

Extending Regression to Multiple Variables



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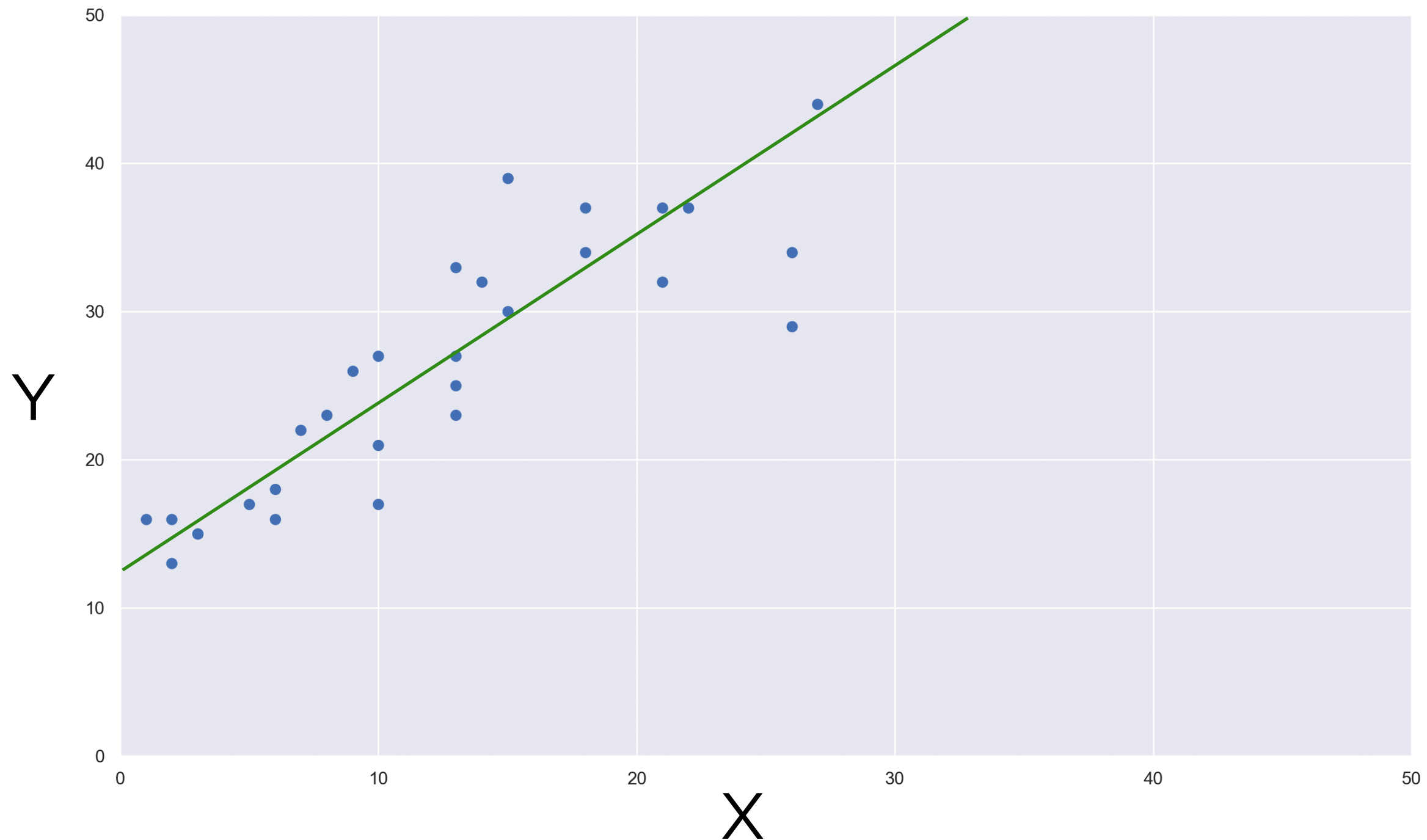
FREELANCE DEVELOPER

@nusco

	Reservations	Temperature	Tourists	Pizzas
13	33	9	52	
2	16	6	17	
14	32	3	46	
23	25	9	70	
13	23	8	43	
13	51	9	60	
1	27	7	23	
18	16	2	43	
7	34	3	28	
10	22	3	31	
26	17	7	65	
3	21	1	15	
3	12	4	15	
21	26	2	59	
22	15	4	52	
2	21	7	22	
27	18	3	68	

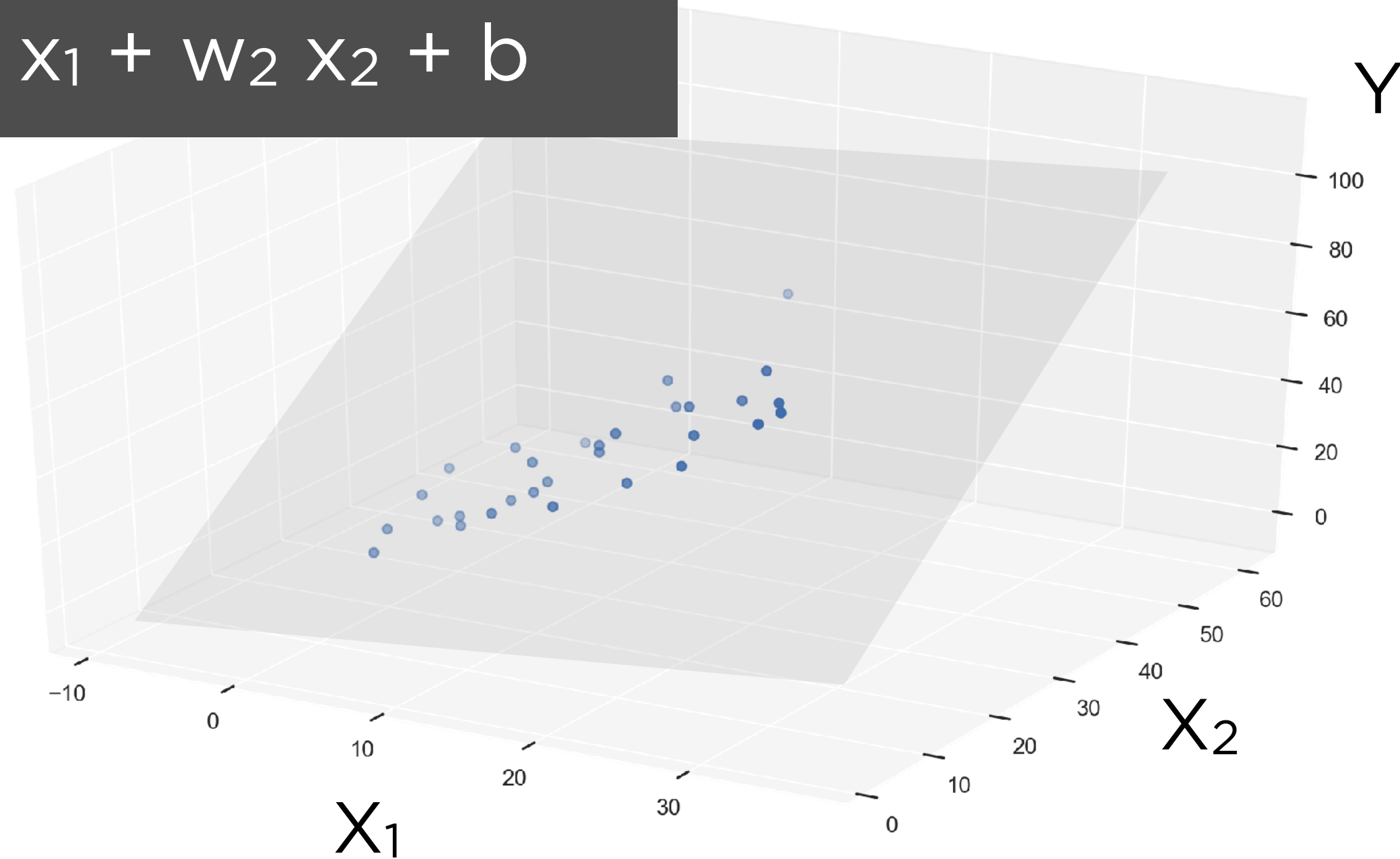
Disclaimer: this is probably the
hardest module in this training.

Linear Regression with One Variable

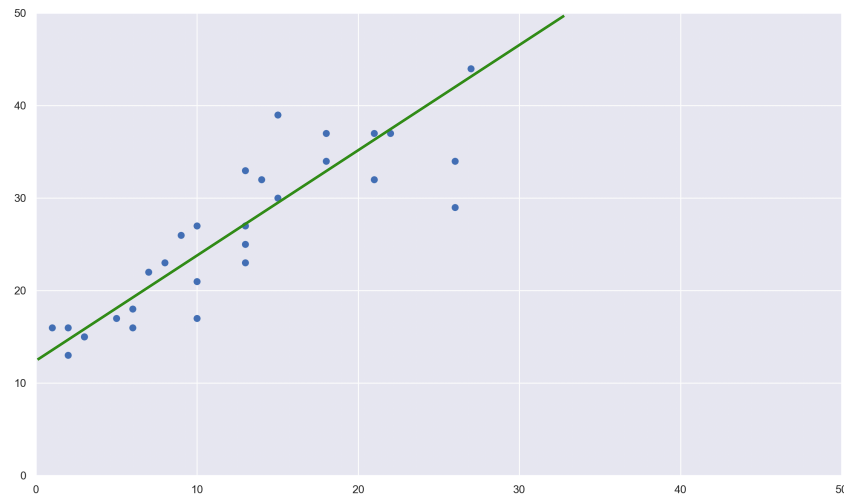


Linear Regression with Two Variables

$$y = w_1 x_1 + w_2 x_2 + b$$

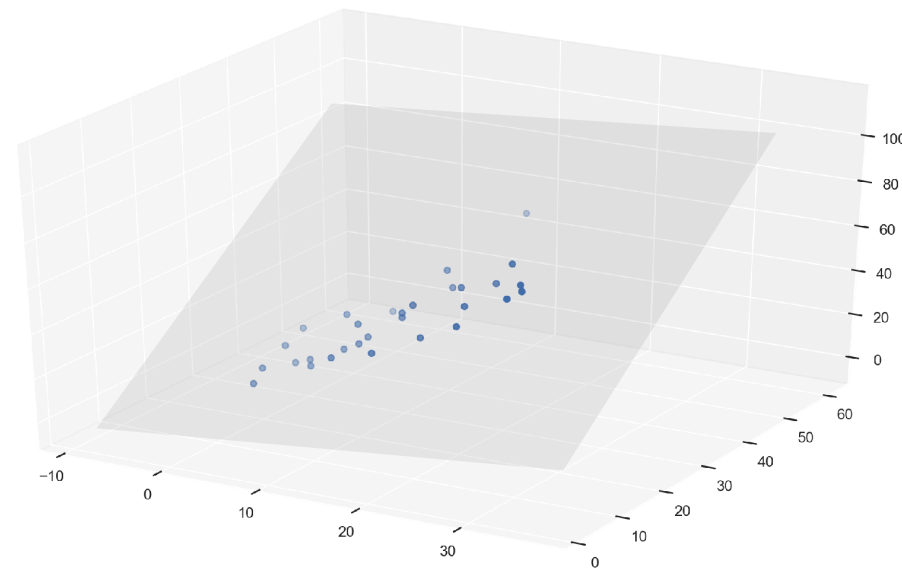


From Linear Regression to Multiple Regression



1 Variable

$$y = wx + b$$



2 Variables

$$y = w_1x_1 + w_2x_2 + b$$

**(Cannot be
visualized)**

N Variables

$$y = w_1x_1 + \dots + w_nx_n + b$$

A Special Case

$$y = w_0 x_0 + w_1 x_1 + w_2 x_2 + w_3 x_3 + \dots$$

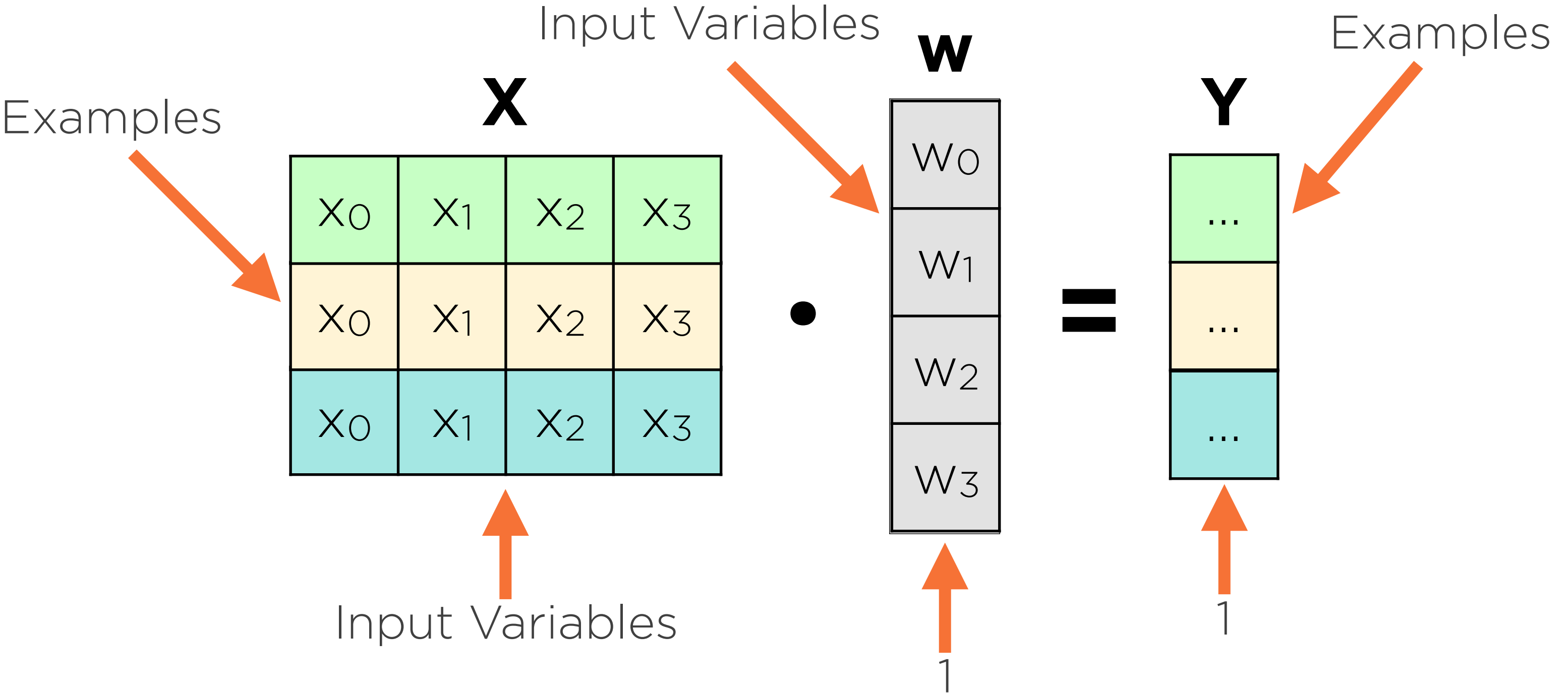


always equal to 1

	Bias	Reservations	Temperature	Tourists	Pizzas
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1	13	33	9	X	52
1	2	16	6		17
1	14	32	3		46
1	23	25	9		70
1	13	23	8		43
1	13	51	9		60
1	1	27	7		23
1	18	16	2		43
1	7	34	3		28
1	10	22	3		31
1	26	17	7		65
1	3	21	1		15
1	3	12	4		15
1	21	26	2		59

Matrix Multiplication



Upgrading *gradient()*

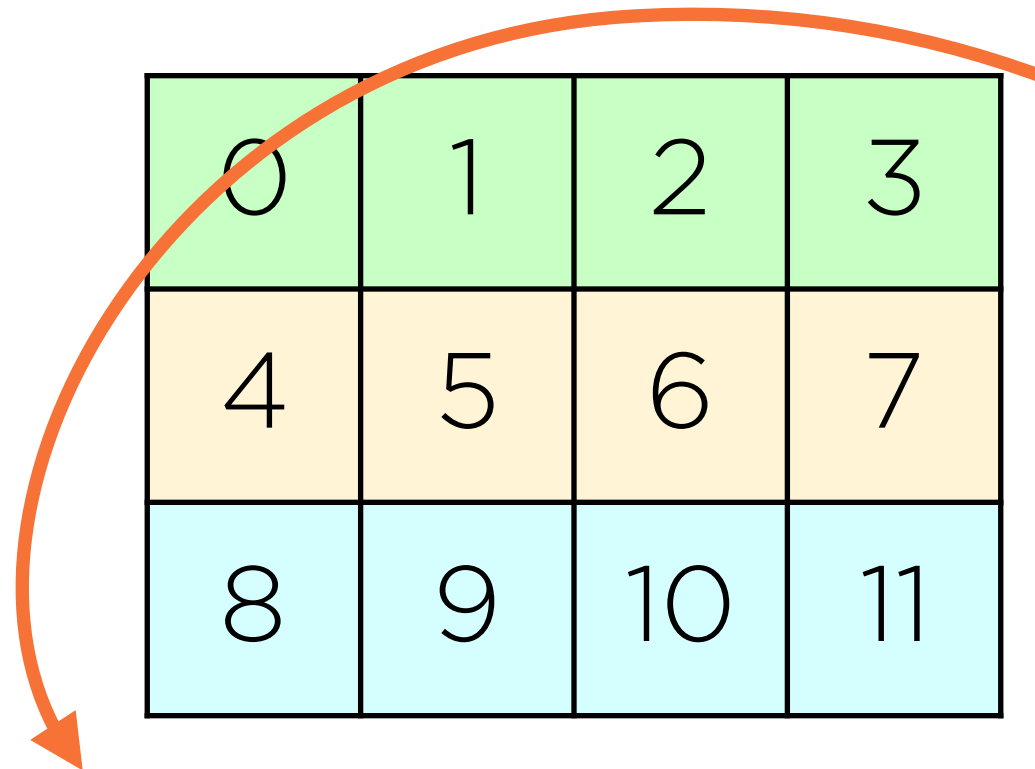
```
np.average(2 * X * (predict(X, w) - Y))
```



```
2 * np.matmul(X.T, (predict(X, w) - Y)) / X.shape[0]
```

Matrix Transposition

X



Summary

We moved from linear regression to multiple regression

We used matrices to represent our data

We got rid of the bias