Pooja Raskar

```
import numpy as np
import matplotlib.pyplot as plt
from keras.models import Sequential
from keras.layers import Dense
```

```
# Prepare the dataset for AND gate
X_and = np.array([[0, 0],
 [0, 1],
 [1, 0],
 [1, 1]])
y_and = np.array([[0], [0], [0], [1]]) # AND gate outputs
```

```
# Prepare the dataset for NAND gate
X_nand = np.array([[0, 0],
 [0, 1],
 [1, 0],
 [1, 1]])
y_nand = np.array([[1], [1], [1], [0]]) # NAND gate outputs
```

```
# Function to create and train the model
def create_and_train_model(X, y):
 # Create the model
 model = Sequential()
 model.add(Dense(2, input_dim=2, activation='sigmoid')) # Hidden layer
 model.add(Dense(1, activation='sigmoid')) # Output layer
 # Compile the model
 model.compile(loss='binary_crossentropy', optimizer='adam', metrics=['accuracy'])
 # Train the model
 model.fit(X, y, epochs=5000, verbose=0)
 return model
```

```
# Train the AND gate model
and_model = create_and_train_model(X_and, y_and)
print("AND Gate Predictions:")
print(and_model.predict(X_and))
```

```
AND Gate Predictions:
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 60ms/step
[[0.00312855]
 [0.02858798]
 [0.0251251 ]
 [0.94285315]]
```

```
# Train the NAND gate model
nand_model = create_and_train_model(X_nand, y_nand)
print("\nNAND Gate Predictions:")
print(nand_model.predict(X_nand))
```

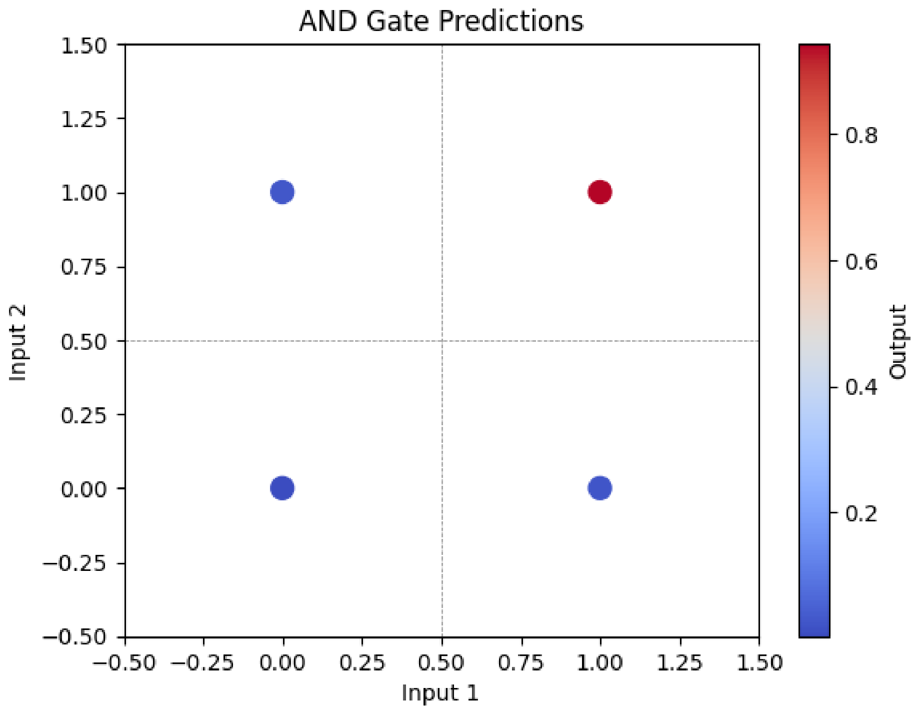
```

NAND Gate Predictions:
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 61ms/step
[[0.9972647 ]
 [0.9722108 ]
 [0.9755846 ]
 [0.08494362]]
```

```
# Visualize predictions
def plot_predictions(model, X, title):
 predictions = model.predict(X)
 plt.figure()
 plt.scatter(X[:, 0], X[:, 1], c=predictions□.flatten(), cmap='coolwarm', s=100)
 plt.title(title)
```

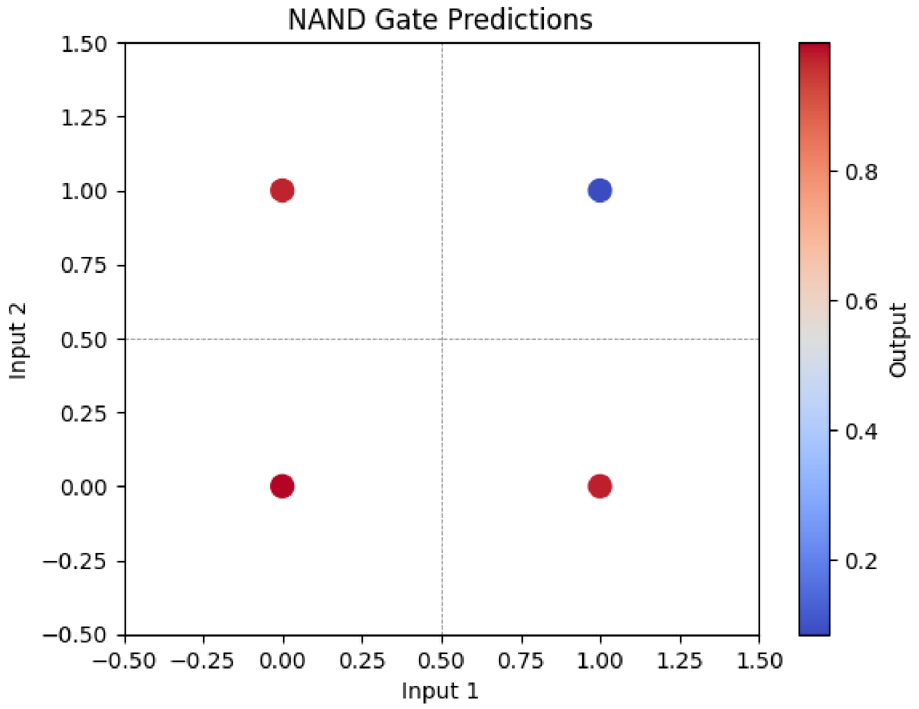
```
    plt.xlabel('Input 1')
    plt.ylabel('Input 2')
    plt.colorbar(label='Output')
    plt.xlim(-0.5, 1.5)
    plt.ylim(-0.5, 1.5)
    plt.axhline(0.5, color='grey', lw=0.5, ls='--')
    plt.axvline(0.5, color='grey', lw=0.5, ls='--')
    plt.show()
```

```
# Plotting the predictions for both gates
plot_predictions(and_model, X_and, "AND Gate Predictions")
plot_predictions(nand_model, X_nand, "NAND Gate Predictions")
```

```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 35ms/step
```



```
1/1 ━━━━━━━━━━━━━━━━━━━━ 0s 38ms/step
```


NAND Gate Predictions
Input 2
Input 1
Output