

Bayes Practice Problems

1. "watch anime now"

$$P(\text{"watch anime now"} | \text{spam}) =$$

$$P(\text{"watch"} | \text{spam}) \cdot P(\text{"anime"} | \text{spam}) \cdot P(\text{"now"} | \text{spam})$$

$$= .095 \cdot .095 \cdot P(\text{"now"} | \text{spam})$$

↓
Number of times "now" occurs in
all spam + 1

Count of all words in all spam +

✓ number of unique words in all
messages

$$\frac{2}{8+13} = \frac{2}{21}$$

$$= .095 \cdot .095 \cdot .095 = 8.595e^{-4}$$

$$P(\text{"watch anime now"} | \text{not spam}) =$$

$$P(\text{"watch"} | \text{not spam}) \cdot P(\text{"anime"} | \text{not spam}) \cdot P(\text{"now"} | \text{not spam})$$

$$= .053 \cdot .053 \cdot .053$$

$$= \frac{1}{19}$$

$$= 1.478e^{-4}$$

watch anime now is most likely spam

Bayes Practice

2. "takeout and anime at my house"

$$P(\text{"takeout and anime at my house"} | \text{spam}) =$$

$$P(\text{"takeout"} | \text{spam}) \cdot P(\text{"anime"} | \text{spam}) \cdot$$

$$P(\text{"my"} | \text{spam}) \cdot P(\text{"house"} | \text{spam}) =$$

$$\rightarrow \frac{1}{21} = .0476$$

$$.0476 \cdot .045 \cdot .0476 \cdot .045$$

$$= 2.0448e^{-5}$$

$$P(\text{"takeout and anime at my house"} | \text{nospam})$$

$$= P(\text{"takeout"} | \text{nospam}) \cdot P(\text{"anime"} | \text{nospam})$$

$$\cdot P(\text{"my"} | \text{nospam}) \cdot P(\text{"house"} | \text{nospam})$$

$$\rightarrow \frac{2}{19} = .105$$

$$= .105 \cdot .053 \cdot .053 \cdot .105$$

$$= 3.0469e^{-5}$$

Most likely not spam

Practise

3. "sell me your anime collection"

$$P(\text{"sell me your anime collection"} | \text{spam})$$

$$= P(\text{"sell"} | \text{spam}) \cdot P(\text{"me"} | \text{spam})$$

$$\cdot P(\text{"your"} | \text{spam}) \cdot P(\text{"anime"} | \text{spam}) \cdot$$

$$P(\text{"collection"} | \text{spam})$$

$$= \frac{1}{12}$$

$$\rightarrow \frac{2}{21}$$

$$\rightarrow \frac{2}{21}$$

$$\frac{2}{21} \cdot \frac{2}{21} \cdot \frac{1}{21} \cdot \frac{1}{21} \cdot 0.95$$

$$= 1.9539 e^{-6}$$

$$P(\text{"sell me your anime collection"} | \text{non-spam})$$

$$\frac{1}{19} \leftarrow P(\text{"sell"} | \text{non-spam}) \cdot P(\text{"me"} | \text{non-spam}) \rightarrow \frac{1}{19}$$

$$\frac{1}{19} \leftarrow P(\text{"your"} | \text{non-spam}) \cdot P(\text{"anime"} | \text{non-spam})$$

$$\frac{1}{19} \leftarrow P(\text{"collection"} | \text{non-spam})$$

$$\frac{1}{19} \cdot \frac{1}{19} \cdot \frac{1}{19} \cdot \frac{1}{19} \cdot \frac{1}{19} = 4.0386 e^{-\frac{1}{19}}$$

(Most likely spam)