	0	1	1
3	0	0	0

In [7]:

```
and_data
```

Out[7]:

	input1	input2	output
0	1	1	1
1	1	0	0
2	0	1	0
3	0	0	0

In [8]:

```
xor_data
```

Out[8]:

	input1	input2	output
0	1	1	0
1	1	0	1
2	0	1	1
3	0	0	0

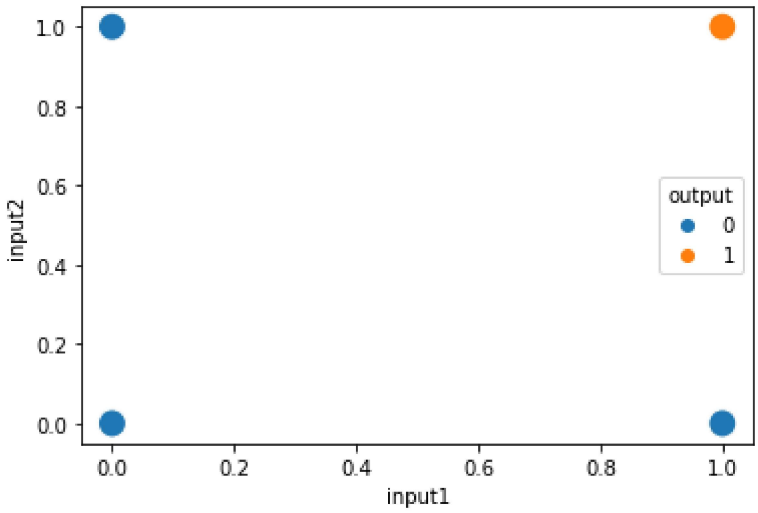
In [9]:

```
sns.scatterplot(and_data['input1'],and_data['input2'], hue=and_data['output'],s=200)
```

```
C:\Users\MSCIT\anaconda3\lib\site-packages\seaborn\_decorators.py:36: Future
Warning: Pass the following variables as keyword args: x, y. From version 0.
12, the only valid positional argument will be `data`, and passing other arg
uments without an explicit keyword will result in an error or misinterpretat
ion.
  warnings.warn(
```

Out[9]:

```
<AxesSubplot:xlabel='input1', ylabel='input2'>
```



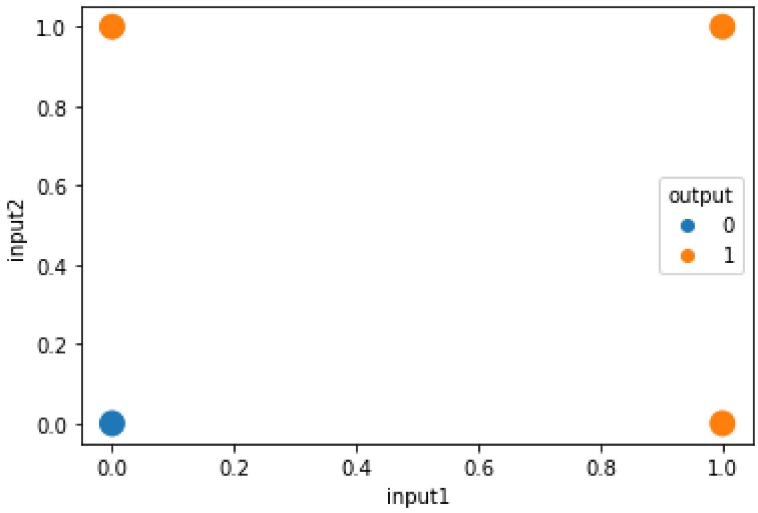
In [10]:

```
sns.scatterplot(or_data['input1'],or_data['input2'], hue=or_data['output'],s=200)
```

```
C:\Users\MSCIT\anaconda3\lib\site-packages\seaborn\_decorators.py:36: Future
Warning: Pass the following variables as keyword args: x, y. From version 0.
12, the only valid positional argument will be `data`, and passing other arg
uments without an explicit keyword will result in an error or misinterpretat
ion.
  warnings.warn(
```

Out[10]:

```
<AxesSubplot:xlabel='input1', ylabel='input2'>
```



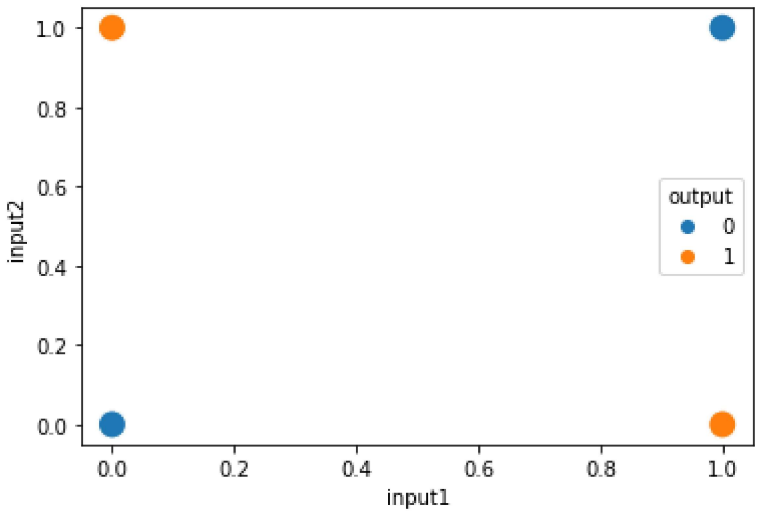
In [11]:

```
sns.scatterplot(xor_data['input1'],xor_data['input2'], hue=xor_data['output'],s=200)
```

```
C:\Users\MSCIT\anaconda3\lib\site-packages\seaborn\_decorators.py:36: Future
Warning: Pass the following variables as keyword args: x, y. From version 0.
12, the only valid positional argument will be `data`, and passing other arg
uments without an explicit keyword will result in an error or misinterpretat
ion.
  warnings.warn(
```

Out[11]:

```
<AxesSubplot:xlabel='input1', ylabel='input2'>
```



In [12]:

```
from sklearn.linear_model import Perceptron
clf1= Perceptron()
clf2= Perceptron()
clf3= Perceptron()
```

In [13]:

```
clf1.fit(and_data.iloc[:,0:2].values,and_data.iloc[:,-1].values)
clf2.fit(or_data.iloc[:,0:2].values,or_data.iloc[:,-1].values)
clf3.fit(xor_data.iloc[:,0:2].values,xor_data.iloc[:,-1].values)
```

Out[13]:

```
Perceptron()
```

In [14]:

```
clf1.coef_
```

Out[14]:

```
array([[2., 2.]])
```

In [15]:

```
clf1.intercept_
```

Out[15]:

```
array([-2.])
```

In [16]:

```
clf2.coef_
```

Out[16]:

```
array([[2., 2.]])
```

In [17]:

```
clf2.intercept_
```

Out[17]:

```
array([-1.])
```

In [18]:

```
clf3.coef_
```

Out[18]:

```
array([[0., 0.]])
```

In [19]:

```
clf3.intercept_
```

Out[19]:

```
array([0.])
```

In [20]:

```
x=np.linspace(-1,1,5)
y=-x+1
```

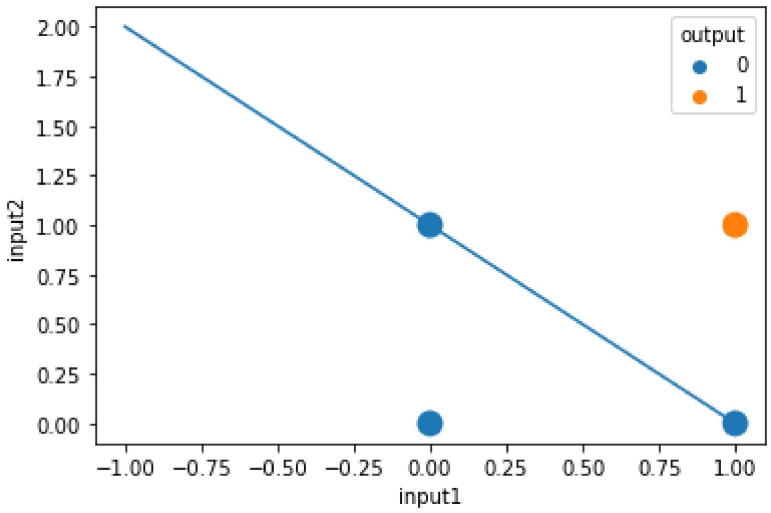
In [21]:

```
plt.plot(x,y)
sns.scatterplot(and_data['input1'],and_data['input2'],and_data['output'],s=200)
```

```
C:\Users\MSCIT\anaconda3\lib\site-packages\seaborn\_decorators.py:36: Future
Warning: Pass the following variables as keyword args: x, y, hue. From versi
on 0.12, the only valid positional argument will be `data`, and passing othe
r arguments without an explicit keyword will result in an error or misinterp
retation.
  warnings.warn(
```

Out[21]:

```
<AxesSubplot:xlabel='input1', ylabel='input2'>
```



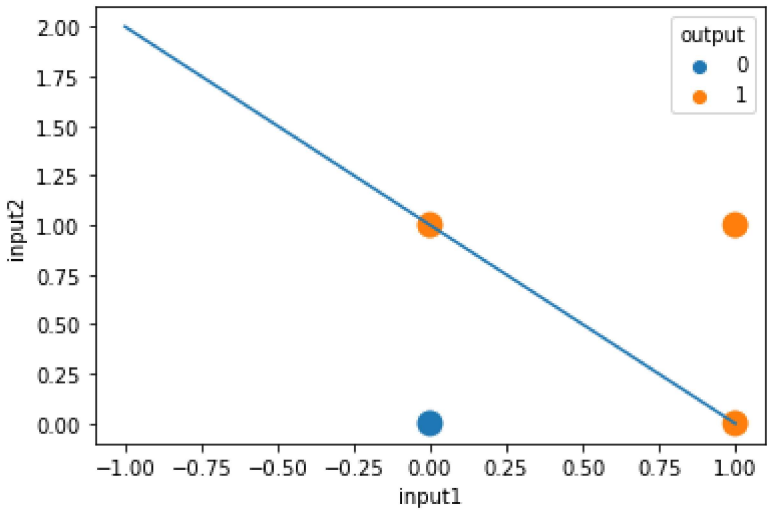
In [22]:

```
plt.plot(x,y)
sns.scatterplot(or_data['input1'],or_data['input2'],or_data['output'],s=200)
```

```
C:\Users\MSCIT\anaconda3\lib\site-packages\seaborn\_decorators.py:36: Future
Warning: Pass the following variables as keyword args: x, y, hue. From versi
on 0.12, the only valid positional argument will be `data`, and passing othe
r arguments without an explicit keyword will result in an error or misinterp
retation.
  warnings.warn(
```

Out[22]:

```
<AxesSubplot:xlabel='input1', ylabel='input2'>
```



In [23]:

```
x1=np.linspace(-1,1,5)
y1=-x+0.5
```

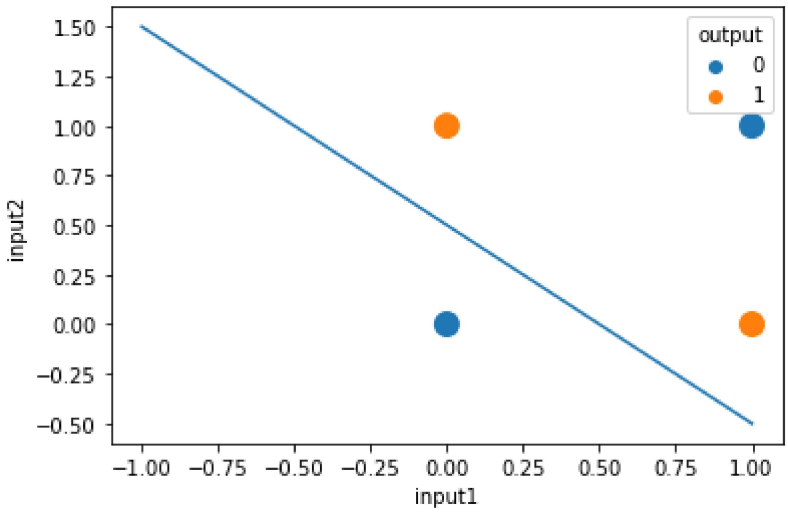
In [24]:

```
plt.plot(x1,y1)
sns.scatterplot(xor_data['input1'],xor_data['input2'],xor_data['output'],s=200)
```

```
C:\Users\MSCIT\anaconda3\lib\site-packages\seaborn\_decorators.py:36: Future
Warning: Pass the following variables as keyword args: x, y, hue. From versi
on 0.12, the only valid positional argument will be `data`, and passing othe
r arguments without an explicit keyword will result in an error or misinterp
retation.
  warnings.warn(
```

Out[24]:

```
<AxesSubplot:xlabel='input1', ylabel='input2'>
```



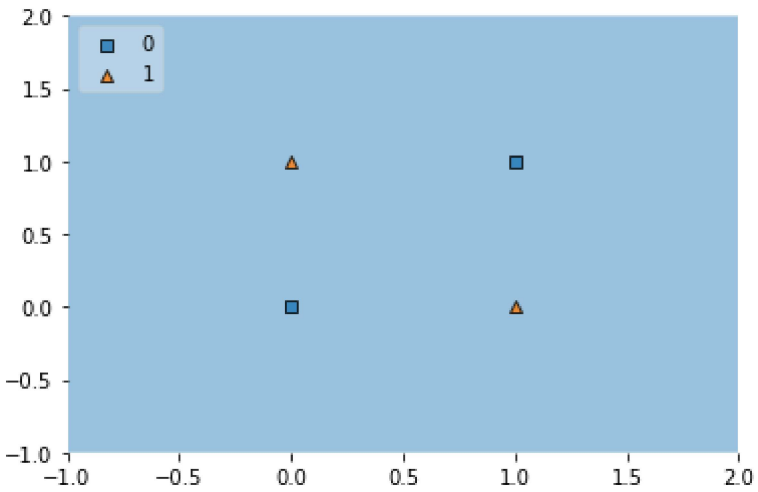
In [25]:

```
from mlxtend.plotting import plot_decision_regions
plot_decision_regions(xor_data.iloc[:,0:2].values,xor_data.iloc[:,-1].values, clf=clf3, leg
```

```
C:\Users\MSCIT\anaconda3\lib\site-packages\mlxtend\plotting\decision_region
s.py:243: UserWarning: No contour levels were found within the data range.
  ax.contour(xx, yy, Z, cset.levels,
```

Out[25]:

```
<AxesSubplot:>
```



In [ ]: