

3. Step 1,
Confusion Matrix

	Predicted Cat	Predicted Dog	Predicted Person
True cat	5	2	1
True dog	1	3	2
True Person	1	2	3

Step 2,

For Cat

$$TP = 5, FP = 2, FN = 3$$

$$\text{Precision} = \frac{5}{5+2} = 0.71 = 71\%$$

$$\text{Recall} = \frac{5}{5+3} = 0.63 = 63\%$$

$$\text{F1 score} = \frac{2 \times 0.71 \times 0.63}{0.71 + 0.63} = 0.67 = 67\%$$

For Dog,

$$TP = 3, FP = 4, FN = 3$$

$$\text{Precision} = \frac{3}{3+4} = 0.43 = 43\%$$

$$\text{Recall} = \frac{3}{3+3} = 0.5 = 50\%$$

$$\text{F1 score} = \frac{2 \times 0.43 \times 0.5}{0.43 + 0.5} = 0.46 = 46\%$$

For Person,

$$TP = 3, FP = 3, FN = 3$$

$$\text{Precision} = \frac{3}{3+3} = 0.5 = 50\%$$

$$\text{Recall} = \frac{3}{3+3} = 0.5 = 50\%$$

$$\text{F1 score} = \frac{2 \times 0.5 \times 0.5}{0.5 + 0.5} = 0.5 = 50\%$$

Dog class has low, although it has high precision. It needs improvement for predicting true dog. Person class overall F1 score is 50%. Even it has moderate ability we need to fix more to get higher precision and recall.

Step 3,

For the brief analysis,

Cat class has high precision and recall is okay to use.

Cat class has best F1 score in every class which is 67%. It has a good learning on cat.

Dog class has low precision although it has moderate recall. It has the lowest F1 score in the three class indicating dog class need better improvement.

Person class has equal precision and recall which is 50%. So, its overall F1 score is 50%. Even it has moderate ability we need to fix more to get higher precision and recall.