* Training / Validation / Test sets

size	price	
2104	400	training set 60%
1600	330	
⋮	⋮	
1985	300	
1534	315	validation set 20%
1427	199	
1380	212	test set 20%
1494	243	

$(x^{(1)}, y^{(1)})$ … $(x^{(m_{train})}, y^{(m_{train})})$ → $m_{train} = 6$

$(x_{cv}^{(1)}, y_{cv}^{(1)})$ … $(x_{cv}^{m_{cv}}, y_{cv}^{m_{cv}})$ → $m_{cv} = 2$

$(x_{test}^{(1)}, y_{test}^{(1)})$ … $(x_{test}^{m_{test}}, y_{test}^{m_{test}})$ → $m_{test} = 2$

Training error: $J_{train}(\vec{w}, b) = \frac{1}{2m_{train}} \left[\sum_{i=1}^{m_{train}} (f_{\vec{w},b}(\vec{x}^{(i)}) - y^{(i)})^2 \right]$

Validation error: $J_{cv}(\vec{w}, b) = \frac{1}{2m_{cv}} \left[\sum_{i=1}^{m_{cv}} (f_{\vec{w},b}(\vec{x}_{cv}^{(i)}) - y_{cv}^{(i)})^2 \right]$

Test error: $J_{test}(\vec{w}, b) = \frac{1}{2m_{test}} \left[\sum_{i=1}^{m_{test}} (f_{\vec{w},b}(\vec{x}_{test}^{(i)}) - y_{test}^{(i)})^2 \right]$

⇓ then model selection

$d=1$: $f_{w,b}(\vec{x}) = w_1 x_1 + b$ → $w^{<1>}, b^{<1>}$ → $J_{cv}(w^{<1>}, b^{<1>})$

$d=2$: $f_{w,b}(\vec{x}) = w_1 x_1 + w_2 x^2 + b$ → $w^{<2>}, b^{<2>}$ → $J_{cv}(w^{<2>}, b^{<2>})$

$d=3$: $f_{w,b}(\vec{x}) = w_1 x_1 + w_2 x^2 + w_3 x^3 + b$

⋮

$d=10$: $f_{w,b}(\vec{x}) = w_1 x_1 + w_2 x^2 + \cdots + w_{10} x^{10} + b$ → $w^{<10>}, b^{<10>}$ → $J_{cv}(w^{<10>}, b^{<10>})$

Choose $d=4$

⇒ if $J_{cv}(w^{<4>}, b^{<4>})$ is the lowest ⇒ Pick $w_1 x_1 + \cdots + w_4 x^4 + b$

then "estimate generalization error using test set" : $J_{test}(w^{<4>}, b^{<4>})$