

Bayesian Spam Filter Practice Problems

1. Watch anime now

$$P(\text{watch} | \text{spam}) = .095$$

$$P(\text{anime} | \text{spam}) = .095$$

$$P(\text{now} | \text{spam}) = \frac{2}{21} = .095$$

$$P(\text{watch anime now} | \text{spam}) = .095^3 = .000857375$$

$$P(\text{watch} | \text{not spam}) = .053$$

$$P(\text{anime} | \text{not spam}) = .053$$

$$P(\text{now} | \text{not spam}) = \frac{0+1}{0+13} \cdot \frac{1}{19} = .053$$

$$P(\text{watch anime now} | \text{not spam}) = .053^3 = .000148877$$

Watch anime now is most likely spam

2. takeout and anime at my house

$$P(\text{takeout} | \text{spam}) = \frac{0+1}{8+13} = \frac{1}{21} = .048$$

$$P(\text{and} | \text{spam}) = \frac{0+1}{8+13} = \frac{1}{21} = .048$$

$$P(\text{anime} | \text{spam}) = \frac{1+1}{8+13} = \frac{2}{21} = .095$$

$$P(\text{my} | \text{spam}) = \frac{0+1}{8+13} = \frac{1}{21} = .048$$

$$P(\text{house} | \text{spam}) = \frac{1+1}{8+13} = \frac{2}{21} = .095$$

$$P(\text{takeout and anime at my house} | \text{spam}) = .048 \times .048 \times .095 \times .048 \times .095 = .0000009980928$$

$$P(\text{takeout} | \text{not spam}) = \frac{1+1}{6+13} = \frac{2}{19} = .105$$

$$P(\text{and} | \text{not spam}) = \frac{0+1}{6+13} = \frac{1}{19} = .053$$

$$P(\text{anime} | \text{not spam}) = \frac{0+1}{6+13} = \frac{1}{19} = .053$$

$$P(\text{my} | \text{not spam}) = \frac{0+1}{6+13} = \frac{1}{19} = .053$$

$$P(\text{house} | \text{not spam}) = \frac{1+1}{6+13} = \frac{2}{19} = .105$$

$$P(\text{takeout and anime at my house} | \text{not spam}) = .053^3 \times .105^2$$

$$.000001641368925$$

takeout and anime at my house is most likely not spam

3. Sell me your anime collection

$$P(\text{sell} | \text{spam}) = \frac{1+1}{8+13} = \frac{2}{21} = .095$$

$$P(\text{me} | \text{spam}) = \frac{0+1}{8+13} = \frac{1}{21} = .048$$

$$P(\text{your} | \text{spam}) = \frac{1+1}{8+13} = \frac{2}{21} = .095$$

$$P(\text{anime} | \text{spam}) = \frac{1+1}{8+13} = \frac{2}{21} = .095$$

$$P(\text{collection} | \text{spam}) = \frac{0+1}{8+13} = \frac{1}{21} = .048$$

$$P(\text{sell me your anime collection} | \text{spam}) = .095 \times .048 \times .095 \times .095 \times .048 = .0000019754$$

$$P(\text{sell} | \text{not spam}) = \frac{0+1}{6+13} = \frac{1}{19} = .053$$

$$P(\text{me} | \text{not spam}) = \frac{0+1}{6+13} = \frac{1}{19} = .053$$

$$P(\text{your} | \text{not spam}) = \frac{0+1}{6+13} = \frac{1}{19} = .053$$

$$P(\text{anime} | \text{not spam}) = \frac{0+1}{6+13} = \frac{1}{19} = .053$$

$$P(\text{collection} | \text{not spam}) = \frac{0+1}{6+13} = \frac{1}{19} = .053$$

$$P(\text{sell me your anime collection} | \text{not spam}) = .053^5 =$$

$$.060000064182$$

Sell me your anime collection is most likely spam