(1) Multi

~~A~~ good, good ~~plot and~~ great ~~characters,~~

~~but~~ poor ~~acting~~.

$V = 3$

$C(+) = 9$

$C(-) = 14$

$P(+) = \frac{2}{5}$, $P(-) = \frac{3}{5}$

$$P(\text{good}|+) = \frac{3+1}{9+3} = \frac{4}{12}$$

$$P(\text{great}|+) = \frac{5+1}{9+3} = \frac{6}{12}$$

$$P(\text{poor}|+) = \frac{1+1}{9+3} = \frac{2}{12}$$

$$\frac{4\times6\times2}{12^3}\times\frac{2}{5}=0.\overset{0}{1}111\ldots$$

$$P(\text{good}\mid -)=\frac{2+1}{14+3}=\frac{3}{17}$$

$$P(\text{great}\mid -)=\frac{2+1}{14+3}=\frac{3}{17}$$

$$P(\text{poor}\mid -)=\frac{10+1}{14+3}=\frac{11}{17}$$

$$\frac{3\times3\times11}{17^3}\times0.6=0.012$$

negative

Binary

good	poor	great	class
1	0	1	+
0	1	1	+
1	1	0	−
1	1	1	−
0	1	0	−

$c(+) = 4$, $c(-) = 6$

$V = 3$

$$P(good|+) = \frac{1+1}{4+3} = \frac{2}{7}$$

$$P(great|+) = \frac{2+1}{4+3} = \frac{3}{7}$$

$$P(poor|+) = \frac{1+1}{4+3} = \frac{2}{7}$$

$$\frac{2\times3\times2}{7^3} \times \frac{2}{5} = 0.014$$

$$P(good|-) = \frac{2+1}{6+3} = \frac{3}{9}$$

$$P(great|-) = \frac{1+1}{6+3} = \frac{2}{9}$$

$$P(poor|-) = \frac{3+1}{6+3} = \frac{4}{9}$$

negative

$$\frac{3\times2\times4}{9^3} \times \frac{3}{5} = 0.019$$ //

(2)

		Predicted	
		+	−
Actual	+	80	20
	−	30	70

$$\text{Acc.} = \frac{80+70}{200} = 0.75$$

$$\text{Pre.} = \frac{TP}{TP+FP} = \frac{80}{80+30}$$

$$= \frac{8}{11} = 0.72$$

$$\text{Rec.} = \frac{TP}{TP+FN} = \frac{80}{80+20} = 0.80$$

$$F1 = \frac{2PR}{R+P} = \frac{2 \times 0.8 \cdot 0.72}{0.8 + 0.72}$$

$$= 0.76$$

Actual \ Predicted	+	N	−
+	100	20	10
N	330	120	20
−	15	25	95

	+	-
+	100	30
	345	260

car	N	
N	120	350
	45	220

	−	
−	95	40
	30	570

Act \ Predicted	+	-
+	100	30
	345	260

$$Acc = \frac{360}{735} = 0.49$$

$$Pre = \frac{100}{445} = 0.22$$

$$Rec = \frac{100}{130} = 0.77$$

$$F1 = \frac{2 \cdot 0.22 \cdot 0.77}{0.22 + 0.77} = 0.34$$

ue \	N	
N	120	350
	45	220

$$Acc = \frac{340}{735} = 0.46$$

$$Pre = \frac{120}{165} = 0.73$$

$$Rec = \frac{120}{470} = 0.26$$

$$F1 = \frac{2 \cdot 0.73 \cdot 0.26}{0.73 + 0.26} = 0.38$$

	-	
-	95	40
	30	570

$$Acc = \frac{95 + 570}{735} = 0.90$$

$$Pre = \frac{95}{125} = 0.76$$

$$Rec = \frac{95}{135} = 0.70$$

$$F1 = \frac{2 \times 0.7 \times 0.95}{0.76 + 0.7} = 0.73$$

(4) Bootstrap method is a way to create a smaller size of dataset to train a model, by randomly picking batches of datapoints with replacement and training the model using the batches. It's good for comparing two classifiers because

Model A and Compute

(1) Bootstrap Model A with replacement

(2) Same for B

(3) Create a histogram of both A, B individually until you will find some distribution for each model.

(4) Using Statistical Hypothesis Testing, Calculate the prob of each hypothesis, whichever, is higher → true.