# [320] Accuracy, Recall, and Precision

Meenakshi Syamkumar

# Confusion Matrix

what does the model think?

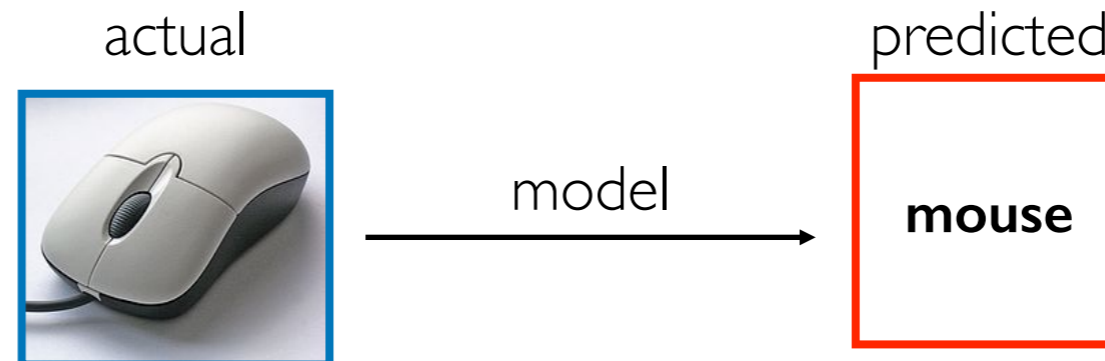|  | dog | cat | mouse |
|---|---|---|---|
| dog | 0 | 0 | 0 |
| cat | 0 | 0 | 0 |
| mouse | 0 | 0 | 0 |

what is it actually?

# Confusion Matrix

|  | dog | cat | mouse |
|---|---|---|---|
| dog | 0 | 0 | 0 |
| cat | 0 | 0 | 0 |
| mouse | 0 | 0 | (1) |

what is it actually?

actual

model →

predicted

**mouse**

# Confusion Matrix

what does the model think?

|  | dog | cat | mouse |
|---|---|---|---|
| dog | 0 | (1) | 0 |
| cat | 0 | 0 | 0 |
| mouse | 0 | 0 | 1 |

what is it actually?
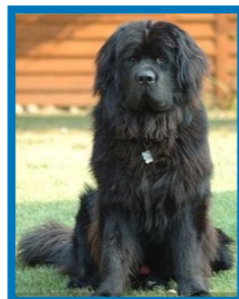
actual

model →

predicted

**cat**

# Confusion Matrix

**what does the model think?**

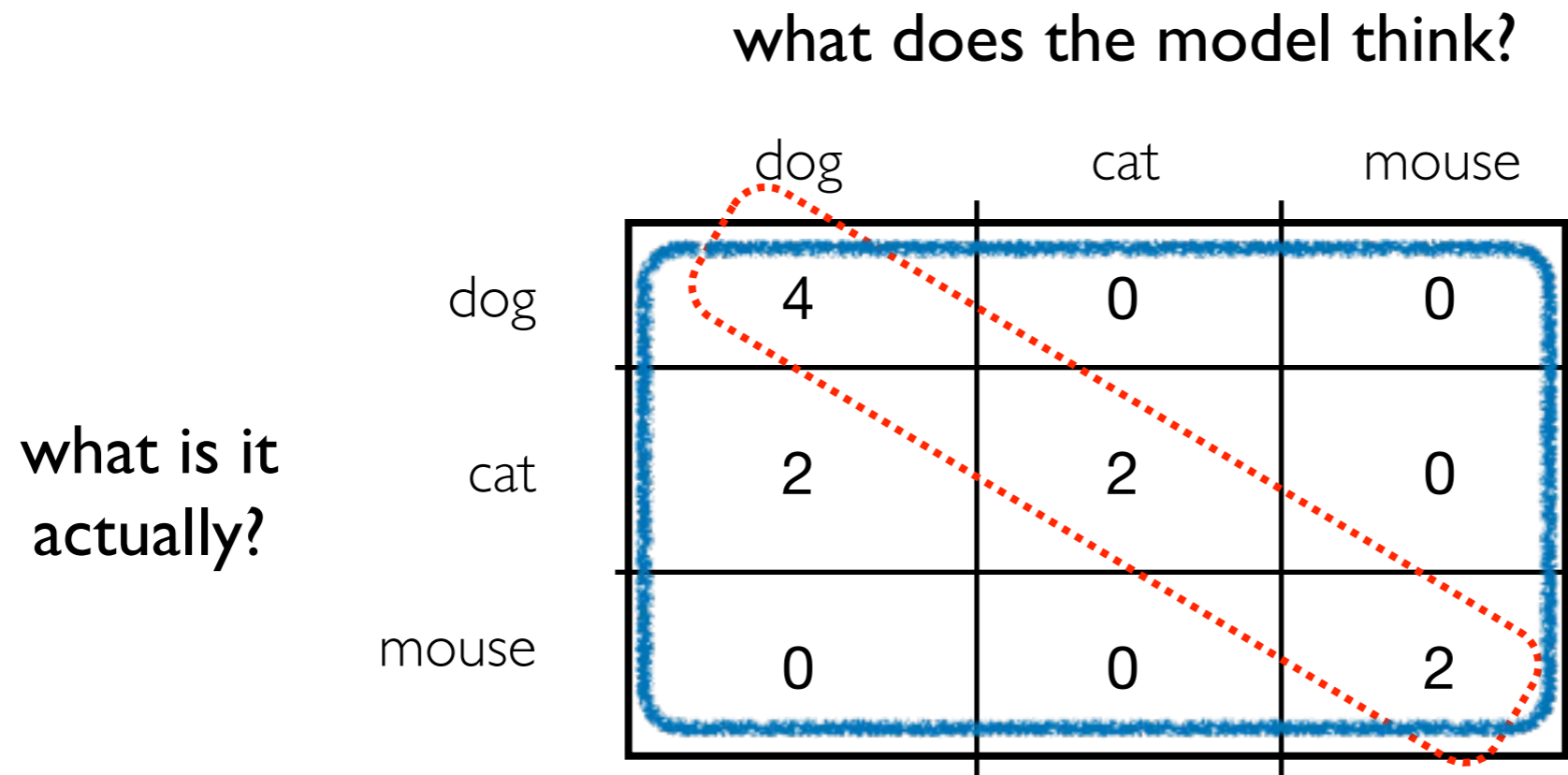|  | dog | cat | mouse |
|---|---|---|---|
| **dog** | 4 | 0 | 0 |
| **cat** | 2 | 2 | 0 |
| **mouse** | 0 | 0 | 2 |

**what is it actually?**

accuracy: total correct (diagonal divided by whole)

$$\frac{8}{10}$$

**observations**
- fraction, so between zero and one
- "good" is in numerator, so one is best

# Confusion Matrix

**what does the model think?**

|  | dog | cat | mouse |
|---|---|---|---|
| dog | 4 | 0 | 0 |
| cat | 2 | 2 | 0 |
| mouse | 0 | 0 | 2 |

**what is it actually?**

precision and recall have these properties, but focus on subsets of the confusion matrix
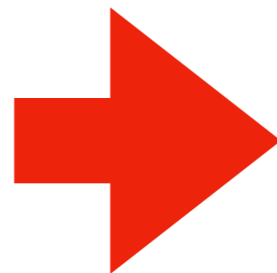
**observations**
- fraction, so between zero and one
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# Confusion Matrix

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**what is it actually?**

cat recall: when we **actually** have a cat (row!), what percentage of the time is the model right?   $\dfrac{2}{4}$

# Confusion Matrix

**what does the model think?**

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**what is it actually?**

cat recall: when we **actually** have a cat (row!), what percentage of the time is the model right? $\dfrac{2}{4}$

dog recall: ????

# Confusion Matrix

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| **dog** | 4 | 0 | 0 |
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**what is it actually?**

cat recall: when we **actually** have a cat (row!), what percentage of the time is the model right?  $\dfrac{2}{4}$

dog recall: when we **actually** have a dog (row!), what percentage of the time is the model right?  $\dfrac{4}{4}$

# Confusion Matrix

**what does the model think?**

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|---|---|---|---|
| **dog** | 4 | 0 | 0 |
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**what is it actually?**

cat recall: when we **actually** have a cat (row!), what percentage of the time is the model right?  $\dfrac{2}{4}$

dog recall: when we **actually** have a dog (row!), what percentage of the time is the model right?  $\dfrac{4}{4}$

dog precision: when the model **predicts** a dog (column!), what percentage is it right?  $\dfrac{4}{6}$

# Confusion Matrix

**what does the model think?**

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dog recall: when we **actually** have a dog (row!), what percentage of the time is the model right? $\dfrac{4}{4}$

dog precision: when the model **predicts** a dog (column!), what percentage is it right? $\dfrac{4}{6}$

cat precision: ????

# Confusion Matrix

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dog recall: when we **actually** have a dog (row!), what percentage of the time is the model right?   $\dfrac{4}{4}$

dog precision: when the model **predicts** a dog (column!), what percentage is it right?   $\dfrac{4}{6}$

cat precision: when the model **predicts** a cat (column!), what percentage is it right?   $\dfrac{2}{2}$

# Confusion Matrix

what does the model think?

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what is it actually?

F1 score = 2 * (precision * recall) / (precision + recall)