

6.1

| | <u>pos</u> | <u>neg</u> |
|---------|------------|------------|
| I | 0.09 | 0.16 |
| always | 0.07 | 0.06 |
| like | 0.29 | 0.06 |
| foreign | 0.04 | 0.15 |
| films | 0.08 | 0.11 |

"I always like foreign films."

$$\begin{aligned}p(s | 'pos') &= p(I | 'pos') p(\text{always} | 'pos') p(\text{like} | 'pos') p(\text{foreign} | 'pos') p(\text{films} | 'pos') \\&= 0.09 \times 0.07 \times 0.29 \times 0.04 \times 0.08 \\&= 5.85 \times 10^{-6}\end{aligned}$$

$$\begin{aligned}p(s | 'neg') &= p(I | 'neg') p(\text{always} | 'neg') p(\text{like} | 'neg') p(\text{foreign} | 'neg') p(\text{films} | 'neg') \\&= 0.16 \times 0.06 \times 0.06 \times 0.15 \times 0.11 \\&= 9.50 \times 10^{-6}\end{aligned}$$

result : neg

6.2

- | | |
|----------------------------|--------|
| 1. fun couple love love | comedy |
| 2. fast furious shoot | action |
| 3. couple fly fast fun fun | comedy |
| 4. furious shoot shoot fun | action |
| 5. fly fast shoot love | action |

new: fast couple shoot fly

| <u>counts</u> | | comedy | action | |
|---------------|--|--------|--------|----------------------------|
| fun | | 3 | 1 | |
| couple | | 2 | 0 | $p(\text{comedy}) = 9/20$ |
| love | | 2 | 1 | $p(\text{action}) = 11/20$ |
| fast | | 1 | 2 | |
| furious | | 0 | 2 | |
| shoot | | 0 | 4 | |
| fly | | 1 | 1 | |
| | | 9 | 11 | |

| <u>prob</u> | | comedy | action |
|-------------|-----------------------------------|------------------------------------|--------|
| fun | $\frac{3+1}{9+20} = \frac{4}{29}$ | $\frac{1+1}{11+20} = \frac{2}{31}$ | .138 |
| couple | $\frac{2+1}{9+20} = \frac{3}{29}$ | $\frac{0+1}{11+20} = \frac{1}{31}$ | .103 |
| love | $\frac{2+1}{9+20} = \frac{3}{29}$ | $\frac{1+1}{11+20} = \frac{2}{31}$ | .103 |
| fast | $\frac{1+1}{9+20} = \frac{2}{29}$ | $\frac{2+1}{11+20} = \frac{3}{31}$ | .069 |
| furious | $\frac{0+1}{9+20} = \frac{1}{29}$ | $\frac{2+1}{11+20} = \frac{3}{31}$ | .034 |
| shoot | $\frac{0+1}{9+20} = \frac{1}{29}$ | $\frac{4+1}{11+20} = \frac{5}{31}$ | .034 |
| fly | $\frac{1+1}{9+20} = \frac{2}{29}$ | $\frac{1+1}{11+20} = \frac{2}{31}$ | .069 |

$$P(\text{new}|\text{comedy}) P(\text{comedy}) = \frac{9}{20} \cdot \frac{2}{29} \cdot \frac{3}{29} \cdot \frac{1}{29} \cdot \frac{2}{29} = \frac{9}{20} \cdot \frac{12}{29^4} = 7.38 \times 10^{-5} *$$

$$P(\text{new}|\text{action}) P(\text{action}) = \frac{11}{20} \cdot \frac{3}{31} \cdot \frac{1}{31} \cdot \frac{5}{31} \cdot \frac{2}{31} = \frac{11}{20} \cdot \frac{30}{31^4} = 1.79 \times 10^{-5}$$

6.3

| <u>doc</u> | <u>"good"</u> | <u>"poor"</u> | <u>"great"</u> | <u>class</u> |
|------------|---------------|---------------|----------------|----------------|
| 1 | 3 | 0 | 3 | + |
| 2 | 0 | 1 | 2 | + |
| 3 | 1 | 3 | 0 | - |
| 4 | 1 | 5 | 2 | - |
| 5 | 0 | 2 | 0 | - |
| | <u>5 (3)</u> | <u>11 (4)</u> | <u>7 (3)</u> | <u>23 (10)</u> |

$s = \text{"A good, good plot and great characters, but poor acting."}$

| $p(w/c)$ | <u>Naive</u> | | <u>Bin Naive</u> | |
|----------|------------------------------------|--------------------------------------|-----------------------------------|-----------------------------------|
| | + | - | + | - |
| good | $\frac{3+1}{5+23} = \frac{4}{28}$ | $\frac{2+1}{5+23} = \frac{3}{28}$ | $\frac{1+1}{3+10} = \frac{2}{13}$ | $\frac{2+1}{3+10} = \frac{3}{13}$ |
| poor | $\frac{1+1}{11+23} = \frac{2}{34}$ | $\frac{10+1}{11+23} = \frac{11}{34}$ | $\frac{1+1}{4+10} = \frac{2}{14}$ | $\frac{3+1}{4+10} = \frac{4}{14}$ |
| great | $\frac{5+1}{7+23} = \frac{6}{30}$ | $\frac{2+1}{7+23} = \frac{3}{30}$ | $\frac{2+1}{3+10} = \frac{3}{13}$ | $\frac{1+1}{3+10} = \frac{2}{13}$ |

| $p(c)$ | + | - | + | - |
|--------|----------------|-----------------|----------------|----------------|
| | $\frac{9}{23}$ | $\frac{14}{23}$ | $\frac{4}{10}$ | $\frac{6}{10}$ |

$$p(s|+) = \frac{9}{23} \cdot \frac{4}{28} \cdot \frac{4}{28} \cdot \frac{6}{30} \cdot \frac{2}{34}$$

$$p(s|-) = \frac{14}{23} \cdot \frac{3}{28} \cdot \frac{3}{28} \cdot \frac{3}{30} \cdot \frac{11}{34}$$

$$p(s|+) = \frac{4}{10} \cdot \frac{2}{13} \cdot \frac{3}{13} \cdot \frac{2}{14}$$

$$p(s|-) = \frac{6}{10} \cdot \frac{3}{13} \cdot \frac{2}{13} \cdot \frac{4}{14}$$

$$p(s|+) = 9.40 \times 10^{-5}$$

$$p(s|-) = 2.26 \times 10^{-4} *$$

$$p(s|+) = 2.03 \times 10^{-3}$$

$$p(s|-) = 6.09 \times 10^{-3}$$