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Features and Polynomial Regression

We can improve our features and the form of our hypothesis function in a couple different ways.

We can **combine** multiple features into one. For example, we can combine *x*1 and *x*2 into a new feature *x*3 by taking *x*1⋅*x*2.

**Polynomial Regression**

Our hypothesis function need not be linear (a straight line) if that does not fit the data well.

We can **change the behavior or curve** of our hypothesis function by making it a quadratic, cubic or square root function (or any other form).

For example, if our hypothesis function is *hθ*(*x*)=*θ*0+*θ*1*x*1 then we can create additional features based on *x*1, to get the quadratic function *hθ*(*x*)=*θ*0+*θ*1*x*1+*θ*2*x*21 or the cubic function *hθ*(*x*)=*θ*0+*θ*1*x*1+*θ*2*x*21+*θ*3*x*31

In the cubic version, we have created new features *x*2 and *x*3 where *x*2=*x*21 and *x*3=*x*31.

To make it a square root function, we could do: *hθ*(*x*)=*θ*0+*θ*1*x*1+*θ*2*x*1−−√

One important thing to keep in mind is, if you choose your features this way then feature scaling becomes very important.

eg. if *x*1 has range 1 - 1000 then range of *x*21 becomes 1 - 1000000 and that of *x*31 becomes 1 - 1000000000