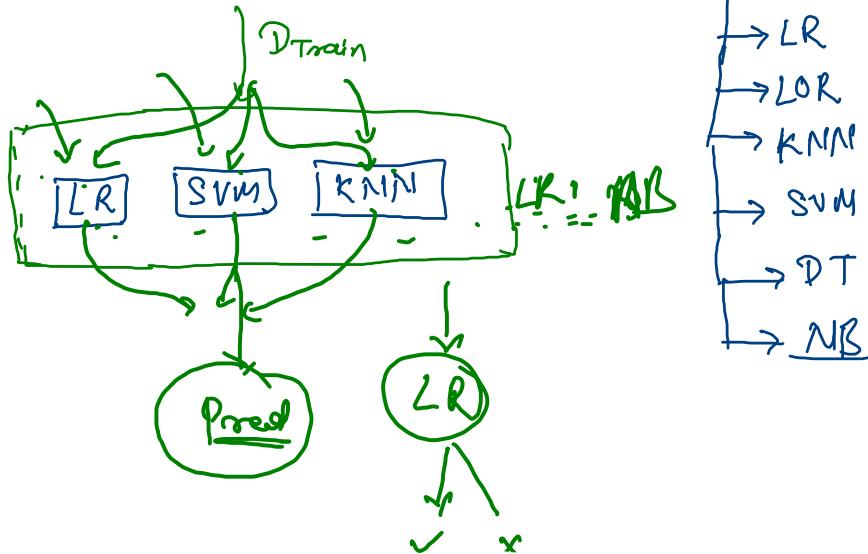
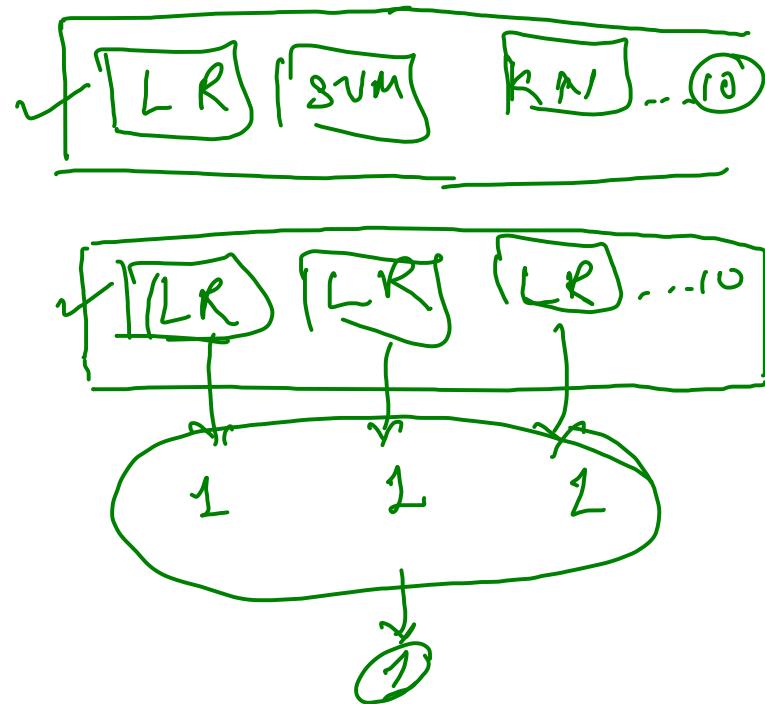


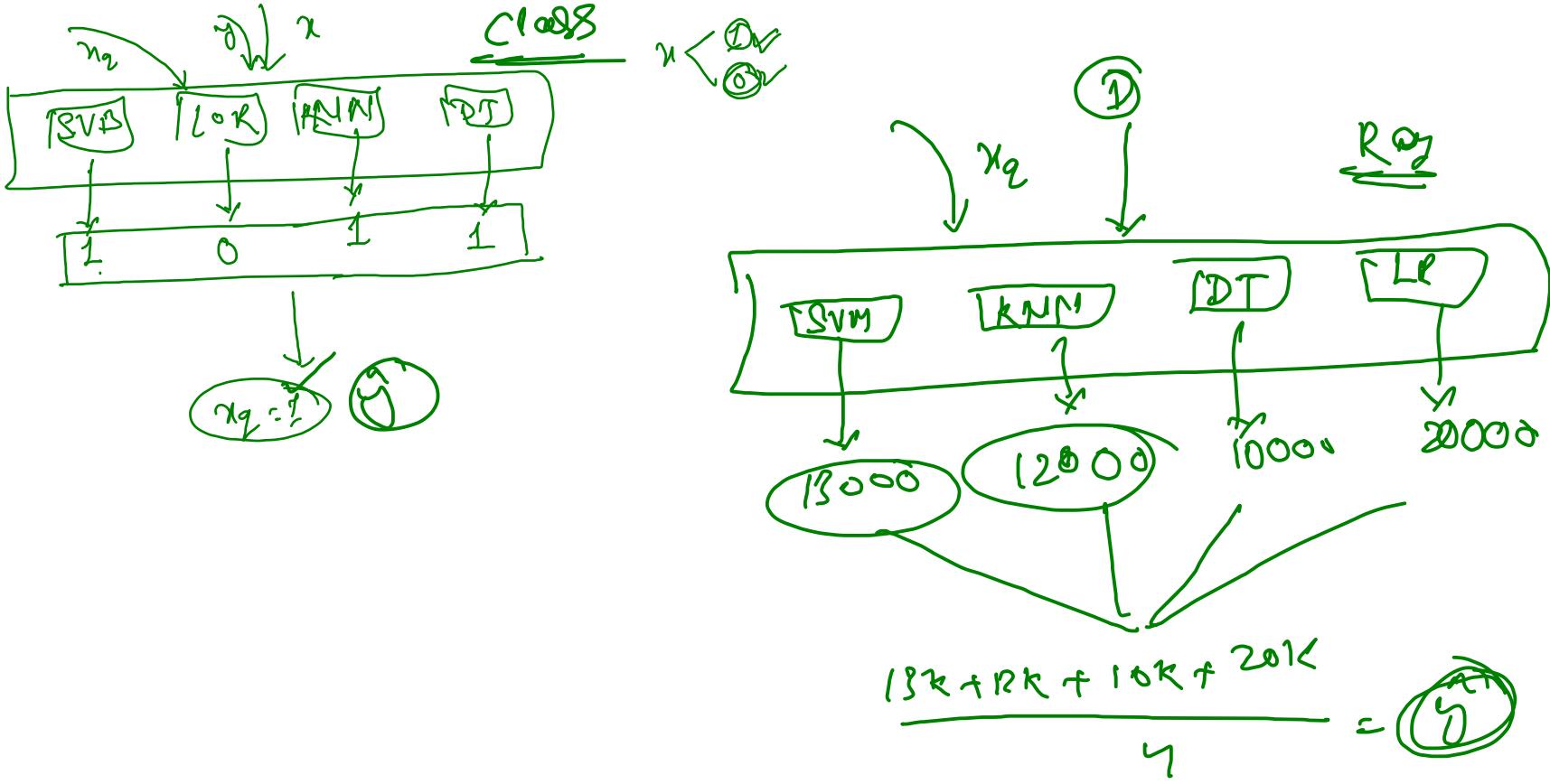
## Ensemble

a group of items viewed as a whole rather than individually.

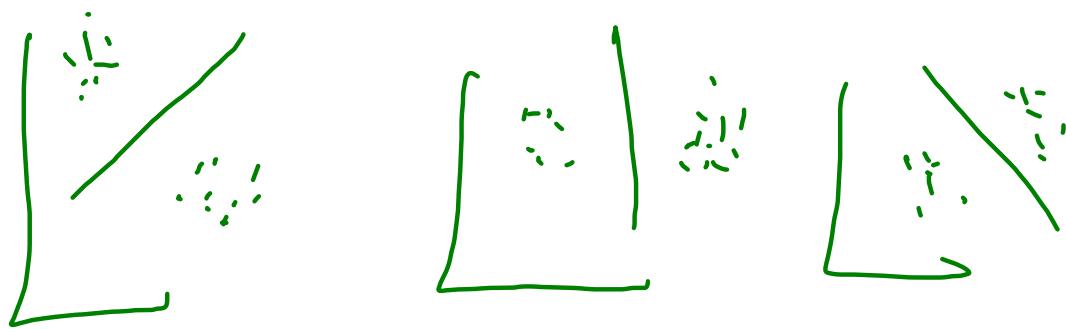
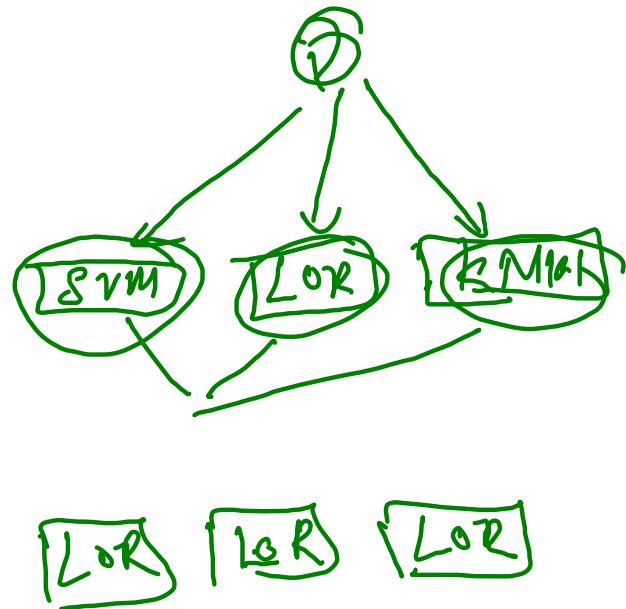
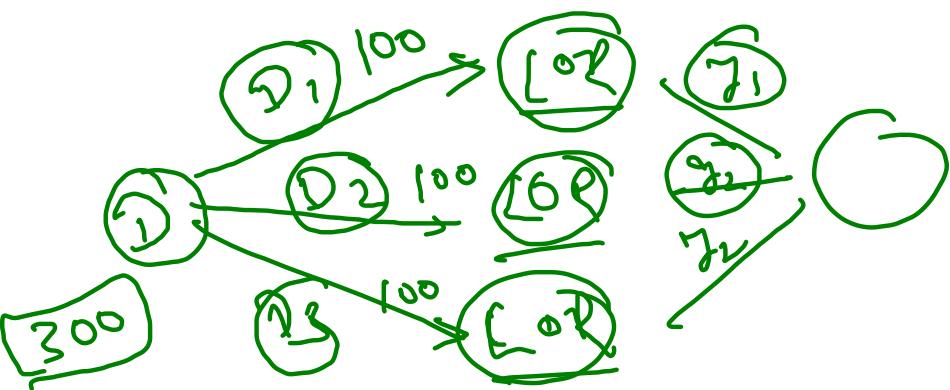


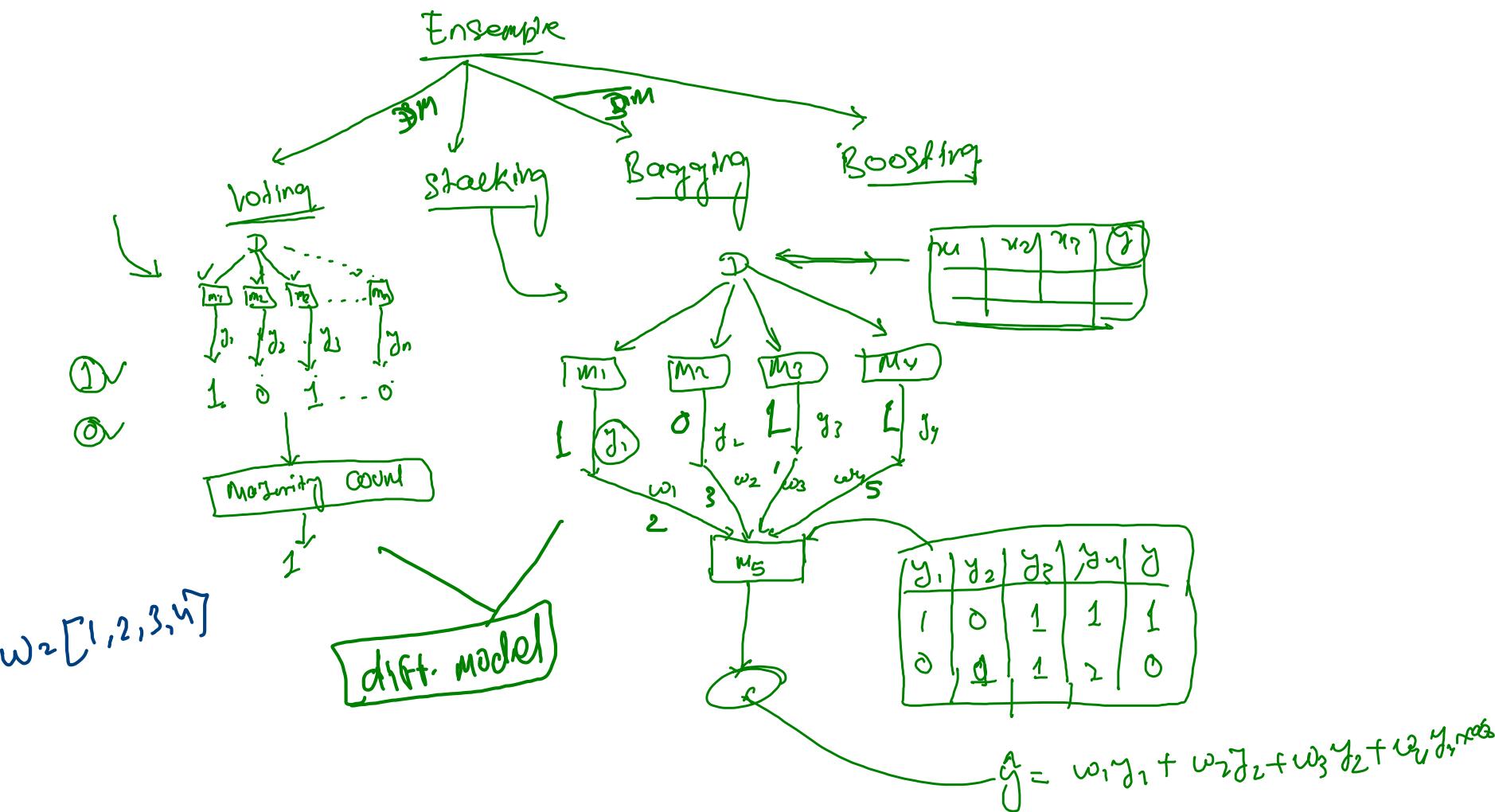
→ LR  
→ LOR  
→ KNN  
→ SVM  
→ DT  
→ NB



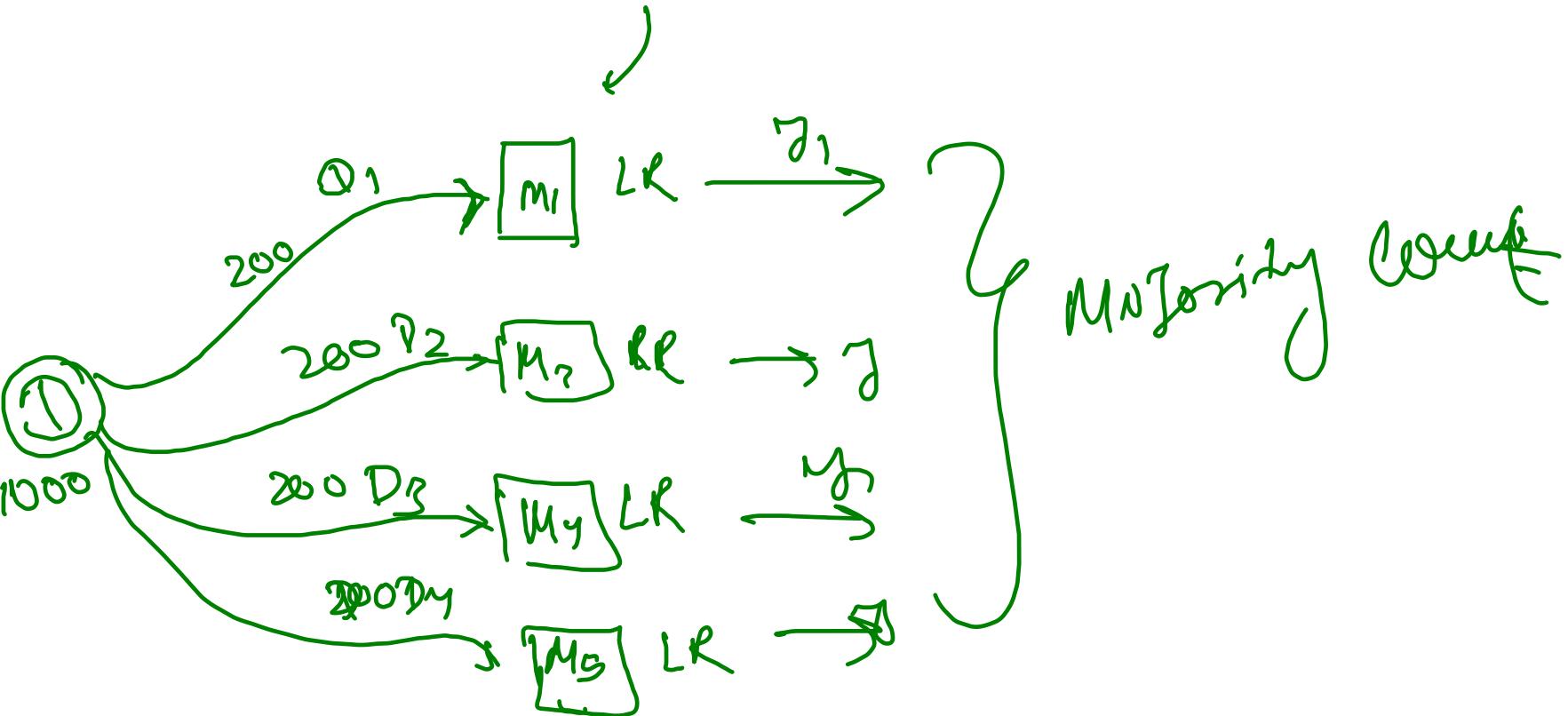


## Ensemble

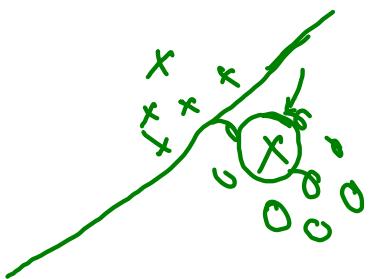
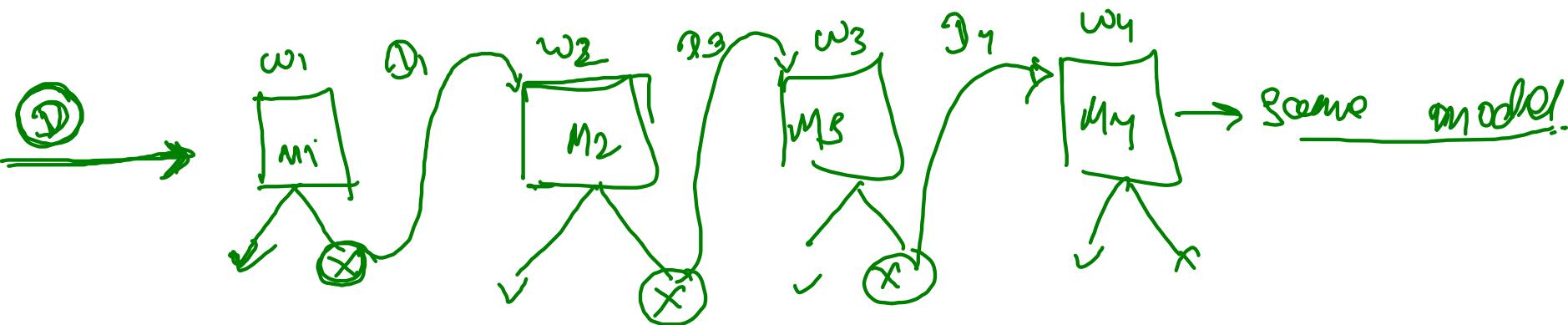




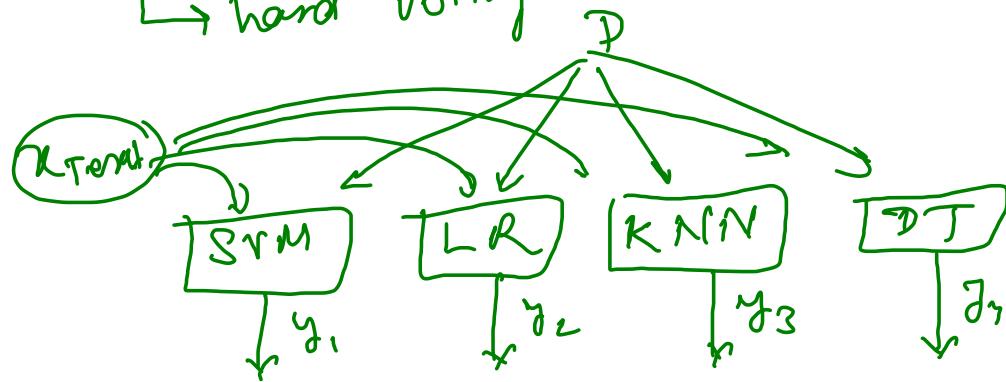
## Bagging



## Boosting



Voting  
 ↗ soft voting  
 ↗ hard voting



Hard voting  $\rightarrow$  1      1      0      1  $\rightarrow$  Majority (and)

Soft voting. 1  $\rightarrow$  0.7      1  $\rightarrow$  0.8      1  $\rightarrow$  0.4      1  $\rightarrow$  0.6  
 0  $\rightarrow$  0.3      0  $\rightarrow$  0.2      0  $\rightarrow$  0.6      0  $\rightarrow$  0.4

$$1 = \frac{0.7 + 0.8 + 0.4 + 0.6}{4}$$

$$0 = \frac{0.3 + 0.2 + 0.6 + 0.4}{4}$$

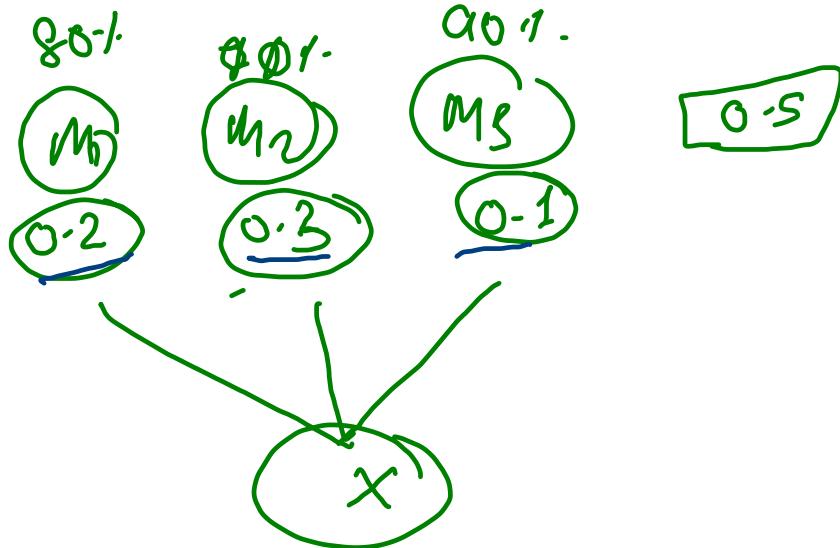
$m_1 \ m_2 \ m_3$

why?

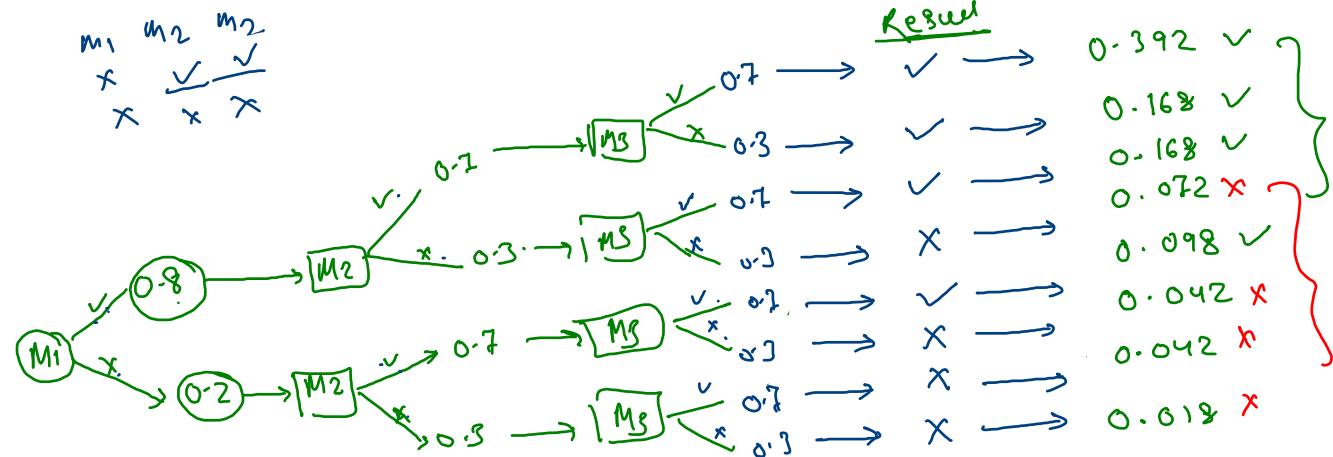
Result ↑

R ↓

Time ↑  
cost ↓



$$\begin{matrix} m_1 & m_2 & m_2 \\ \times & \checkmark & \checkmark \\ \times & \times & \times \end{matrix}$$



$$0.826 \rightarrow 82.6\%$$

$$0.174 \rightarrow 17.4\%$$

$$M_1 \rightarrow \frac{\checkmark}{0.80} \quad \frac{X}{0.20}$$

$$M_2 \rightarrow 0.70 \quad 0.30$$

$$M_B \rightarrow 0.70 \quad 0.30$$

82.1.

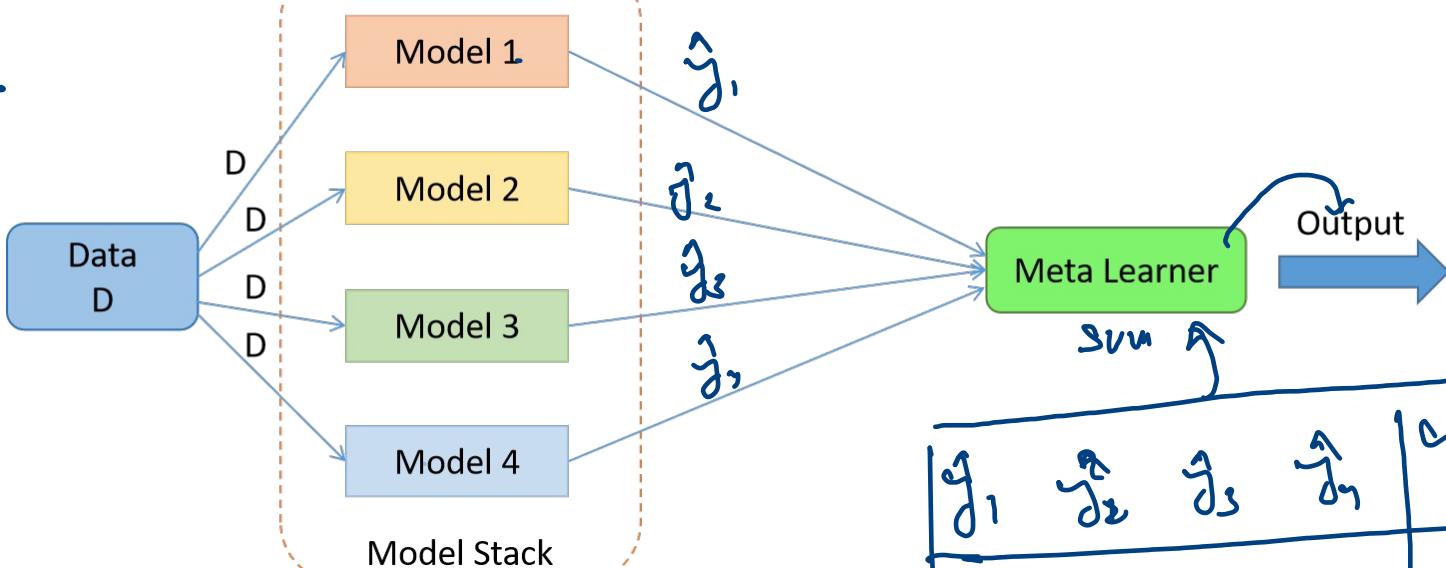
181.

(15)

10:55

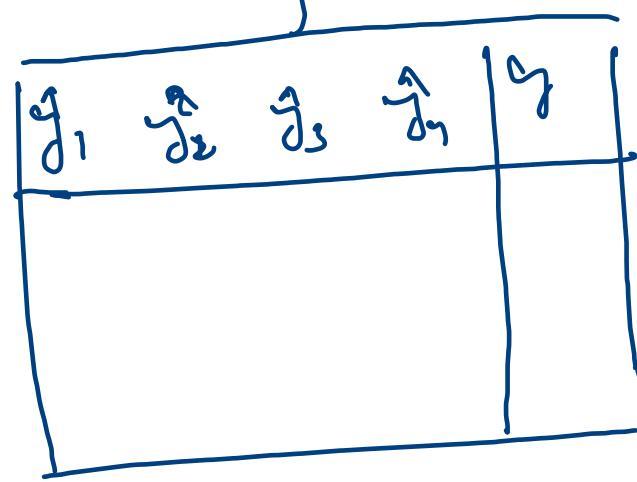
Stacking

→ diff. model

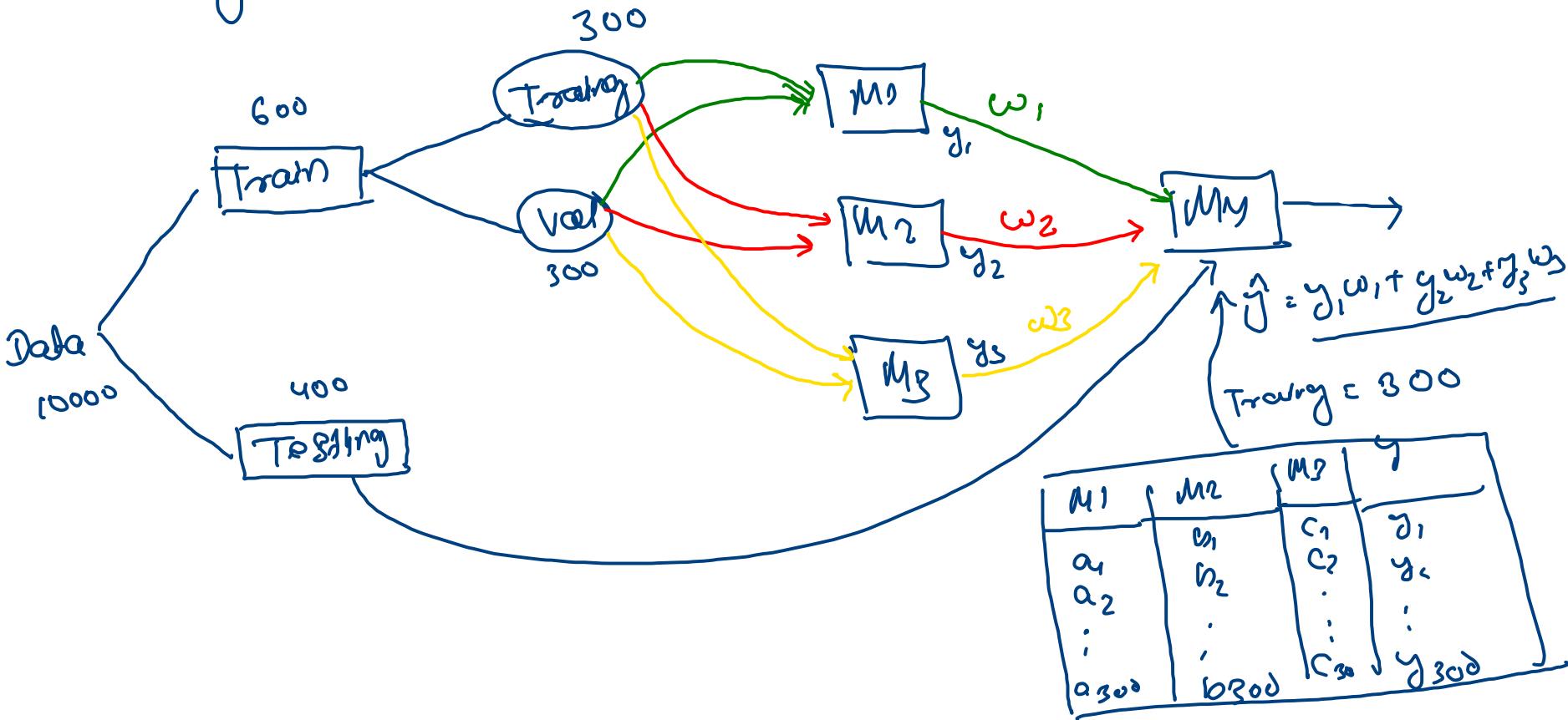


Hold out method  
(Blending)

k-fold method  
(stacking)

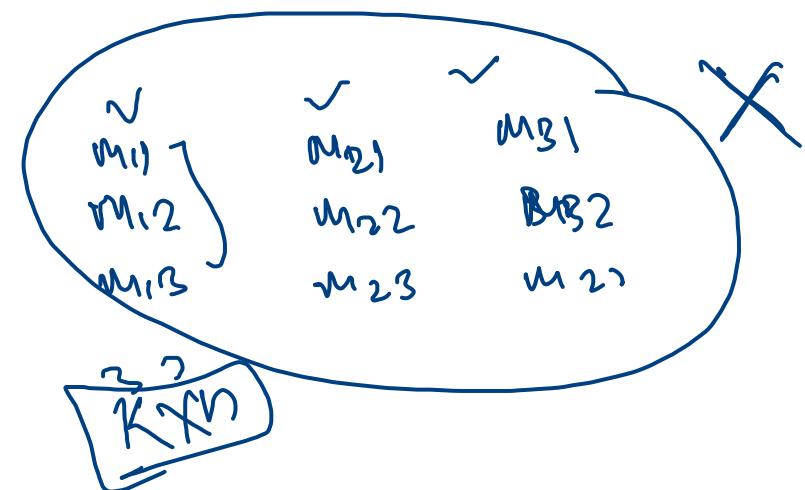
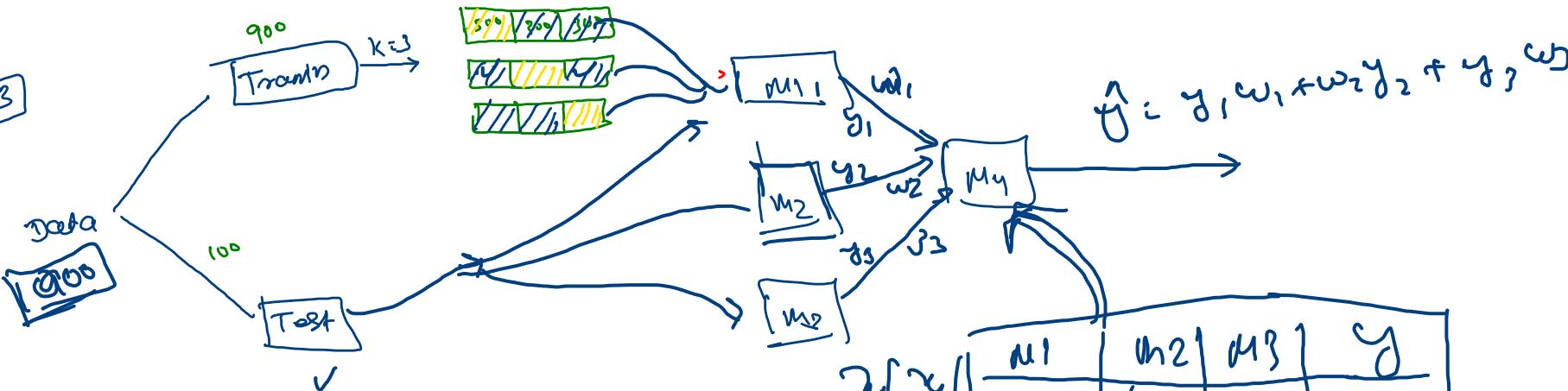


# Blending (Hold out method)

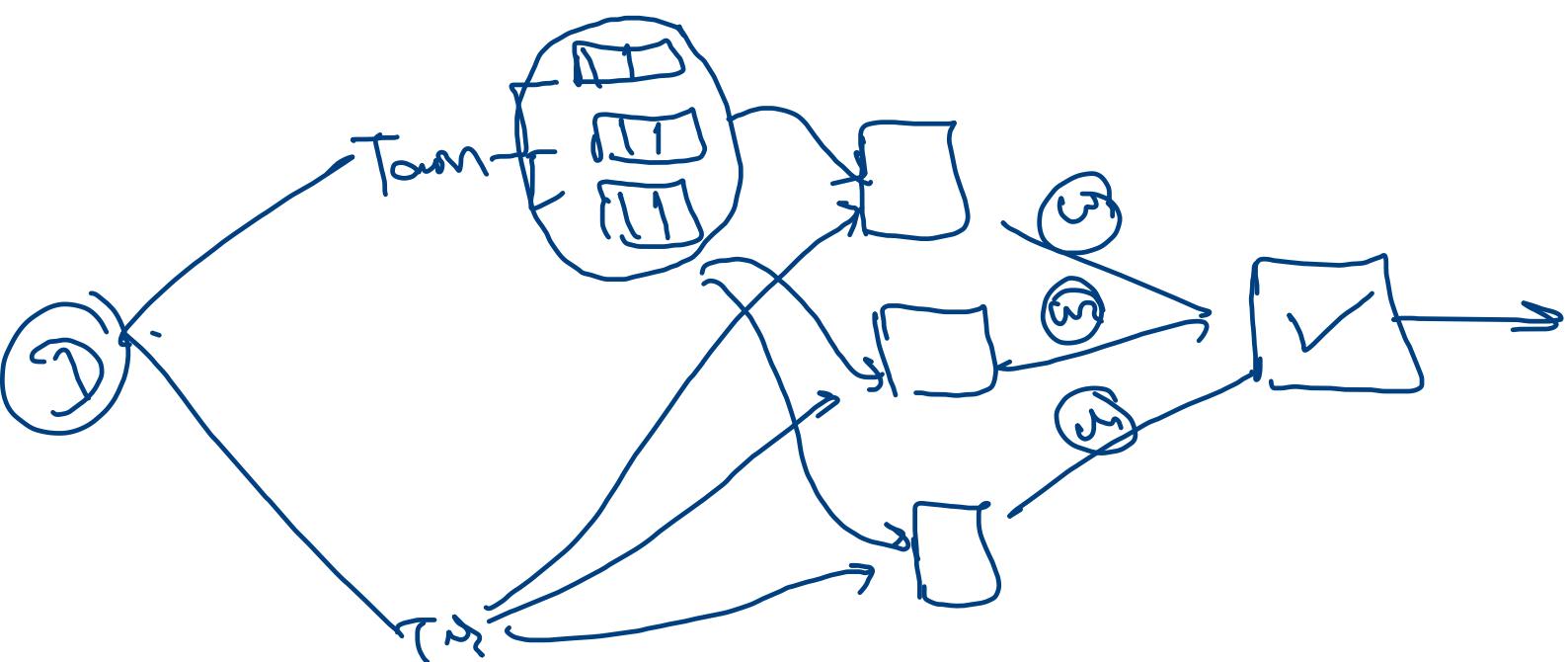


## K-fold (stacking)

$K=3$



	$M_1$	$M_2$	$M_3$	$y$
900	$a_{1,1}$ $a_{1,2}$ $\vdots$ $a_{1,100}$	$b_{1,1}$ $b_{1,2}$ $\vdots$ $b_{1,100}$	$c_{1,1}$ $c_{1,2}$ $\vdots$ $c_{1,100}$	$y_1$
	$a_{2,1}$ $a_{2,2}$ $\vdots$ $a_{2,100}$	$b_{2,1}$ $b_{2,2}$ $\vdots$ $b_{2,100}$	$c_{2,1}$ $c_{2,2}$ $\vdots$ $c_{2,100}$	$y_2$
	$a_{3,1}$ $a_{3,2}$ $\vdots$ $a_{3,100}$	$b_{3,1}$ $b_{3,2}$ $\vdots$ $b_{3,100}$	$c_{3,1}$ $c_{3,2}$ $\vdots$ $c_{3,100}$	$y_3$
				$\vdots$



# Mult' by stocks

