$$\hat{y} = \arg\max_i P(y=i \mid f=x)$$

$$= \arg\max_i \left(\frac{P(y=i, f=x)}{P(f=x)} \right)$$

if since $P(f=x)$ is same for all classes, we can just do:

$$\hat{y} = \arg\max_i P(y=i, f=x)$$

$P(y=0|x)$
$P(y=1|x)$
$P(y=2|x)$
:
same
care abt numerator

$$P(y=i|x) = \frac{P(y=i, f=x)}{\sum_j P(y=j, f=x)}$$

in end, we'll divide by $\sum P(y=i, f=x)$

Running eg.

Q) Given a male, Rich person, Classify them as working more or less than 40.5 hrs/wk.

Data →

M/F	hrs	status	P
F	40.5-	R	0.255
		P	0.024
	40.5+	R	0.042
		P	0.011
M	40.5-	R	0.331
		P	0.021
	40.5+	R	0.134
		P	0.105

Sol $P(40.5+, M, R)$ $P(40.5-, M, P)$ (I)

0.105 0.097

more probable 40.5+

$P(M, R) = 0.202$

Numerator → dont care bout denom. to classify

for actual prob, divide by denom
divide by evidence

$\frac{0.0105}{0.202}$??