9. Linear Regression An affine function used to approximate/estimate data

$$\hat{y} = \beta^T x + v$$

- x - feature vector (data) inputs
- $\hat{y}$ - thing being approx. prediction
- β - coeff. vector
- v - offset

10. In the chart below, x_1 is house area in 1000 square feet and x_2 is the number of bedrooms. Assume the coefficient vector is $\beta = (148.73, -18.85)$ and $v = 54.40$.

House	x_1 (area)	x_2 (beds)	y (price)	$\hat{y}$ (prediction)
1	0.846	1	115.00	161.37
2	1.324	2	234.50	213.61
3	1.150	3	198.00	168.88
4	3.037	4	528.00	430.67
5	3.984	5	572.50	552.66

Write out the linear approximation $\hat{y}$ given by β and v and confirm that the top entry in the last column is correct.

10. $\hat{y} = \beta^T \cdot x + v = \begin{bmatrix} 148.73 \\ -18.85 \end{bmatrix}^T \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + 54.4$

$= 148.73 x_1 - 18.85 x_2 + 54.4$

Check $\hat{y} = 148.73(0.846) - 18.85(1) + 54.4 = 161.37558$

11. Interpret the coefficients in β.

If area of house increases by 1000 sq feet and # bedrooms is fixed, then house price is modelled to increase by \$148,730.

If # bedrooms ↑ by 1 and sq. footage is fixed, then model predicts house price ↓ by \$18,850.